Image-Pro® Plus

Version 7.0 for Windows™

Auto-Pro Reference

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Section 1 - Overview

As you become proficient with *Image-Pro*, you may find that you need to automate routine procedures or tailor its interface to your specific needs. For example, you may want to automate a series of steps that are performed daily, or perform certain steps only when certain conditions exist. You might also want to call *Image-Pro* functions from a program of your own creation. These levels of customization can be achieved with the *Auto-Pro* scripting facility.

Auto-Pro lets you translate a sequence of actions into a set of written instructions that can be recalled and "played back" whenever they are needed. The *Auto-Pro* scripting facility also lets you add variable definition and flow control statements (e.g., looping and branching) to these instructions, so that you can specify when and how often the actions are performed.

About Auto-Pro

The *Auto-Pro* scripting facility is made up of two basic components:

◆ **The *Auto-Pro* function set:** *Auto-Pro* functions are used to perform *Image-Pro* actions. For example, the `IpFltSobel` function performs a Sobel filtering operation, and the `IpLutReset` function resets the Lookup Table. These functions are written to a script file when a macro is recorded, and are "called" when the macro is played back. *Auto-Pro* functions can also be called from your own Visual Basic™ programs, allowing you to add the image-processing power of *Image-Pro* to programs of your own design.

◆ ***Image-Pro* BASIC (IPBasic):** IPBasic is the language in which *Image-Pro* macros are written and interpreted. When an *Image-Pro* action is recorded, it is written as an IPBasic call to the appropriate *Auto-Pro* function. The macro itself is defined as an IPBasic sub-routine.

The IPBasic component of *Auto-Pro* also provides many commands that can be used to add variable definition, flow control and string manipulation to your macro. These commands are a subset of the BASIC language, and conform to Visual Basic syntax.

This Manual

This manual describes the *Auto-Pro* function set scripting facility.

- The first section provides a discussion of the key elements in each component. It also describes how *Auto-Pro* is used with a Visual Basic program.

- The second section contains alphabetically arranged descriptions of the functions and commands in the *Auto-Pro* function set . IPBasic functions are described in the IPBasic online help, where you will find complete descriptions and other important information.

- The appendices list the functions, commands, reserved words, data types and character codes used by the *Auto-Pro* scripting facility.

What's New in Version 7.0

- New macro functions have been added to support Live EDF, Live Tiling, and Bayer Interpolation. Improvements have been made to the AFA macros.

- The Scope-Pro and Stage-Pro macros have been integrated into this manual.

Macros

When you record a macro with the **Record Macro** command, your actions are translated into a sequence of *Auto-Pro* function calls written in IPBasic. These instructions are stored in a script file. When you play the macro back, the commands are read and executed by *Image-Pro's* built-in BASIC interpreter, IPBasic.

The tools used to create and play back macros are located on the *Macro* menu. These are:

> **Record Macro -** the command used to create a macro by writing *Auto-Pro* functions, representing the actions you perform, to a script file.
>
> **Macro Management** – the command which invokes the Macro Management dialog. This dialog allows you to load and work with the contents of different script files, including tasks such as running, editing, deleting, and renaming macros.
>
> **The Macro Menu** – The end of the macro menu itself lists the macro commands that are available from the currently loaded script (use the Macro Management item to load different scripts). Clicking the name of the macro in this menu will run that function from the macro script.

These commands are explained in full detail in your *Image-Pro Plus Reference Manual*. For the automation of simple routine procedures, these commands may be all the functionality you will ever need. However, to create powerful routines that branch on condition or loop when instructed, you will need to edit the macro to add this capability.

Script Files

A script file is a collection of macros that you have recorded — when you record a new macro, its instructions are appended to the file. By default, macros are written to the DEFAULT.IPM script file. You may have as many script files as you choose, but *Image-Pro* can record to and play back from only one at a time — the one that is currently loaded. Script files are loaded using the **Change** button in the **Macro** dialog box. Once a script file is loaded, the macros within it are available for playback.

You can at any time examine the current script file (which is a simple text file) by using the **Edit** button in the **Macro** dialog box. Furthermore, you can modify the file according to the rules laid out in this manual. Be sure to reload the script file after you have saved your changes.

Before learning in detail how *Auto-Pro* works, take a moment to look at an example script file below, to familiarize yourself with its components.

```
Sub VIDENH()
'<c>0
'
ret = IpWsLoad("c:\ipwin\images\bankvid.tif","TIF")
ret = IpFltSharpen(5, 10, 2)
ret = IpWsScale(753, 462, 1)
End Sub
```

Macro
VIDENH

```
Sub DNATEST()
'<c><s>F2
' Save 10 Profiles
dim x1 As integer, x2 As integer
dim i As integer, j As integer
ret = IpProfCreate( )
ret = IpProfSetAttr(LINETYPE, THICKVERT)
x1 = 96
x2 = 110
j = 0  ' Save to file the first time;  then append
for i = 1 to 9
   ret = IpProfLineMove(x1, 0, x2, 290)
   ret = IpProfSave("C:\IPWIN\PROFILE.HST", j)
   x1 = x1 + 41
   x2 = x2 + 41
   j = 1   'Set Append Flag
next i
ret = IpProfSelect(0)
ret = IpProfDestroy()
End Sub
```

Macro
DNATEST

```
Sub FPRINT()
' <s>F4
'
ret = IpWsLoad("c:\ipwin\images\fprint.tif","TIF")
ret = IpFltFlatten(0, 20)
ret = IpLutSetAttr(BRIGHTNESS, 60)
ret = IpLutSetAttr(CONTRAST, 60)
ret = IpLutApply()
ret = IpFltHiPass(3, 10, 1)
End Sub
```

Macro
FPRINT

This script file contains three macros: VIDENH, DNATEST, and FPRINT, as denoted by the name on the `Sub` command line at the top of each macro. If you are familiar with a programming language, you will note that the format of a macro is that of a subroutine — it begins with a `Sub` command, and ends with an `End Sub` command.

The format of a macro is explained in more detail in the following diagram of the DNATEST macro. This macro is one that has been edited to include some simple looping and conditional test operations. Don't worry if some of the explanations are not clear at this time. They should become clearer as you read further in this manual.

```
1. __  Sub DNATEST()
2. __  ' <c><s>F2
3. __  ' Save 10 Profiles
       dim x1 As integer, x2 As integer
4.     dim i As integer, j As integer
       ret = IpProfCreate()
5.     ret = IpProfSetAttr(LINETYPE, THICKVERT)
       x1 = 96
6.     x2 = 110
       j = 0  ' Save to file the first time; then append
       for i = 1 to 9
          ret = IpProfLineMove(x1, 0, x2, 290)
          ret = IpProfSave("C:\IPWIN\PROFILE.HST", j)
7.        x1 = x1 + 41
          x2 = x2 + 41
          j = 1  ' Set Append
       next i
       ret = IpProfSelect(0)
       ret = IpProfDestroy()
8. __  End Sub
```

1. The keyword "Sub," followed by the macro name identifies a macro. A `Sub` statement must be the first statement in any macro. The macro can be given any valid variable name (See *Variable, Constants and Data Types* later in this section for variable name rules). This line is automatically written when you record a macro.

2. This comment line is used to identify the shortcut key assigned to the macro. A shortcut key does not have to be assigned to a macro, but if it is, its name must be placed before the first operational statement (i.e., non-comment statement) in the macro (see *Appendix E - Shortcut Key Assignments* for valid key names). This line is automatically placed on the second line when you record a macro that has been assigned a shortcut key. If you do not assign a shortcut key when you record your macro, this comment line will not appear.

3. This comment line is used to record the macro's description, which is displayed in the **Macro** dialog box. A description does not have to be included with your macro, but if you choose to include it, it must be placed before the first operational statement (i.e., non-comment statement) in the macro. It may appear before or after the shortcut key comment, if one has been included.

   The description line is automatically written when you record a macro that has been given a description. If you do not assign a description, this line will not appear. You may include multiple lines of descriptive comments, however, only the first line will be appear in the **Macro** dialog box.

Note - if you manually add a shortcut key or description line to your macro, be sure to type the apostrophe in the first position of the comment line.

4. The fourth line of the macro contains its first operational statement. This is a good place to begin declaring variables that will be used later in your macro. These types of statements are not written by the macro recorder. They are ones that you might include to support flow control commands that you add to the macro. In this example, these statements declare variables that are used as parameter values and counters by the `For`...`Next` loop in this macro (see element 6).

5. These two lines execute *Image-Pro* commands, in this case the **Line Profile** and **Thick Vert** commands. These lines are automatically written to the macro when the **Line Profile** and **Thick Vert** commands are recorded.

6. These three statements set the initial values of variables used in the `For`...`Next` loop. These types of statements are not written by the macro recorder. They are ones that must be added manually. In this example, these variables establish parameter values used by the subsequent `IpProfLineMove` and `IpProfSave` commands.

7. This group of statements comprise a `For`...`Next`. In this case the loop performs 9 line profiles and stores each result to a disk file. The `IpProfLineMove` and `IpProfSave` statements in this segment were initially recorded, and the variable assignment statements and `For`...`Next` structure were manually written around them.

8. The `End Sub` statement signals the end of the macro. An `End Sub` statement must be the last statement in a macro. This line is automatically written when you record a macro.

Creating An Auto-Pro macro

There are two ways to create an *Auto-Pro* program:

- Record a macro and, if needed, edit the script file to incorporate the control structures you want; or...

- Type the commands directly into a script file.

By far the easiest way to create your program is to record a macro, then, if needed, edit the script file with the macro editor or a text editor of your choice. As you gain experience with *Auto-Pro* and learn the function names, you may prefer to type the statements yourself. There are, however, both obvious and subtle problems with doing so: besides having to type all function names with no typing errors, there can also be difficulties in the sequence of commands selected.

When a script file is interpreted (during playback), many *Auto-Pro* functions are expected to occur in a prescribed sequence. If they do not, errors may occur. If you can't resist a challenge, then you may certainly type the program in yourself. However, most of you will probably want to edit a ready-made macro.

Whether you edit your script file or create it directly, you will want to play it back. To do so, you may do one of the following:

- From the *Macro* menu, select the **Macro Management** command, use the **Change** button to load the script (if your script is not the current script file), select the macro name that you wish to run, and click the **Run** button.

- From the *Macro* menu, find the name of the macro function that you wish to run on the bottom of the menu, and click it to invoke the macro.

- If you assigned a shortcut key when you named the macro, you may press the shortcut key without accessing the Macro menu, so long as the currently loaded script file contains the particular macro that you want to run.

Your macro can also be played back from a Visual Basic program. To learn more about doing this, see the *Using Auto-Pro with Visual Basic* section in this manual.

Auto-Pro Functions

Auto-Pro functions can be readily recognized because all are prefixed with the characters “Ip” — for example, the `IpDocClose` function closes the active image, and the `IpFltMedian` function applies the Median filter.

In a macro, *Auto-Pro* functions are called using standard BASIC function syntax, where the function name, and its parameters, are written as the source element of an assignment statement, as shown in the example below.

```
ret = IpWsLoad("c:\ipwin\images\count.tif","TIF")
```

The destination element (the left half) of the assignment statement is a variable to which the function writes its return value. This return value is always an integer. By default, the variable name `ret` is used to store the return value when a macro is recorded. However, you may use any variable, as long as it is one that will accept an integer value.

In general, the return code indicates whether the function completed successfully or not (a return code of zero indicates that no errors were detected). However, a handful of functions attribute additional significance to the return code. When this is the case, the return code's meaning is expressly described in the *Auto-Pro Function Reference* later in this manual.

Auto-Pro Parameters

Most *Auto-Pro* functions require data, which is usually passed to the function via its parameters. Parameter values are supplied, separated by commas, between parentheses that follow the function name. In the examples below, two parameters are being given to the `IpWsLoad` function: the file name, `c:\images\count.tif`, and the format type, “TIF”. Four parameters are being passed to the `IpPalSetPaletteColor` function: 55, 100, 0 and 0.

```
ret = IpWsLoad("c:\images\count.tif","TIF")
ret = IpPalSetPaletteColor(55,100,0,0)
```

Every function has its own specific parameter requirements in terms of the number of parameters, the order of the parameters and the data it expects. These requirements are completely described in the *Auto-Pro Function Reference* section of this manual.

In the examples above, the parameters have been filled with actual data — the file name is specified “literally” by the character string within the first set of double-quotes, and the numeric values are written right into the `IpPalSetPaletteColor` statement. This is the way in which parameters are written when a macro is recorded. However, parameter values can also be derived via a variable name or expression, and there are many cases you may want to edit your macro to do this. The examples below illustrate derived parameters:

```
Dim Firstfile As String
Dim Formattype As String
Firstfile = "SLIDE25.TIF"
Formattype = "TIF"
ret = IpWsLoad(Firstfile,Formattype)

Dim NINDEX As Integer
Dim NR As Integer
Dim NG As Integer
Dim NB As Integer
NINDEX = 128
NR = 65
NG = 170
NB = 80
ret = IpPalSetPaletteColor(NINDEX+1, NR+1, NG+1, NB+1)
```

In the first example, the file name and file type data are obtained from the contents of the `Firstfile` and `Formattype` variables, respectively. In the second example the parameter values are derived by adding 1 to the contents of each variable, NINDEX, NR, NG and NB.

Note - before a variable can be used to pass parameter information to an Auto-Pro function, it must be declared and assigned an initial value. Be sure you declare it as the same data type as the parameter for which it will be used. Parameter data types are specified in the "Auto-Pro Function Reference." For more about variables and expressions, see the "Variable, Constants and Data Types" section in this manual.

Auto-Pro Arrays & Defined Types

Some *Auto-Pro* functions require data in the form of a user-defined type or array. For example, when a rectangular AOI is defined, it expects to find the coordinates for the AOI in a structure passed to the function. In IPBasic, there are a number of pre-defined variables and structures. Therefore, the values defining the AOI must be defined before the AOI is created by the `IpAoiCreateBox` function. The following macro will demonstrate one of these, an AOI structure called `ipRect`.

```
Sub Rect_AOI()
' <c><s>F2
'
```

```
ipRect.left = 39
ipRect.top = 85
ipRect.right = 95
ipRect.bottom = 147
ret = IpAoiCreateBox(ipRect)
End Sub
```

If you create your macro via the **Record Macro** command, the appropriate data structure/array statements will be written into the macro. If you plan to write a macro from the bottom up, however, be aware that some functions will require this kind of data initialization. If you do not use the predefined variables and structures within IPBasic, you will need to declare those variable using a `Dim` statement. Be sure to check the data and syntax requirements identified in the *Auto-Pro Function Reference,* and write your macro accordingly.

***Important -** if you want your macro on playback to operate upon the same image or AOI as which it was recorded, be sure to record the steps it takes to load the image or create the AOI. If these steps are not explicitly included in your macro, the procedure will be played back using whatever image or AOI is active at the time of execution.*

Template Mode

A particularly powerful feature in *Auto-Pro* is its “template mode.” Template mode lets you selectively prompt the user for parameter information. Template mode is activated with the `IpTemplateMode` function.

When enabled, template mode instructs *Image-Pro* to ignore the parameter values supplied by the macro, and get the values from the user instead. The function's standard dialog box is presented, along with a template mode message box.

In the following example, template mode is enabled (set to 1) to allow the user to select a file, and is then disabled so that the remainder of the macro runs automatically.

```
Sub test()
' <c><s>F2
'
ret = IpTemplateMode(1)
ret = IpWsLoad("c:\ipwin\images\count.tif","TIF")
ret = IpTemplateMode(0)
ret = IpFltHiPass(3, 10, 1)
ret = IpWsOrient(OR_ROTATE90)
ret = IpWsScale(178, 162, 1)
End Sub
```

Playback behavior during template mode is determined by the functions to which it is applied. If a dialog box is associated with a function, it will be presented. However, for operations that have no associated dialog (e.g., creating an AOI), only the template-mode message box will appear.

The `IpTemplateMode` function statement can be edited into the script file, or it can be automatically inserted while a macro is being recorded by enabling "Template Mode" in the **Recording** message box.

Issuing A Message To The User

You may edit your macro so that it issues a message to the user when the macro is played back. This is accomplished using the `IpMacroStop` function. This function will interrupt the macro, and present a message box containing a message that you specify. Macro execution will not continue until your user clicks a button in the message box.

The `IpMacroStop` function can be used to issue message boxes in one of two ways: Modal or Modeless. Modal message boxes are ones that "lock-out" *Image-Pro* — i.e., the user cannot select an image or perform an *Image-Pro* operation while the message box is open. Modal message boxes are useful for notifying the user of events that do not require any action on their part. For example you might use the following statement:

```
ret = IpMacroStop("Last Image Processed; Program Complete", 1)
```

at the end of a macro to inform the user that all images have been processed. You might also use modal message boxes to alert your user to errors that force your macro to terminate.

Note - modal message boxes can be outfitted with a variety of button combinations such as "Yes"/"No", "OK"/"Cancel" and so forth. Each button click returns a different value, which can be tested and used by your program to transfer control to the appropriate procedure (see IpMacroStop in the Auto-Pro Function Reference).

Modeless message boxes are ones that allow the user to access *Image-Pro* while the message is displayed. You might use a Modeless message box to instruct the user to select certain options, or open certain images. For example, you might issue the following message

```
ret = IpMacroStop("Set Bright, Contrast, Gamma; Then Click Resume", 0)
```

to instruct your user to perform a manual procedure, in this case setting the BCG controls, before continuing with the macro. In many instances `IpMacroStop` can be used instead of template mode to obtain input from the user. It has the added benefit of being able to provide instructive information.

Obtaining Data From The User

Auto-Pro gives you a variety of ways to get input from your user. The `IpStGetFloat`, `IpStGetInt` and `IpStGetString` functions can be used to issue a dialog prompting for a floating-point number, an integer or a string of character data, respectively. These functions pass the data entered by the user to a variable that you assign in your program. These functions also let your program know whether the dialog was closed with the **OK** or **Cancel** button, so that your program can process the event appropriately. See the `IpStGetFloat`, `IpStGetInt` and `IpStGetString` descriptions in the *Auto-Pro Function Reference* for examples of this.

Working With Multiple Image Files

Quite often you may find that you need to apply a process to many files automatically. *Auto-Pro* gives you several ways to do this using the following special functions:

The `IpStAutoName` function lets you create file names by automatically assigning to them, unique numeric digits. For example, you might automatically capture and save 10 images, and use the `IpStAutoName` function to create names such as IMG001, IMG002, IMG003...IMG010. This function is usually used in conjunction with a loop, where the numeric digits are derived from the loop's counter. See the `IpStAutoName` function description in the *Auto-Pro Function Reference* for an example of how this is accomplished.

The `IpStSearchDir` function lets you automatically apply a process to all or some of the files in a specified directory. It does this by letting you refer to a file by its position within a directory, rather than by its file name. Written into a looping procedure, it can be used to automatically process the contents of an entire directory. The `IpStSearchDir` function description in the *Auto-Pro Function Reference* shows you how this can be accomplished.

The `IpStGetName` function lets you prompt your user for a file name. This allows you to build a loop that continues until your user chooses to end it. See `IpStGetName` in the *Auto-Pro Function Reference* to see how this is done.

These three functions are ones that must be edited into your macro manually — they will not be generated by the macro recorder. And, to use them to full potential, they must be implemented into some type of IPBasic looping structure. See the next section for more about IPBasic and the looping mechanisms it provides.

Interactive Processes

Virtually all of the commands contained in *Image-Pro* can be automated in a macro. The only exceptions involve functions that are, by their nature, interactive. The following actions will not be recorded in a macro:

- Measurement actions taken with the **Measurement** command
- Selecting or acquiring images with the **Scan** command
- Manually splitting or combining counted objects

Although these interactive actions themselves cannot be programmed, many useful supporting steps, such as opening dialog boxes and setting certain options, can be. For example, the disposition of the **Measurements** window and the setting of measurement options can be automated, as can the commands that load and save measurement data. This lets you automate the front- and back-ends of an interactive process.

Getting Data From An Image

Auto-Pro offers numerous ways to get data from an image. For example, the `IpProfGet` function can be used to get information about a line profile, including the number of points in the profile, it statistics (e.g., mean, minimum and maximum) and the intensity values on the line. Most commands that create data (e.g., "Count/Size", "Histogram") have a similar "get" function that can be used to pass its data to your program (e.g., `IpBlbGet`, `IpHstGet`). You can even use the `IpDocGet` and `IpDocGetArea` functions to get information about an image (e.g., size and class) and its pixel values.

Functions that get data require that you create a variable into which the data can be written. In the following example, the `IpProfGet` function is used to get the number of points in a profile. Note that before the function is called, a variable called `profpts` is declared. This variable is specified in the last parameter of the `IpProfGet` statement.

```
Dim profpts As Integer
ret = IpProfGet(GETNUMPTS, 0, profpts)
```

When using this type of function, it is very important that you carefully consult the function description in your *Auto-Pro Function Reference* and define a variable of the type it specifies — in some cases the variable will even be an array of a required length (for more information about declaring and using variables, refer to *Variables, Constants and Data Types* in the next section).

Data obtained with the “get data” functions can be printed to the Macro Output Window using the `IpOutput` function . This lets you format the data in any manner you choose, and then save it to the Clipboard or an ASCII file.

IPBasic

The *Image-Pro* BASIC (IPBasic) statements, can be used to set variables, evaluate expressions and control the execution of the *Auto-Pro* functions. This set of commands is styled after BASIC, a programming language familiar to many programmers. If you are already conversant with BASIC, you will find the IPBasic statements very easy to work with.

The syntax for the IPBasic statements is identical to the syntax for the comparable statements in Visual Basic. Therefore, *Auto-Pro* macros can be ported, without modification, directly into a Visual Basic program (see *Using Auto-Pro with Visual Basic* for more information about integrating the two).

Statement Structure

An IPBasic statement is made up of variables, expressions, operators, and reserved words. These elements are identified as those characters and symbols that occur between blank spaces. That is, a space or a sequence of spaces is a delimiter for these “word” elements (certain operators, such as Less Than (<), serve as a delimiter even when not surrounded by spaces). The end of line also delimits these elements.

Note - key words in IPBasic are not case sensitive — for example, the keyword `Dim`*, could be entered as* `Dim`*,* `DIM` *or* `dim`*.*

In general, IPBasic statements appear one per line; the end of the line terminates a statement. You may choose, however, to put several short, related statements on the same line. When you do, separate the statements with a colon (:).

Sometimes a statement that might appear on one line may also occur as a block placed on multiple lines. Consider, for example, the statement

```
If A > B Then C = A Else C = B
```

If the variable names were longer, the statement might overflow to the next line. In that event, the multi-line `If...Then...Else...End If` statements would be appropriate:

```
If X > Beta_Male Then
   Charlie = Alpha_Male
Else
   Charlie = Beta_Male
End If
```

A line may begin with a statement, such as `If;` an assignment variable, such as CHARLIE; or a comment.

Using Comments

It is important to provide remarks, or comments, to explain your code. This helps you recall at a later time what your code is expected to do. It also helps anyone else reading the code to understand the steps involved. *Auto-Pro* offers two ways of inserting comments into your code: the `Rem` statement and the apostrophe ('). These are some examples of their use:

```
Rem This is a comment.  The interpreter ignores the whole line.
Rem Dim A As String  'You can use a Rem statement to disable code
Dim A As String : Rem A Rem on the same line as code needs a colon
' An apostrophe can also introduce a comment on a line by itself.
Dim A As String  'A comment after an apostrophe does not need a colon
```

Subroutines and Functions

Other than variable declaration statements, which should appear at the top of your script file, and comments, which may appear anywhere, all other code in your script file must be contained within a subroutine or function procedure. Most of your procedures will be macros you have recorded, which will appear as IPBasic subroutines in your script file. However, your file may also include subroutines and functions that you have defined.

Note - a procedure defined as a subroutine can either be invoked as a macro or called from another Auto-Pro procedure. A function, however, can only be called from within an Auto-Pro procedure.

The following script file contains two subroutines and one macro function.

```
Sub VIDENH()
'F3
'
ret = IpWsLoad("c:\ipwin\images\bankvid.tif","TIF")
ret = IpFltSharpen(5, 10, 2)
ret = IpWsScale(753, 462, 1)
End Sub
```

Macro
VIDENH

```
Sub DNATEST()
'<c><s>F6
'
dim x1 As Integer, x2 As Integer
dim i As Integer, j As Integer
ret = IpProfCreate()
ret = IpProfSetAttr(LINETYPE, THICKVERT)
x1 = 96
x2 = 110
j = 0  ' Save to file the first time;  then append
for i = 1 to 9
   ret = IpProfLineMove(x1, 0, x2, 290)
   ret = IpProfSave("C:\IPWIN\PROFILE.HST", j)
   x1 = x1 + 41
   x2 = x2 + 41
   j = 1
next i
ret = IpProfSelect(0)
ret = IpProfDestroy()
End Sub
```

Macro
DNATEST

```
Function Power (BaseA as integer, Exponent as
Integer)As Long

'calculate base to the exponent power
dim X as Integer
Power = 1
For X = 0 to exponent
Power = Power X Base
Next X
End Function
```

Function
Power

The body of a subroutine is encompassed by the `Sub...End Sub` statements; the body of a function is encompassed by a set of `Function...End Function` statements. The main difference between a subroutine and a function procedure is that a function returns a value. This difference affects the way in which they are called by other procedures.

A subroutine is called by another procedure using the `Call` statement. For example:

```
Call DNATEST ()   'From previous example page
```

A function is called using an assignment statement, or by including its name in an expression. For example:

```
Result = Power (3,5) 'Calculates 3 in Result, from previous page
```

Variables, Constants, Data Types

Variables and constants are used to provide data to a macro. A variable is a symbolic construct that contains a value. Variables are identified by name. When a macro references a variable name, the current value of the variable is used by the macro. The value in a variable typically changes during the course of the macro, hence its name.

Variable Names

Each variable must have a name. Like all programming languages, IPBasic has certain naming conventions. These are as follows:

- The first character of the variable name must be a letter (A through Z *or* a through z).

- The remaining character(s) may be any combination of letters (A through Z *or* a through z), numbers (0 through 9), or underscores (_).

- The variable name must not be an *Auto-Pro* or IPBasic reserved word. Reserved words include *Auto-Pro* function names and IPBasic keywords. A list of reserved words appears in *Appendix B - Auto-Pro Keywords*.

- Variable names in IPBasic are not case-sensitive (for example, a variable name of “VName” and a variable name of “vname” will be treated as the same variable).

Variable Types

Because variables represent many different kinds of information (numbers and names, for example), a macro needs to know what kind of data to expect in order to allocate sufficient storage and use the right routines to manipulate it. Please refer to the data type descriptions in the on-line Help (language reference) for more information.

Scope Of A Variable

Variables declared within a subroutine or function are local to that procedure. That is, any variable declared within `Sub VIDENH`, although it may have the same name as a variable in `Sub FPRINT`, will be treated as a different variable. If you want both procedures to share a variable, it must be declared at the beginning of the script file, preceding any `Sub` statements, i.e. in Global scope.

All variables, regardless of how they are declared, are local to a script file. That is, when a new script file is loaded, the variables associated with the previous script file are released.

Note that variables declared in subroutines and functions "hide" variables with the same names in the global scope.

Declaring Variables

Before a variable can be referenced in a macro, it must be explicitly declared, within the script file in which it is referenced, using the `Dim`, `Static,Redim,` or `Global` statements.

Variable declaration is done to inform IPBasic of the variable's name, type, size, and number of dimensions. A variable must be declared before it is used. For that reason, and for ready reference to the variables in a procedure, variable declaration statements should be the first thing to appear in a subroutine or function procedure. Declaration statements for variables that are global, should be the first thing to appear in the script file.

To declare a variable, you may use either the `Dim,ReDim,` or `Static` statement. For example:

```
Dim A As String               'Declare a string variable named A
Dim A25 As String *25         'Declare a 25-character string
ReDim B(100) As Single        'Declare a static, array variable
```

The `Dim` statement causes the allocation of storage for the variable each time the procedure is entered; it is de-allocated upon exiting the procedure. The value of the variable is not available outside the procedure, nor is it preserved for successive calls to the procedure (including recursive calls).

The `Static` statement causes the allocation of storage for the variable once; it is de-allocated upon termination of the program. The value of the variable is not available outside the procedure but retains its value during successive calls to the procedure.

To declare a global variable for the script file, use the `Global` statement, or place the `Dim` or `Static` statements at the top of the file, before any subroutine or function definitions.

Every variable declaration statement must define the type of data for which it will be used, where the type must be String, Integer, Long, or Single (see type definitions under *Variable Types*). For example:

```
Global Xnum As Integer        'Declares Global integer
Dim ImgName As String         'Declares a string variable
Static ImLg As Long           'Declares a long static variable
```

Passing An Array To Auto-Pro

When you record an *Auto-Pro* macro, functions that take an array are recorded with both the name of the array *and* the subscript of its first element. Referencing the first element of the array ensures that the array header, which Basic automatically attaches to every array it generates, is not passed as data to the *Auto-Pro* function. *Auto-Pro* functions use "C" arrays that do not have that header.

If you should choose to type *Auto-Pro* functions into your Basic program, rather than recording them in and copying them from *Image-Pro*, be sure that you reference all arrays that you pass to *Auto-Pro,* in this way. The following example shows how an array called myPts must be passed to the IpAoiCreateIrregular function:

```
ret = IpAoiCreateIrregular(myPts(0), Numpoints%)
```

By specifying myPts's first element (0), you force Visual Basic to skip its header, and pass the address of the first piece of data to *Auto-Pro*.

Constants

A constant is a particular kind of variable, whose value is assigned only once during the program and not changed thereafter. The advantage to using a constant is that IPBasic will not allow a change to its value; hence, any attempt to modify the variable will be flagged as an error.

The name of a constant follows the same rules as any variable; by convention, a constant is usually typed in uppercase characters, to mark it as a constant. To declare a constant, use the Const statement:

```
Const TRUE = -1              'Assigns constant value of -1 to TRUE
Const FALSE = 0              'Assigns constant value of 0 to FALSE
Const PI = 3.14159265        'Declares constant to save typing
Const EMPLOYEES = 10         'Sets employee population
```

User-defined Types

IPBasic allows you to define a data type, comprised of one or more variables, which are often of different types. This structure is often used to hold and operate upon record-like data that contains several fields of information. The `Type` statement introduces the definition of your record structure, and the `End Type` statement concludes it.

```
Type RECT
    left As Integer
    top As Integer
    right As Integer
    bottom As Integer
End Type
```

A variable of this type can then be declared:

```
Dim ipRect As RECT
```

and its elements individually referenced by using `variable.elementname` notation, as shown below:

```
ipRect.left = 53
ipRect.right = 102
ipRect.top = 111
ipRect.bottom = 162
```

The type that you define is global. The variables that you declare using the type may be global or local.

Expressions

An expression is some valid combination of operators and operands. An operator is a symbol that tells IPBasic what action you want performed on the operand(s), such as adding two numbers or testing two expressions for equality.

In IPBasic, operators fall into four classes:

- Assignment,
- Arithmetic,

- Relational, and
- Logical.

The Assignment Operator

The Assignment Operator is used to change an operand's value. It can be used to change the value of a variable. The IPBasic Assignment Operator is the Equal Sign (=). In the statement X= 7, the value of X is to be assigned (set to) the value of 7 (you cannot say 7 = X however). If X has the value 214 before this statement is executed, the value 214 will be lost, or overwritten, with the value 7.

The Arithmetic Operators

An Arithmetic Operator tells IPBasic to perform a mathematical function on numeric operand(s). The following Arithmetic Operators are supported. In the examples, assume that A is type Integer, B is type Single, S is type String, and that the examples are executed sequentially.

ARITHMETIC OPERATORS			
USE THIS	**TO PERFORM THIS**	**EXAMPLE**	**RESULT**
^ (Caret)	Exponentiation	A = 3^4	81
- (Minus)	Negation	A = -A	-81
* (Asterisk)	Multiplication	A = 3 * A	-243
/ (Slash)	Division	B = 9. / 2.	4.5
\ (Backslash)	Integer Division	A = 9\2	4
Mod	Modulo Arithmetic	A = 9 Mod 2	1
+ (Plus)	Addition	A = A + 3	4
- (Minus)	Subtraction	A = A - 6	-2
& (Ampersand)	String Concatenation	S = "C" & "D"	"CD"

Note - the table is ordered from the highest precedence (Exponentiation) to the lowest (Addition and Subtraction). Operators on the same level are separated by a thin line; a thicker line separates operators on different levels

The minus sign (-) is used for both Negation and Subtraction. When it immediately precedes a single operand, it signals Negation and will change the sign of that number. When it separates two operands, it implies Subtraction.

The Division Operator (/) produces a floating-point result. Use the Integer Division Operator (\) for an integer result. For example, 5.0 / 2.0 (division) yields 2.5, while 5 \ 2 (integer division) yields 2. Before integer division, operands are rounded to Integer or Long expressions. Any fractional portion of the result of an integer division is truncated.

Modulo Arithmetic is used to obtain the remainder from a division operation. For example, when 5 is divided by 2, there is a remainder of 1. The operation, 5 Mod 2, will produce that remainder.

Most Common Relational Operators

A Relational Operator causes two expressions to be compared, to determine their relationship to each other. A true relational operation has a resulting value of -1. False relational operations have a value of zero. IPBasic defines the true and false constants for use in relational operations.

The following relational operators are supported by IPBasic. In the table below, assume that A = 3, B = 4, and C = 4.

RELATIONAL OPERATORS			
USE THIS	**TO TEST FOR THIS**	**EXAMPLE**	**RESULT**
=	Equality	A = B	0
<>	Nonequality	A <> B	-1
>	Greater than	A > B	0
<	Less than	A < B	-1
>=	Greater than or equal to	B >= C	-1
<=	Less than or equal to	A <= C	-1

Note - all Relational Operators have the same precedence (i.e., they are evaluated as they occur from left to right).

The relational operators can be used upon string values as well as numeric values. The relationship of a string is determined by it ANSI character value. Therefore, the string "J" is not equal to the string "j". Refer to *Appendix C - ANSI Characters*.

Most Common Logical Operators

A Logical Operator tells IPBasic to operate on each bit in the operand(s) in a prescribed way. For this reason, it is sometimes called a Bitwise Operator.

- **Not** (Logical Negation) changes every bit in its one operand to the opposite value (0 to 1, 1 to 0). All the other Logical Operators require two operands.

- **And** returns a 1 bit where both operands have a 1 bit, and a 0 otherwise.

- **Or** (Inclusive Or) returns a 0 bit where both operands have a 0 bit, and a 1 otherwise.

- **Xor** (Exclusive Or) returns a 0 bit where both operands have the same bit (both 0s or both 1s), and a 1 bit otherwise.

- **Eqv** (Logical Equivalence) returns a 1 bit where both operands have the same bit (both 0s or both 1s), and a 0 bit otherwise.

- **Imp** (Implication) first examines the first operand: where that operand has a 0 bit, it returns a 1; where that operand has a 1 bit, it returns whatever bit the second operand contains.

The following table illustrates bitwise operations. It assumes the following values for each variable:

```
ByteA = 00001111
ByteB = 00111100
```

LOGICAL OPERATORS			
USE THIS	**FOR THIS**	**EXAMPLE**	**RESULT**
Not	Logical negation	`Not ByteA`	11110000
And	Logical and	`ByteA And ByteB`	00001100
Or	Inclusive or	`ByteA Or ByteB`	00111111
Xor	Exclusive or	`ByteA Xor ByteB`	00110011
Eqv	Logical equivalence	`ByteA Eqv ByteB`	11001100
Imp	Implication	`ByteA Imp ByteB`	11111100

Note - the table is ordered from highest precedence (Not) to lowest precedence (Imp).

The **Not, And, Or**, and **Xor** operators can be used for getting resutls from multiple Boolean relational operations. For example:

```
(A=B) AND (A<>B) is False
(A>B) or (A<=B) is True.
```

Precedence Of Operators

The order in which values appear in an expression (i.e. from left to right) determines one way in which IPBasic orders evaluation of operators. For example, in the expression “A + B - C,” IPBasic begins at the left, adds B to A, then subtracts C from the result.

There is another factor, however, in determining the order in which IPBasic performs operations. In the expression “A + B * C,” IPBasic first multiplies B and C, then adds the result to A. This is because Multiplication and Division have a higher precedence than Addition and Subtraction.

To change this natural order of precedence, you use parentheses to group the items you want acted upon first. If, in the example above, you wanted A and B added, before multiplication by C, your expression would be “(A + B) * C.”

In the table of Arithmetic Operators given earlier in this document, the order shown is from the highest precedence (Exponentiation) to the lowest (Addition and Subtraction). Operators on the same level are separated by a thin line; a thicker line separates operators on different levels.

All Relational Operators have the same precedence (i.e., they are evaluated as they occur from left to right), and are at a lower precedence than Arithmetic Operators.

The Logical Operator's order of precedence is that shown in the table of logical operators earlier in this section. Logical operations are lower in precedence than Relational operations.

Flow Control

When a macro is recorded, your actions are written as a long series of instructions. Unaltered, this series of instructions must always follow the same sequence. If you want to change the sequence, to branch to another location, for instance, if a certain condition is met, or to loop through the same steps a certain number of times, you need to modify the flow of control. IPBasic provides several statements that let you do this.

Loops

A loop is a portion of program code (a sequence of instructions) that is repeated a certain number of times or while a specified condition is true or false. It usually implies that some condition or counter is tested, either before or after the command sequence is executed.

If the loop is tested before executing the command sequence, then the command sequence may not be executed at all. If the loop is tested after executing the command sequence, then the command sequence will be executed at least once.

Counting Iterations vs. Testing A Condition

When a loop is iterated for a set number of times, you specify a *counter*, the *start* amount for the counter, the *stop* amount for the counter, and the amount to *increment* (or decrement) the counter. All of these arguments are numeric.

When a terminal *condition* is used to determine when to stop execution of the loop, that *condition* is an expression that evaluates to either zero (False) or nonzero (True). This is known as a Boolean expression.

Most Common IPBasic Loop Structures

IPBasic provides the following types of loop structures:

- `For...Next`, which allows you to repeat a sequence of commands a predetermined number of times
- `Do...Loop Until` and `Do Until...Loop`, which allow you to repeat the code until a specified condition is reached,
- `Do...Loop While`, `Do While...Loop`, and `While...Wend`, which allow you to repeat the code while a specified condition holds

Most of these statements allow you to exit prematurely from the loop and return control back to the calling program (on an error condition, for example).

The structures that IPBasic provides for looping each have their own features. To determine which one is most appropriate for the task at hand, consider the following table:

LOOP STRUCTURE	**END OF LOOP DETERMINED BY...**	**TESTED**	**PERFORMED IF CONDITION IS**	**EARLY EXIT AVAILABLE?**
`For...Next`	Counter	After loop	In bounds	Yes
`Do...Loop`	—	—	—	Yes
`Do Until...-Loop`	Boolean expression	Before loop	False	Yes
`Do...Loop Until`	Boolean expression	After loop	False	Yes
`Do...Loop While`	Boolean expression	After loop	True	Yes
`Do While...Loop`	Boolean expression	Before loop	True	Yes
`While...Wend`	Boolean expression	Before loop	True	No

For...Next Statements

Use the For and Next statements to repeat a command sequence a given number of times. The following example shows how a For...Next loop could be used to obtain and save data from 9 line profiles in an image. The following sequence would accomplish this:

```
for i = 1 to 9
   ret = IpProfLineMove(x1, 0, x2, 290)
   ret = IpProfSave("C:\IPWIN\PROFILE.HST", 0)
   x1 = x1 + 40
   x2 = x2 + 40
next i
```

Do...Loop Statements

Use the Do...Loop statements when you want a command sequence to repeat while or until a certain condition is met. If you wanted to open the four images listed at the bottom of the *File* menu, you might use the following sequence:

```
A = 1
Do
   Call IpWsLoadNumber (A)
   A = A + 1
Loop While A < 5
```

Typically, you want to avoid an infinite loop (a loop in which the code is repeated endlessly, with no condition ever succeeding in terminating the loop). There are a few instances, however, when it is desirable to set up the outer loop structure as an endless loop, with an exit condition that is met while executing the body of the loop. For this instance, you may use the Do...Loop statements with no While or Until clause.

While...Wend Statements

You may use the While and Wend statements when you want a command sequence to repeat as long as a condition is met. These statements are equivalent to the Do While...Loop statements, which we recommend that you use. The While...Wend statements do not allow you to exit the loop prematurely. The following example of a While...Wend loop rewrites the previous example:

```
A = 1
While A < 5
   Call IpWsLoadNumber(A)
   A = A + 1
Wend
```

Nested Loops

Loops may be nested (one loop placed totally inside another loop) to any level, in order to achieve the command sequence you want. You need to be sure that each inner loop is completely contained within its surrounding loop(s). A visual aid in doing this, and in making the code more readable, is to indent the body of an inner loop and correlate the counter of the `Next` statement with that of the `For` statement, as the following example shows:

```
Dim I As Integer
Dim J As Integer
For I = 1 To 10
   For J = 1 To 10
      ...
   Next J
Next I
```

Note that it would be incorrect in this example for `Next I` to precede `Next J`. It is possible, however, to use the `Next` statement without the `J` or `I`. It is also permitted to use a single `Next` statement for both counters, as follows:

```
Dim I As Integer
Dim J As Integer
For I = 1 To 10
   For J = 1 To 10
      ...
Next J, I
```

Note that whether you use one `Next` statement or several, the order in which you place the counter names must be inverse to the order in which they were introduced by the `For` statements.

Branching

When you want to change the order in which commands are executed, use one of the branching statements that IPBasic provides. These include the following:

- If...Then...Else
- If...Then...ElseIf...End If
- On…Error…GoTo
- GoTo

Decision Structures

When the value of some condition determines whether or not you want to branch to another location, use a decision structure. In IPBasic, these include:

- If...Then...Else
- If...Then...ElseIf...End If
- On...Error…GoTo

Use either `If...Then...Else or If...Then...ElseIf...End If` to test a condition or sequence of conditions, with differing responses according to the value of the conditional expression.

The `If...Then...Else` statement is a one-line construct: if the statement cannot be completed on a single line, use `If...Then...ElseIf...End If.` The latter is a multi-line construct that allows you to embed any number of `Else` conditions. The `Else` and `ElseIf` conditions are optional. The `End If` statement is required to mark the end of the multi-line statement; it must not be used with the single-line statement.

Unconditional Branching

When you want to transfer control to another location regardless of the condition, use the GoTo statement.

Errors

When a statement contains an error in syntax, IPBasic will tell you that an error has occurred, the line number nearest where the problem was identified, and an error message describing the general type of error.

Run-Time Errors

Many operations macy cause errors that can only be detected when the macro runs, such as an attempt to open a non-existant file, or writing to a file on a full disk. The following statements ca be used to specify how to handle run-time errors:

- `On…Error…GoTo`
- `On…Error…Resume…Next`

`On…Error…Resume…Next` can be used to specify a line label indicating where to continue after an error occurs. `On…Error…GoTo` restores the default handling (which terminates the macro if an error is encountered). `n…Error…Resume…Next` can also be used to cause any error to be ignored.

Version 4.0

IPBASIC 4.0 comes with a new and improved editor/debugger. A few of the improvements are listed below. For more details, please refer to the to the IPBasic online help.

- ♦ You can keep the editor open at all time. There is no need to close it after editing. You can run a macro with the editor open or closed.

- ♦ As in Visual Basic, the editor has a **Run** button which loads and parses the script file. Any Basic error will be reported at that time. If parsing is successful, the **Run** button will gray out and the **Stop** button will be active. You have to press the **Stop** button in order to edit the script file or close the editor. If you start editing the script file before you press **Stop**, the program will ask you whether you want to stop and edit. Macros must still be run from the *Macro* menu in *Image-Pro* however.

- ♦ You can set break points for debugging purposes, or as in the previous version, you can execute the macro step by step.

- ♦ IPBASIC 4.0 looks for all the *Auto-Pro* functions and constants declarations in IPC32.BAS (That same file can be included in any Visual Basic project in order to run macros from that environment). More generally, any function declaration or implementation found in any .BAS file located in the BAS sub-directory, will be read-in by IPBASIC at start-up, and available during script execution. You could for instance reduce the size and complexity of your script files by moving commonly used functions to one or more .BAS files. These functions would then be available from any active script file. IPUTIL32.BAS, which is installed by the program, is an example of such file.

- ♦ The new editor features a **References** dialog which lists all the OLE Automation Servers available in the system (See *Edit:References* in the *Image-Pro Plus Reference Guide*). These servers can be used to communicate, send or query data, to an from other applications. Excel, Word, Access can all be controlled via their OLE Automation Server. For more information, see the section on **GetObject/CreateObject** in the *IPBASIC Language* online help file.

Compatibility Issues

In order to make IPBASIC 4.0 fully compatible with Visual Basic, a few non-standard IPBASIC formats had to be abandoned:

- ♦ No function, subroutine, or variable name starting with an underscore (_) is allowed.

Print

The `print` statement is now used to print text or numerical values to file. In order to print to the *Output* window, you must now call `Debug.print` or `IpOutput.` `Debug.print` will print text both on the *Output* window and on the *Immediate* window of the macro editor. You can also replace print with `iprint.` `iprint` eventually calls `IpOutput` and is found in IPUTIL32.BAS.

Note that `Debug.Print` and `iprint` do not support the comma character used to insert a tab between string expressions:

```
print "hello", "world"
```

Must be written as:

```
Debug.print "hello" + chr$(9)  + "world"
```

RTrim$

This functions takes out all trailing spaces. This is useful when concatenating several fixed length strings into one. For example:

```
' This worked in IPP 3.0 but not in IPP 4.0 and/or VB.
Sub BuildFileName()
    dim mypath as string * 256
    dim myname as string * 32

    ret = IpStGetString("Enter path(ex:c:\IPWIN\)",
    mypath, 255)
    ret = IpStGetString("Enter filename", myname, 31)
    ret = IpWsLoad(RTrim$(mypath) + RTrim$(myname), "TIF")
End Sub
```

Auto-Pro functions such as `IpStGetString` take fixed length strings and fill them with characters ending with a zero (so that C calling programs will work). In IPP 3.0, `RTrim` used to remove trailing spaces AND zeros. The new version removes spaces only, leaving a zero at the end which causes the concatenation to fail. Now you can use `IpTrim` instead of `RTrim$`:

```
   ret = IpWsLoad(IpTrim(mypath) + IpTrim(myname), "TIF")
```

`IpTrim` is defined in IPUTILS.BAS as:

```
Function IpTrim(ByVal mystring As String) As String
   iptrim = RTrim$(Replace(mystring, Chr$(0), " "))
End Function
```

Str$

This is another concatenation issue. `Str$` returns the string representation of a value (e.g. `Str$(123)` returns "`123`"). In VB and in IPP 4.0, positive values result in strings starting with a space character (where the minus sign would be if it were a negative value). In IPP 3.0, the space was removed. This example demonstrates the problem:

```
' This worked in IPP 3.0 but not in IPP 4.0 or VB
Sub BuildFileName2()
    dim mysuffix as integer

    ret = IpStGetInt("Enter a number", mysuffix, 0, 0, 999)
    ret = IpWsLoad("images\file" + Str$(mysuffix) +
    ".tif", "TIF")
End Sub
```

In IPP 5.0 or VB you can use instead `Format$()` or `LTrim$(Str$(...)).` `Format$,` which was not available in IPP 3.0, offers a wide array of date and number formatting capabilities.

```
   ret = IpWsLoad("images\file" + Format(mysuffix) +
   ".tif", "TIF")
```

IpDocGet, IpAppGet

IPBASIC 3.0 was more forgiving when it came to variable type checking. It allowed in particular passing strings and arrays to *Image-Pro* via a same argument defined `As Any` in the function declaration. For instance `IpDocGet` is defined `as IpDocGet...(ByVal sCmd%, ByVal sParam%, lpParam as Any)`... and could be called to get numeric data or text, both types being returned in *lpParam*. With IPBasic 4.0, text information must be queried via `IpDocGetStr`, which is an "alias" of `IpDocGet`, and defined as `..(ByVal sCmd%, ByVal sParam%, ByVal sText$)...` While numerical data is still queried via `IpDocGet`. Other affected functions are listed below:

```
IpDocGet    IpDocGetStr
IpAppGet    IpAppGetStr
IpBlbGet    IpBlbGetStr
IpMeasGet   IpMeasGetStr
IpIniFile   IpIniFileStr
```

Dim

IPBasic 4.0 conforms to VB when it come to dimensioning variables. The following statement may generate incorrect results if a and b must be integers:

```
Dim a, b, c as integer
```

Where in fact it simply says that c is an integer while a and b are variants. To declare a and b as integer as well, the statement should read:

```
Dim a as integer, b as integer, c as integer
```

Or in a more compact way:

```
Dim a%, b%, c%
```

Use `ReDim` to dimension an array:

```
ReDim a(10) as integer
```

Will dimension an array of 11 integers starting at index number 0.

Note that:

```
Dim a$ as string
```

is redundant, and will generate an error message. Correct declarations are:

```
Dim a$
```

or

```
Dim a as string
```

Option Explicit

This line is added automatically at the beginning of every script file. It tells IPBasic to display an error message when undeclared variables are encountered. Without `Option explicit`, IPBasic and Visual Basic will assign a type automatically to such variables. That type will depend on the context under which they are encountered. This may however hide mistyped variable names, which can in turn cause the macro not to behave correctly. Therefore it is much safer to force variable declaration.

Image Updates

Versions 3.0 and 4.0/4.5 of IPBasic differ in the way they refresh image display during the execution of a macro. In version 3.0, image display was refreshed when the macro stopped for a message, or when it ended. In version 4.0/4.5, image display is refreshed after any instruction that changes the image contents. In this respect, macros run from IPBasic 4.04.5 behave in the way that those run from Visual Basic. Albeit marginal, some speed improvements can be gained by not refreshing image display too often, new instructions were added to prevent image display during macro execution. These instructions can be inserted at any time during macro recording (See *Macro*:*Insert* in the *Image-Pro Plus Reference Guide*. Also see `IpAppUpdate(DOCSEL_NONE)` and `IpAppUpdate(DOCSEL_ALL)` later in this manual).

Using Auto-Pro with Visual Basic

You can also include *Auto-Pro* functions in a Visual Basic™ program. Visual Basic is a complete software development environment from Microsoft™ that lets you create Windows™ applications quickly and easily. The ability to include *Auto-Pro* commands in a Visual Basic program allows you to create customized versions of *Image-Pro* — you can create a tailored user-interface, provide support for a unique external device, or add custom operations, for example. You might also decide to use Visual Basic if your macro application requires custom dialog boxes, or requires a function that is not provided by *Image-Pro's* IPBasic statements.

Calling an *Auto-Pro* function from your Visual Basic program involves the following basic steps:

1. If you will be making API calls to an online database, serial port connection, or similar feature, you must include the **WIN32API.TXT** file, which is supplied with Visual Basic**.** This file is usually found in the VB subdirectory called **WINAPI.**

   If you include the file **WIN32API.TXT,** it will need to be modified because it is too large to include in a VB executable program. Only the declarations necessary to perform the specific API calls need to be added (copy and pasted from WIN32API.TXT) and the new module will need to be renamed (not WIN32API.TXT).

2. **The IPC32.BAS file must be included** in your project. This file is located in the BAS subdirectory of the folder where *Image-Pro Plus* is installed. This file must be copied to your hard drive and added to the file list in your program's project window (use the **Add File** command on the Visual Basic *Project* menu).

3. **The IPUTIL32.BAS file in the BAS subdirectory must be included** in your project for backward compatiblity. It allows you to run some fuctions from earlier versions of *Auto-Pro*.

4. **An *Auto-Pro* function must be invoked as a function** in your program, just like an *Auto-Pro* script file. As such, it must be formatted as the source element (right half) of an assignment statement. The destination element (left half) of this statement must be a variable to which the *Auto-Pro* command can write its return value. The following statement would cause your Visual Basic program to perform an exponential histogram equalization on the active image:

```
ret = IpHstEqualize(EQ_EXPONENTIAL)
```

The variable name `ret` has been used above, and is the name used when a macro is recorded in *Image-Pro*. However, the name of this variable is really up to you, as long as it is a type that will accommodate an integer value (for concise code you might want to assign it a name that includes the "%" integer-type declaration character rather than defining it as a Variant data type, or explicitly declare it as an Integer).

Note - most Auto-Pro functions return a zero when the function executes successfully. However, some functions returning other meaningful values such as Document or Button IDs. You will need to consult the "AutoPro Function Reference" for the specific values returned by each function (if there is no return value listed for a function, it is one that returns a 0 upon success).

You may type the *Auto-Pro* functions into your program yourself, or you may cut-and-paste the commands directly from a macro that you have already recorded (you can use the **Copy to Clipboard** button in the **Macro** command to accomplish this). As discussed earlier in this manual, recording, rather than typing, is the recommended way to generate a stream of *Auto-Pro* functions to insure they are typed without error and are properly sequenced.

The following example illustrates a Visual Basic procedure that includes several *Auto-Pro* functions (bolded). This procedure 1) loads an image file, 2) performs a histogram equalization, 3) applies the results to the image bitmap, then 4) sharpens and 5) enlarges the image.

```
Sub Command3 Click()
    If check1.Value = 0 Then
1.       Msgbox "Load the Image Now"
    End If
    WinRet% = IpWsLoad("c:\ipwin\images\bankvid.tif", "I
    If check1.Value = 0 Then
2.       Msgbox "Histogram Equalization"
    End If
    WinRet% = IpHstEqualize(EQ_EXPONENTIAL)
    If check1.Value = 0 Then
3.       Msgbox "Apply LUT"
    End If
    WinRet% = IpLutApply()
    If check1.Value = 0 Then
4.       Msgbox "Sharpen the Image"
    End If
    WinRet% = IpFltSharpen(3, 10, 2)
    If check1.Value = 0 Then
5.       Msgbox "Resize the Image"
    End If
    WinRet% = IpWsScale(753, 462, 1)
    If check1.Value = 0 Then
         Msgbox "How About That?"
    End If

End Sub
```

If you intend from the outset to create a Visual Basic program, you will probably want to import just the *Auto-Pro* functions from your macro, and write the rest of your program in Visual Basic. However, if you have already created a macro with *Auto-Pro*, that includes IPBasic statements, the entire macro can be ported directly into Visual Basic.

5. ***Image-Pro* <u>must be running</u> when the *Auto-Pro* commands in the Visual Basic program are executed**. You can include steps in your program to load *Image-Pro*. The following sample code shows you how to use the Windows API `WinExec` function to do this. This procedure could be assigned to a control button in your application.

```
Sub Command1_Click ()
    WinRet% = WinExec("c:\IPWIN\IPWIN2.exe", SW_SHOWNORMAL)
    MsgBox "Ready to go."
End Sub
```

This particular example loads *Image-Pro* in its “normal” window size (SW_SHOWNORMAL is set). However, you could also load *Image-Pro* in a minimized state (set SW_SHOWMINIMIZED) if you wanted only your custom user-interface to show. Bear in mind that if *Image-Pro* is minimized, the image upon which it is operating will not be visible to the user.

Also, consider using the Windows API function `SetWindowPos` to keep your application's window on top, even when it is not the active window. Otherwise, *Image-Pro's* window will be activated, and may obscure your window, when its *Auto-Pro* functions are called. The example below shows how this is done. This procedure might be the first one called in your program.

```
Sub Form_Activate ()
' Call the WINAPI subroutine to set window to topmost on
desktop.
' This is a Windows feature.
Call
SetWindowPos(Form1.hWnd,HWND_TOPMOST,0,0,0,0,SWP_NOMOVE+SWP_NO
SIZE)
End Sub
```

You can also use this routine to keep the window visible. This code should be run at least once during the VB.exe startup:

```
Sub Form_Activate ( )
    ...
    ' Call the WINAPI routine to set the VB exe window
topmost,
    ' preventing it from going behind IPP. This is an old
Win3.1 feature
    Call SetWindowPos(Form1.hWnd, HWND_TOPMOST, 0, 0, 0, 0,
SWP_NOMOVE+SWP_NOSIZE)
    ...
End Sub
```

Image-Pro can also be run from his executable, such as this button handler:

```
  Sub Command1_Click ( )
    WinRet% = WinExec("c:\ipwin\ipwin32.exe", SW_SHOWNORMAL)
End Sub
```

Section 2 - Auto-Pro Function Reference

Function Syntax

The diagram below describes the notation used in this reference.

❶IpCalSetOptDens

❷ **Syntax**	**IpICalSetOptDens(BlackLevel, IncidentLevel)**		
❸**Description**	This function establishes the Black level and Incident level to be applied to the optical density curve. Equivalent to completing the **Optical Density Calibration** dialog box.		
❹**Parameters**	*BlackLevel*	**Single**	A number (of IPBasic type, Single) specifying the value representing the pixel intensity of totally opaque material.
	IncidentLevel	**Single**	A number (of IPBasic type, Single) specifying the value representing the pixel intensity of totally transparent material.
❺**Example**	`ret = IpICalSetOptDens(23.0, 179.5)` This statement will set the Black level to 23.0 and the Incident level to 179.5.		
❻**Comments**	Call IpICalShowFormat to set the calibration curve to OD.		
❼**See Also**	`IpICalShowFormat`		

❶ This line identifies the function name. Functions are listed in alphabetic order by this name.

❷ This line contains the function syntax consisting of the following two components:

COMPONENT	EXAMPLE	EXPLANATION
FunctionName	**IpICalSetOptDens**	The name of the function as it must appear in the statement.
Parameters	*BlackLevel*	Data that must be given to the function.

❸ This block describes the function's use. This block will also document the equivalent *Image-Pro* command. This lets you know the action that is required to record the described function. This also informs you of the command/dialog box to which you can refer in your *Image-Pro Reference Manual* for additional information about it.

Note - Auto-Pro functions for which there are no Image-Pro equivalent actions, will be so noted.

❹ This block explains the parameters, as follows:

COMPONENT	**EXAMPLE**	**DESCRIPTION**
Parameter Name	*BlackLevel*	This is the parameter name, as given in the function syntax.
Parameter Type	**Integer**	This block documents the data type of the parameter. as it is defined in IPBasic.
Description	The value used to represent the transmission of no light.	This block describes the parameter's purpose and its possible values.

❺ This block provides an example of the function as it would be written in an *Auto-Pro* macro.

❻ This block provides additional information about the function.

❼ This block suggests other functions that are relevant to the one described.

Note - many Auto-Pro functions take an "enumerated integer" as a parameter value. An enumerated integer is an integer that is represented by a symbolic name. For example, the measurement names, BLBM_AREA, BLBM_ASPECT, and BLBM_BOX_AREA, actually represent the integer values, 0, 1 and 2, respectively. You generally do not need to concern yourself with these values except in the rare instance where you want to operate upon it logically or arithmetically..

IpAcqAverage

Syntax

IpAcqAverage(*Frames, Divider*)

Description

This function captures and averages (or accumulates) the specified number of frames from the frame-grabber and displays the result in a new image window. Equivalent to **the Video Average** command.

Parameters

Frames	**Integer**	An integer specifying the number of consecutive frames to accumulate.
Divider	**Integer**	An integer from 1 - 255 specifying the value to be used as the divisor for the accumulated total in each pixel. Specify a value equal to *Frames* to obtain the mean; specify 1 to obtain the sum.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpAcqAverage(16,16)
```

This statement will average 16 frames acquired from the frame-grabber.

Comments

The capture will be performed using the **Acquire** options that are currently in effect on the system.

See Also

IpAcqSnap, IpAcqTimed

IpAcqControl

Syntax

IpAcqControl*(Cmd, Param, lpParam)*

Description

This function is used to set various options assocated with particular frame-grabbers. It is equivalent to setting the options button in the *Video Capture* menu.

Parameters

Cmd	**Integer**	Specifies the type of option that will be set on the video capture board.
Param	**Integer**	A value that specifies data required by the option.
lpParam	**Integer**	A value that specifies the data required by the option. The data type of this value will vary depending on the value in the *Cmd.*

Cmd	***wParam***	***lpParam***

48 (Capture Area)	`0 = preview`
	`1 = acquire`
		Address or pointer to a rectangular structure.

Example

```
  Dim captarea as RECT
  captarea.left = 10
  captarea.top  = 20
  captarea.right = 300
  captarea.bottom = 400
  ret = IpAcqControl(48, 1, captarea)
```

49 (Exposure Time)	`0 = preview`
	`1 = acquire`
		Address or pointer to a long containing the exposure time in milliseconds.

Example

```
Dim exposure as long
exposure = 1000
ret = IpAcqControl(49, 1, exposure)
```

52 (binning)	`0 = preview`
	`1 = acquire`
		Array of two short values containing the x and y binning

Example

```
Dim binning(2) as integer
binning(0) = 2
binning(1) = 2
ret = IpAcqControl(52, 0, binning (0))
```

53 (gain)	`0 = preview`
	`1 = acquire`
		Pointer or address to a short containing the gain index

```
Dim gain as integer
gain = 1
ret = IpAcqControl(53, 0, gain)
```

84 (exposure time)	`0 = preview`
	`1 = acquire`
		Pointer or address to a single containing the exposure values (for cameras using microsecond exposure).

Example

```
Dim exposure as single
exposure = 42.123
ret = IpAcqControl(84, 1, exposure)
```

Comments

Because of the extensive number of frame-grabber combinations, it is not practical to describe all of the possible parameter values allowed by this function here. If you need to obtain the specific values used to set an option on your particular device, use the **Record Macro** command to record the **Option** setting steps on your system. Then use the macro editor to view the recorded statement. A list of constants appears below:

Global Const ACQCMD_VIDEOSTD = 6	‘ Set video standard
Global Const ACQCMD_CAMERA = 7	' Set camera type
Global Const ACQCMD_CHANNEL = 8	' Set channel value
Global Const ACQCMD_GENLOCK = 11	' Turn on/off genlock
Global Const ACQCMD_CONTRAST = 9	' Set contrast value
Global Const ACQCMD_BRIGHTNESS = 10	' Set brightness value
Global Const ACQCMD_EXTRIG = 12	' Turn on/off external trigger
Global Const ACQCMD_GREYACQUIRE = 13	' Turn on/off 8-bit grey acquire
Global Const ACQCMD_HUE = 15	' Set hue value
Global Const ACQCMD_SAT = 16	' Set saturation value
Global Const ACQCMD_CAMERARGB = 17	' Set camera RGB values
Global Const ACQCMD_VOLTAGE = 18	' Set voltage values
Global Const ACQCMD_2MONLIVE = 26	' Turn on/off external monitor preview
Global Const ACQCMD_ZOOM = 45	' Change preview zoom factors

```
Global Const ACQCMD_PANSCROLL = 46

Global Const ACQCMD_CAPTRECT = 48             ' Set capture area

Global Const ACQCMD_EXPOSURE = 49             ' Set exposure value

Global Const ACQCMD_BINNING = 52              ' Set binning values

Global Const ACQCMD_DIGITALGAIN = 53          ' Set digital gain value

Global Const ACQCMD_CAPTRECT_LIMITS = 55  ' Gets the current camera area
limits.

Global Const ACQCMD_EXPOSURE_LIMITS = 65  ' Gets the exposure limits for the
current camera.

Global Const ACQCMD_BINNING_LIMITS = 66      ' Gets the current driver binning
limits.

Global Const ACQCMD_DIGITALGAIN_LIMITS = 67 ' Gets the currentdriver digital gain
limits.

Global Const ACQCMD_BINNING_SUPPORT = 72   ' Gets the sparse matrix of the
supported binning modes.

Global Const ACQCMD_DIGITALGAIN_SUPPORT = 73  ' Gets the sparse matrix of the
supported gain values. Only avaiable for digital gain, not for digital gain 2

Global Const ACQCMD_MULTI_DEVICE = 82       ' Select multiple device number

Global Const ACQCMD_EXPOSURE2 = 84          ' Sets or gets the exposure as a
double value. The driver needs to support this feature in order to use it.

Global Const ACQCMD_EXPOSURE2_LIMITS = 85 ' Gets the exposure limits of the
current camera in doubles.

Global Const ACQCMD_AUTOEXPOSURE = 88    ' Calculates an exposure
automatically, this feature is available only for driver that supports it.

Global Const ACQCMD_WHITEBALANCE = 89      ' Calculates an automatic white
balance
```

```
Global Const ACQCMD_RESOLUTION_ACQ = 91              ' Sets or gets the index for
the current acquire resolution (only if the driver supports it).

Global Const ACQCMD_RESOLUTION_PVW = 92             ' Sets or gets the index for
the current preview resolution (only if the driver supports it).

Global Const ACQCMD_BITDEPTH = 93              ' Sets the bitdepth for acquire (only if
the driver supports it).

Global Const ACQCMD_DIGITALOFFSET = 95     ' Sets or gets the digital offset value.

Global Const ACQCMD_GAMMA = 97                  ' Sets or gets the gamma value.

Global Const ACQCMD_GAMMA_LIMITS = 98       ' Gets the gamma limits supported by
the current driver.

Global Const ACQCMD_FRAMEOFFSET = 99      ' Sets or gets the frame offset for
analog cameras.

Global Const ACQCMD_RESET2DEFAULT = 102 ' Resets to defaults the setting for the
current camera (only if the driver supports it).

Global Const ACQCMD_DFS = 103                   ' Sets or gets the status of the Dark
frame subtraction (only if the driver supports it).

Global Const ACQCMD_BGC = 104                   ' Sets or gets the status of the
Background image (only if the driver supports it).

Global Const ACQCMD_HISTOGRAM = 105        ' Starts and positions the histogram
window (only if the driver supports it)..

Global Const ACQCMD_DIGITALGAIN_2 = 106    ' Sets or gets the digital gain as a
double value.

Global Const ACQCMD_DIGITALGAIN_LIMITS_2 = 107       ' Gets the current limits of
the digital gain as a double.

Global Const ACQCMD_DYNAMIC_AE = 108       ' Starts/stops the dynamic auto
exposure.

Global Const ACQCMD_DYNAMIC_AC = 111       ' Starts/stops the dynamic auto
contrast.
```

```
Global Const ACQCMD_WSPREVW = 800             ' Turn on/off workspacepreview
Global Const ACQCMD_KEEPWSIMG = 801          ' Turn on/off keepworkspace image
Global Const ACQCMD_BESTFIT = 802            ' Turn on/off best fit
Global Const ACQCMD_AVERAGE = 803            ' Turn on/off frame averaging
Global Const ACQCMD_AVERACC = 804            ' Set frame averaging accumulate
number of frames
Global Const ACQCMD_AVERDIV = 805            ' Set frame averaging divide by
constant
Global Const ACQCMD_SEQDISP = 806            ' Turn on/off sequencedisplay option
Global Const ACQCMD_FILEBASE = 807           ' Set file name basenumber
Global Const ACQCMD_FILEPREFIX = 808         ' Set file name prefix
Global Const ACQCMD_FILEPATH = 809           ' Set file name path
Global Const ACQCMD_LIVEMOUSE = 810          ' Turn on/off the livepreview mouse
control
Global Const ACQCMD_ONCHIP_PREF = 811        ' Set the on-chipintegration
preference
Global Const ACQCMD_LOCKEXPOSURE = 812  ' Turn on/off the lock exposure times
feature
Global Const ACQCMD_PROMPTFILESAVE = 813  ' Turn on/off the prompt file save
feature
Global Const ACQCMD_MULTIIMAGE = 814         ' Turn on/off the multi-image capture
feature
Global Const ACQCMD_FILEDIGITS = 815         ' Set the file name base number of
digits
Global Const ACQCMD_AUTOADJBIN = 816          ' Turn on/off auto-adjust for binning
Global Const ACQCMD_AUTOAPPLY = 817          ' Turn on/off auto-apply changes for
preview
Global Const ACQCMD_IMAGEDEST = 818          ' Set image destination selection
Global Const ACQCMD_DYNINT = 820             ' Enable/disable dynamic integration
auto-exposure
Global Const ACQCMD_DYNSATWARN = 822          ' Enable/disable dynamic integration
saturation warning
Global Const ACQCMD_DYNBLACKLVL = 823         ' Set the dynamic integration black
level
Global Const ACQCMD_DYNBLACKAUTO = 824   ' Start the dynamic black level auto
set process
Global Const ACQCMD_PROGSEQ = 825             ' Turn on/off progressive sequence
dynamic integration
```

```
Global Const ACQCMD_DYNSEQ = 826              ' Turn on/off dynamic integration to
sequence

Global Const ACQCMD_PRGSEQINT = 827           ' Set progressive

sequence interval mode

Global Const ACQCMD_PRGSEQREGNUM = 828 ' Set progressive sequence regular
interval number of images

Global Const ACQCMD_PRGSEQREGTME = 829  ' Set progressive sequence regular
interval total time

Global Const ACQCMD_DYNSEQNUM = 830           ' Set dynamic sequence number of
images

Global Const ACQCMD_DYNSEQTIME = 831          ' Set dynamic sequence total time

Global Const ACQCMD_ONCHIPINT = 832           ' Turn on/off on-chip integration

Global Const ACQCMD_STOPDYNINT = 833          ' Stop performing dynamic integration
```

```
Global Const ACQCMD_PRGSEQIRGSEL = 834   ' Set progressive sequence irregular
interval selection

Global Const ACQCMD_LOCKDIGTALOFFSET = 835 ' Locks digital offset

Global Const ACQCMD_LOCKGAIN = 836            ' Locks gain values

Global Const ACQCMD_LOCKGAMMA = 837           ' Locks gamma values

Global Const ACQCMD_LOCKAOI = 838             ' Locks AOI settings

Global Const ACQCMD_WBRESET = 839             ' Resets the white balance

Global Const ACQCMD_WB_SET = 840              ' Sets the whitebalance per channel.
wParam indicates the channel and lParam a pointer to a double to set it.

Global Const ACQCMD_CC_BUTTON = 841           ' Custom control button

Global Const ACQCMD_CC_SLIDER = 842           ' Custom control slider

Global Const ACQCMD_CC_CHECKBOX = 843         ' Custom control check box

Global Const ACQCMD_CC_COMBO = 844            ' Custom control combo box.

Global Const ACQCMD_AUTOSET = 846             ' Resets to defaults, calculates an
auto exposure and auto white balance (if available).
```

IpAcqDynIntSnap

Syntax

IpAcqDynIntSnap (b*TotTimeExp*, *NumImages*, *TotalTime*)

Description

This function captures a dynamic integration sequence of images using the specified dynamic integration options.

Parameters

bTotTimeExp	**Integer**	An integer value of 0 or 1 specifying whether to perform a total time exposure dynamic integration capture. 0 - perform normal dynamic integration 1 - perform total time exposure dynamic integration
NumImages	**Long**	A long integer specifying the number of images to be captured in a total time exposure dynamic integration capture. This parameter is not used for normal dynamic integration captures and should be set to -1.
TotalTime	**Long**	An integer specifying the total exposure time, in milliseconds that will be used to calculate the interval exposure time for total time exposure dynamic integration captures. This parameter is not used for normal dynamic integration captures and should be set to -1.

Example

```
ret = IpAcqDynIntSnap(0, -1, -1)
```

This statement will acquire a normal dynamic integration.

```
ret = IpAcqDynIntSnap(1, 100, 30000)
```

This statement will acquire a total time exposure dynamic integration of 100 frames and 30 seconds of total exposure time.

Comments

Note that any of the parameters in this function may be set to -1 to be ignored and use the current setting of that parameter.

Return Value

Document ID of the last image created.

See Also

IpAcqSnap, IpAcqAverage, IpAcqSeqIntSnap, IpAcqMultiSnap, IpAcqTimed

IpAcqMultiSnap

Syntax **IpAcqMultiSnap***(Startframe, Numframe, destVri)*

Description This function captures multiple image from the frame-grabber.

Parameters

destVri	**Integer**	An enumerated integer specifying the window into which the image will be captured. Must be one of the following: ACQ_CURRENT ACQ_NEW ACQ_SEQUENCE ACQ_FILE ACQ_SEQUENCE_APPEND where, ACQ_NEW saves the captured image to a new image window, and ACQ_CURRENT saves it to the active image window. ACQ_SEQUENCE saves it to a sequencer file. ACQ_SEQUENCE_APPEND appends captured images as frames to the active image window.
Startframe	**Integer**	The number of the first frame in the range to be captured.
Numframe	**Integer**	The total number of frames to be captured

Example

To capture 4 new images: `IpAcqMultiSnap (0, 4, ACQ_NEW)`

To capture a 5-frame sequence: `IpAcqMultiSnap (0,5,ACQ_SEQUENCE)`

Comments The capture will be performed using the **Acquire** options currently in effect on the system. Note that in previous versions of this program, the last parameter, *destVri,* was used to indicate whether to capture the frames to the frame grabber's memory, or to store them in this program as new images. Therefore, acquiring a series of frames was a two-step process, and was only possible if your hardware supported multiple frames in memory. In the current version of this program, IpAcquMultiSnap will automatically use the frame grabber's multiple frame support if possible, or will simulate this capability if necessary. For this reason, the start frame parameter should be set to zero, and the old true/false parameter *(toVri)* has been replaced by *destVri.*

Return Value Document ID of the last image created.

See Also IpAcqSnap

IpAcqSelectDriver

Syntax **IpAcqSelectDriver** *(DriverName, Command)*

Description This function selects a capture driver, or inquires about the capture drivers.

Parameters

DriverName	**String**	Name of the driver you want to use.
Command	**Integer**	Must be one of the following: 0 = Select the driver contained in *DriverName* 1 = Return the current driver contained in *DriverName* 2 = Returns total number of available drivers 3 = Resets the driver list index position to 0 4 = Returns the name of the driver in the list at the specified index position in *DriverName* 5 = increment the index position

Return Value For most commands, the IpAcqSelectDriver returns 0 if successful, and a negative failure if an error occurs. For command 2, the return value is the number of drivers installed, and a negative value indicates an error.

Example The following example selects the Analog Simulation driver as the active capture driver:

```
ret = IpAcqSelectDriver("Analog Simulation", 0)
```

The following example gets the name of the currently selected capture driver:

```
Dim szDriver As String * 255
ret = IpAcqSelectDriver(szDriver, 1)
```

The following example gets the number of capture drivers installed and gets the name of each one:

```
Dim i, iNumDrivers As Long
Dim szDriver As String * 255
iNumDrivers = IpAcqSelectDriver("", 2)
ret = IpAcqSelectDriver("", 3)      ' reset the index
For i = 1 To iNumDrivers
    ' get the driver for this index
    ret = IpAcqSelectDriver(szDriver, 4)
    ' and increment the index
    ret = IpAcqSelectDriver("", 5)
    MsgBox "Driver #" + CStr(i) + " is '" + IpTrim(szDriver) +
"'"
Next i
```

Comments The string contained in *DriverName* is the driver name shown in the **Setup** tab of the **Capture** dialog.

IpAcqSettings

Syntax **IpAcqSettings** *(File, bSave)*

Description This function loads or saves a settings file.

Parameters

File	**String**	String containing the full path to the settings file that you want to load or save.
bSave	**Integer**	0 = Read settings to the settings file specified in *File* 1 = Save settings from the settings file specified in *File.* 2 = Return current settings file pathname.

Example

```
IpAcqSettings("newvpf", 0)
```

Comments This function can be used to save and reload complicated capture settings. These settings are recorded when you use the Load, Save, or Default buttons on the Setup page.

IpAcqShow

Syntax **IpAcqShow**(*Dialog, bShow*)

Description This function displays or hides the video acquisition dialogs, and selects the active page.

Parameters

Dialog	**Integer**	An enumerated integer that specifies the dialog to be displayed or hidden. Must be one of the following: ACQ_AVG ACQ_ISLIVE ACQ_ISSHOWN ACQ_LIVE ACQ_MULTI ACQ_SETTINGS ACQ_SETUP ACQ_SNAP ACQ_TIMED ACQ_ISINITIALIZED ACQ_MACROS See definitions under Comments, below
bShow	**Integer**	A value of 0, 1, or 3 specifying whether the dialog is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog 2 - not used 3 - show the basic dialog (ACQ_SNAP only)

Return Value For ACQ_ISLIVE and ACQ_ISSHOWN, 1 if the dialog is visible, 0 if not shown. For ACQ_ISINITIALIZED, 1 if capture is initialized, 0 if not initialized.
For all others, 0 if successful, a negative value indicates an error.

Example

```
  ret = IpAcqShow(ACQ_SNAP, 1)
  ret = IpAcqShow(ACQ_LIVE, 1)
```

These statements will display the **Acquire** dialog and the live video window.

Comments

The live video window is considered an element of an acquisition dialog. As such, it can only be shown while one of the other acquisition dialogs is displayed.

Dialog options are as follows:

VALUE	DESCRIPTION
ACQ_AVG	Specifies the **Integration** tab on the **Acquire** dialog box.
ACQ_ISLIVE	Indicates if **live preview** is active or not. Uses the following commands: 0 = Hide the live preview window 1= Show the live preview window 2 = Suspend live preview 3 = Resume live preview
ACQ_ISSHOWN	Indicates if the **Acquire** dialog is active or not.
ACQ_LIVE	Specifies the **live video** window.
ACQ_MULTI	Specifies the **Image** page on the **Acquire** tabbed dialog.
ACQ_SETTINGS	Specifies the **Signal** page on the **Acquire** tabbed dialog (for analog drivers)
ACQ_SETUP	Specifies the **Setup** page on the **Acquire** tabbed dialog.
ACQ_SNAP	Specifies the **Preview** page on the **Acquire** dialog box (for analog drivers).
ACQ_TIMED	Specifies the **Image** tab on the **Acquire** dialog box.
ACQ_ISINITIALIZED	Indicates if capture has been initialized or not.
ACQ_IMAGE	Specifies the **Image** page on the **Acquire** tabbed dialog.
ACQ_PREVIEW	Specifies the **Preview** page on the **Acquire** tabbed dialog for digital drivers
ACQ_ACQUIRE	Specifies the **Acquire** page on the **Acquire** tabbed dialog for digital drivers
ACQ_MACROS	Specifies the **Macros** page on the **Acquire** tabbed dialog.

See Also `IpAcqSnap`

IpAcqSnap

Syntax

IpAcqSnap(*destVri*)

Description

This function captures a single image from the frame-grabber. Equivalent to clicking the **Acquire** command's **Snap** button.

Parameters

destVri	**Integer**	An enumerated integer specifying the window into which the image will be captured. Must be one of the following: These five commands capture an image to the chosen destination and set the image destination for all future user acquisitions (by clicking the Snap button) to the same destination. ACQ_NEW ACQ_CURRENT ACQ_FILE ACQ_SEQUENCE ACQ_SEQUENCE_APPEND These five commands capture an image to the chosen destination, but leave the destination for all future user acquisitions (by clicking the Snap button) as last set by the user or by calling `ret = IpAcqControl(ACQCMD_IMAGEDEST, ...):` ACQ_NEWEX ACQ_CURRENTEX ACQ_FILEEX ACQ_SEQUENCEEX ACQ_SEQUENCE_APPENDEX

Return Value

This function returns the Document ID of the new image, which will be an integer greater than or equal to 0. A negative return value indicates an error.

Example

```
IpAcqSnap(ACQ_NEW)

IpAcqSnap(ACQ_CURRENT)

IpAcqSnap(ACQ_FILE)
```

Comments

The capture will be performed using the **Acquire** options currently in effect on the system. The destination file for ACQ_FILE will be the last file indicated by the SetFile button.

See Also

IpAcqAverage, IpAcqTimed, IpAcqShow, IpAcqMultiSnap

IpAcqTimed

Syntax

IpAcqTimed(*Dir*, *Prefix*, *StartNumber*, *Frames*, *Interval*)

Description

This function captures a sequence of images at the specified rate, and saves them to disk. Equivalent to the **Timed Acquire** command.

Parameters

Dir	**String**	A string specifying the directory to which the captured images will be saved.
Prefix	**String**	A string specifying the “prefix” to be used to compose the file names for the saved images. *Note - acquired images are automatically stored in TIFF format, and are assigned the .TIF file extension.*
StartNumber	**Integer**	An integer specifying the sequence number to be appended to the prefix of the first image. This number is automatically incremented as successive images are stored.
Frames	**Integer**	An integer specifying the total number of images to be acquired during the timed-acquire session.
Interval	**Long**	An integer specifying the interval, in seconds, at which the images are to be acquired.

Example

```
ret = IpAcqTimed("c:\images", "img", 1, 10, 45)
```

This statement will acquire and store an image every 45 seconds until 10 images have been obtained. The captured images will be stored to the “C:\IMAGES” directory under the file names IMG1.TIF, IMG2.TIF, IMG3.TIF. . .IMG10.TIF.

You can also save frames to a new Sequencer image workspace by setting both strings to:

```
ret = IpAcqTimed("", "", 0, 3, 5)
```

Similarly, frames can be saved to a new image workspace or the active image workspace by setting the first string to " " and the second string to either "\\New\\" or \\Current\\ as shown below:

```
ret = IpAcqTimed("", "\\New\\", 0,3,5) New Image
ret = IpAcqTimed("", "\\Current\\", 0,3,5) Active Image
```

Comments

Note that IpAcqTimed (Path, Prefix, 1,0,1) is equivalent to IpAcqSnap(Acq_FILE) except that the file name is specified.

Return Value

Document ID of the last image created.

See Also

IpAcqSnap, IpAcqAverage, IpAcqShow, IpAcqMultiSnap

IpAcqTimedEx

Syntax

IpAcqTimedEx(*Dir*, *Prefix*, *StartNumber*, *Frames*, *Interval*)

Description

This function captures a sequence of images at the specified rate, and saves them to disk. Equivalent to the **Timed Acquire** command.

Parameters

Dir	**String**	A string specifying the directory to which the captured images will be saved.
Prefix	**String**	A string specifying the "prefix" to be used to compose the file names for the saved images. *Note - acquired images are automatically stored in TIFF format, and are assigned the .TIF file extension.*
StartNumber	**Integer**	An integer specifying the sequence number to be appended to the prefix of the first image. This number is automatically incremented as successive images are stored.
Frames	**Integer**	An integer specifying the total number of images to be acquired during the timed-acquire session.
Interval	**Long**	An integer specifying the interval, in milliseconds, at which the images are to be acquired.

Example

```
ret = IpAcqTimedEx("c:\images", "img", 1, 10, 200)
```

This statement will acquire and store an image every 200 milliseconds until 10 images have been obtained. The captured images will be stored to the "C:\IMAGES" directory under the file names IMG1.TIF, IMG2.TIF, IMG3.TIF. . .IMG10.TIF.

You can also save frames to a new Sequencer image workspace by setting both strings to:

```
ret = IpAcqTimedEx("", "", 0, 3, 50)
```

Similarly, frames can be saved to a new image workspace or the active image workspace by setting the first string to " " and the second string to either "\\New\\" or \\Current\\ as shown below:

```
ret = IpAcqTimedEx("", "\\New\\", 0,3,50) New Image
ret = IpAcqTimedEx("", "\\Current\\", 0,3,50) Active Image
```

Comments

Note that IpAcqTimedEx (Path, Prefix, 1,0,1) is equivalent to IpAcqSnap(Acq_FILE) except that the file name is specified.

Return Value

Document ID of the last image created.

See Also

IpAcqSnap, IpAcqAverage, IpAcqShow, IpAcqMultiSnap, IpAcqTimed

IpAcqSeqIntSnap

Syntax

IpAcqSeqIntSnap(b*RegularSeq*, *IndexOrNumImg*, *TotalTime*)

Description

This function captures a sequential integration sequence of images using the specified sequential integration options.

Parameters

bRegularSeq	**Integer**	An integer value of 0 or 1 specifying whether to perform a regular interval or irregular interval sequential integration capture. 0 - perform irregular interval 1 - perform regular interval
IndexOrNumImg	**Long**	A long integer specifying the zero-based selection index for irregular interval sequential integration captures or the number of images to be snapped in a regular interval sequential integration capture. *Note – The selection index chooses one of the predefined irregular interval sequences as shown in the sequential integration dialog.*
TotalTime	**Long**	An integer specifying the total exposure time, in milliseconds that will be used to calculate the interval exposure time for regular interval sequential integration captures. This parameter is not used for irregular sequential integration capture and should be set to -1.

Example

```
ret = IpAcqSeqIntSnap(0, 1, -1)
```

This statement will acquire a sequential integration with irregular interval selection 1

ret = IpAcqSeqIntSnap(1, 100, 30000)

This statement will acquire a sequential integration with iregular intervals of 100 frames and 30 seconds of total exposure time.

Comments

Note that any of the parameters in this function may be set to -1 to be ignored and use the current setting of that parameter.

Return Value

Document ID of the last image created.

See Also

IpAcqSnap, IpAcqAverage, IpAcqDynIntSnap, IpAcqMultiSnap, IpAcqTimed

IpAFAAddChan

Syntax

IpAFAAddChan *(lpChanName)*

Description

This function adds a channel using the current name

Parameters

lpChan Name	**String**	Indicates the set to examine.

Return Value

0 if successful, a negative error code if failed.

Comments

Acquisition of multiple channels must be selected, using `IpAFASetInst(AFA_MCHAN,0,1)`

The new channel is added to the end of the list of channels. You can use IpAFAGet to inquire the number of channels before calling IpAFAAddChan – this number can then be used as the index to the new channel when using IpAFASetInt, IpAFASetSingle and IpAFASetEx to set the channel’s properties.

Example

```
Dim NewChan as Integer
‘ Get the current number of channels
ret = IpAFAGet(AFA_NUMCHANNELS, 0, NewChan)
‘ Add a new channel called “New Channel”
ret = IpAFAAddChan(“New Channel”)
‘ Set the wavelength of the new channel to 400nM
ret = IpAFASetSingle(AFA_WAVELENGTH, NewChan, 400)
```

See Also

IpAFAGet, IpAFASetEx, IpAFASetInt, IpAFASetSingle

IpAFADelChan

Syntax **IpAFADelChan** *(nChannel)*

Description This function deletes a channel by number.

Parameters			
	nChannel	**Integer**	The index of the channel to delete.

Return Value 0 if successful, a negative error code if failed.

Comments The number may be obtained by using AFA_NUMCHANNELS to find the channel count and iterating through to find the channel with the required name or values.

See Also IpAFADelChanStr

IpAFADelChanStr

Syntax **IpAFADelChanStr** *(ChanName)*

Description This function deletes a channel by name rather than by number

Parameters			
	ChanName	**String**	Name of the channel to delete

Return Value 0 if successful, a negative error code if failed.

See Also IpAFADelChan

IpAFAGet

Syntax

IpAFAGet *(sAttribute, sParam, sValue)*

Description

This function gets the current value of an AFA attribute.

Parameters

sAttribute	**Integer**	The setting to inquire. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table.
sValue	**(varies)**	Variable to receive the setting's current value. See the Type column in the Comments table for the type of variable required for each attribute.

Return Value

0 if successful, a negative error code if failed.

Comments

This function is used for all attributes returning numeric values. For several attributes taking a dimension identifier in sParam, the following constants are used:

AFA_CHAN – Channel
AFA_Z – Z Position
AFA_SCAN – X/Y Scan position
AFA_SAMPLE – Sampling position (well, slide, or user-defined position)
AFA_TIMEPOINT – Time point.

If the value is listed as a 'Stage', it is a boolean value with 0 for off or 1 for on.

sAttribute	**sValue**	**sParam**	**Type**
AFA_ACQUISITION_TONE	Indicates if program should beep at the end of each acquisiton	N/A	Integer
AFA_AUTOEXPOSE	State of autoexposure	N/A	Integer
AFA_BACKGROUNDSET	Set number associated with background images	N/A	Integer
AFA_BOTTOM_UP	Capture Z planes from the bottom up of the stack upwards	N/A	Integer
AFA_CAPTCHANNEL	Is channel active/inactive for this capture	Channel index	Integer

sAttribute	**sValue**	**sParam**	**Type**
AFA_CAPTUREORDER	Enumerated integer describing capture order, values of AFA_ORDER_FOCUSFIRST, AFA_ORDER_CHANNELFIRST	N/A	Integer
AFA_CAPTURESUBSET	State of All/Selected channels	N/A	Integer
AFA_CAPTURETO	Destination type, values AFA_DEST_MEM, AFA_DEST_DISK	N/A	Integer
AFA_CHANGEPHASE	Change current time phase, return change state	N/A	Integer
	Defines for AFA_CHANGEPHASE, only valid during acquisition. Phase numbers of 0 to (AFA_NUMTIMEPHASES-1) will move directly to that portion of the time lapse acquisition. AFA_SET_PHASENEXT -1 // Go to next phase AFA_SET_PHASEPREV -2 // Go to previous phase		
AFA_COMPOSITEMATCH	Does composite doc match? Boolean result.	N/A	Integer
AFA_DELCHANNEL	Delete channel by number	Channel index	Integer
AFA_CHAN_NAME	AFA_CHAN_NAME is obsolete, and is replaced by AFA_DYE. Both commands do the same thing, which is for **IpAFAGet** is to return the channel/dye name.		
AFA_DELTIMEPHASE	Delete time phase specified by sParam (write only)	N/A	Integer
AFA_DELTAZ	Microns distance between planes	N/A	Single
AFA_DIVISION	Division of channel or time phase	Channel or time phase	Integer

sAttribute	sValue	sParam	Type
AFA_EDOFSTYPE	Type of software focus, values AFA_EDOF_LOCAL, AFA_EDOF_MAX, AFA_EDOF_MIN, AFA_EDOF_DEPTH	N/A	Integer
AFA_EXPOSURE	Exposure time of channel	Channel	Single
AFA_EXWAVELENGTH	Sets the excitation wavelength for the channel specified by the sParam parameter. Setting the excitation wavelength by using AFA_WAVELENGTH with **IpAFASetSingle** modifies the dye file for the channel	Channel	Integer
AFA_FOCUS	State of multiple focus acquisition	N/A	Integer
AFA_FOCUSCHANNEL	This command gets the channel used as the Focus Channel. The focus offset for the Focus Channel is also set to 0.0	N/A	Integer
AFA_FOCUSOFFSET	Gets the focus offset for the channel specified by the sParam parameter. The focus offset for a channel is applied to the Z focus position determined for the focus channel when determining the Z focus position for the channel of interest. The focus offset for the current focus channel should not be set – trying to do so will return an IPCERR_INVARG error code	Channel	Integer

sAttribute	**sValue**	**sParam**	**Type**
AFA_GENCOMPOSITE	State of color composite enabling	N/A	Integer
AFA_GENCOMPOSITE_ACQ	Generate composite while acquiring. 0 or 1	N/A	Integer
AFA_HOLDTIME	Seconds time refocus hold	N/A	Single
AFA_INTEGRATION	Integration of channel or time phase	Channel index or time phase	Integer
AFA_ISMODIFIED	State of document modification	N/A	Integer
AFA_LAPSETIME	Seconds time lapse	N/A	Single
AFA_LAST_IMAGE_SET	Get the set manager ID of the set most recently acquired using IpAFASnap or the Acquire button on the AFA user interface. Bested us immediately after an acquisition.		
AFA_MCHAN	State of multiple channel acquisition	N/A	Integer
AFA_MINTIME	State of minimum time lapse	N/A	Integer
AFA_MOVEMENT	Return the current position along the specified dimension	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT	Integer
AFA_NA	NA of specific channel	Channel	Single
AFA_NUMALLTIMEPOINTS	Total number of time points for all phases (read-only)	Time phase	Integer
AFA_NUMCHANNELS	Number of channels defined (one-based)	N/A	Integer
AFA_NUMFOCUS	Number of focal planes	N/A	Integer
AFA_NUMSAMPLES	Number of samples	N/A	Integer
AFA_NUMSCAN	Number of scan images	N/A	Integer

sAttribute	**sValue**	**sParam**	**Type**
AFA_NUMTIMEPOINTS	Number of time points	Time phase	Integer
AFA_NUMTIMEPHASES	Number of time phases	N/A	Integer
AFA_PREVIEW	Is AFA currently previewing?	N/A	Integer
AFA_PREVIEWHOLD	Will the specified dimension be held steady when viewing all in Preview	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_ SAMPLE, AFA_ TIMEPOINT	Integer
AFA_PREVIEWSET	Will the specified dimension be previewed?	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_ SAMPLE, AFA_ TIMEPOINT	Integer
AFA_PREVIEWTIME	Time of preview hold, in seconds	N/A	Single
AFA_RECORDLAYOUT	(write only) 1 = record layout from current set 0 = clear layout parameters	Not used, set to 0	Integer
AFA_REFINDEX	RI of immersion of specific channel	Channel	Single
AFA_REFOCUS	State of refocus during acquisition	N/A	Integer
AFA_REFOCUSFREQ	Frequency of refocusing	N/A	Integer
AFA_REFOCUSTYPE	Type of refocus during acquisition	N/A	Integer

sAttribute	sValue	sParam	Type
AFA_RETAIN	Type of image retained from focus:		Integer
	AFA_RETAIN_STACK = Keep all planes of focus AFA_RETAIN_BESTFOCUS = Keep only the best focused image from the Z planes AFA_RETAIN_COMPOSITE = Create a composite image using the EDOF functions with every pixel individually focused. AFA_RETAIN_SINGLE = Keep a single plane at the focus point.		
AFA_RESTART_AFTER_ PAUSE	Set the current experiment's default resume option, which should be one of the following: AFA_RESTART_IMMEDIATELY – start the next acquisition immediately AFA_RESTART_ON SCHEDULE – start the next acquisition at the next regularly scheduled time point		
AFA_SAMPLECOORD	XYZ coordinates of a sample position	Sample number	Array of 3 singles
AFA_SCANAREA	State of scanned acquisition	N/A	Integer
AFA_SETMATCH	Does set number match AFA set? Returns a state.	set number	Integer
AFA_SINGLEOBJECTIVE	Gets whether all channels should use the same objective information. When the single objective option is set to TRUE (any non-zero value), the lens information (AFA_NA, AFA_REFINDEX and AFA_LENS) will be set for all existing channels.		Integer
	Setting the single objective option to TRUE makes it unnecessary to specify the objective when adding new channels.		

sAttribute	**sValue**	**sParam**	**Type**
AFA_STAGE	State of multiple position acquisition	N/A	Integer
AFA_STAGETYPE	Type of stage movement, values of AFA_STAGE_ WELLS, AFA_STAGE_ RANDOM	N/A	Integer
AFA_TIME	State of multiple time acquisition	N/A	Integer
AFA_TIMEPHASE	Current time phase		
AFA_TIMEPHASEDESCR	Phase number	Starting from 0	String
AFA_TIMEPREVIEW	State of preview during time lapse	N/A	Integer
AFA_TINT	Gets the tine used to represent the channel specified by sParam. Modifying the tint will update the underlying dye file for the channel.	Channel	Integer
AFA_TILEANGLE	Angle of tiling in radians	Double	Integer
AFA_TILEBLEND	Tiling blend method for scans	N/A	String
AFA_TILEDIRPOS	Stage movement positive	0 = X 1 = Y	Integer
AFA_TILEIMAGES	State of tiled acquisition	N/A	
AFA_TILEOFFSET	POINTAPI of specificed offset	0 = X 1 = Y	Integer
AFA_TILESIZE	Size of tile (array of 2 hsort/interger) for mosaic	N/A	Integer
AFA_TILESTAGESCALE	Stage movement	Calibrated pixel distance	Integer
AFA_TILETYPE	Tiling method for scans	N/A	String
AFA_Z_SCAN_NOMINAL	Z nominal position for a scan location	scan location	Single
AFA_Z_STG_NOMINAL	Z nominal position for a stage location	stage location	Single

Example

```
Dim nScan as Integer
ret = IpAFAGet(AFA_NUMSCAN, 0, nScan)

' Index to the 3rd scan point in the 5th stage position
Dim fPosition As Single
ret = IpAFAGet(AFA_Z_SCAN_NOMINAL, 4*nScan + 2, fPosition)

Debug.Print "Stage 5, Scan 3"; fPosition
```

See Also **IpAFAGetStr**

IpAFAGetInt

Syntax **IpAFAGetInt** ***(sAttribute, sParam, lpData)***

Description This function gets AFA attributes taking an integer value to a new value.

Parameters

sAttribute	**Integer**	Attribute to modify. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table.
shData	**Integer**	New value for the attribute.

Return Value 0 if successful, a negative error code if failed.

Comments This function is used for all attributes taking integer values. For several attributes taking a dimension identifier in sParam, the following constants are used:

AFA_CHAN – Channel
AFA_Z – Z Position
AFA_SCAN – X/Y Scan position
AFA_SAMPLE – Sampling position (well, slide, or user-defined position)
AFA_TIMEPOINT – Time point.

sAttribute	shData	sParam
AFA_ACQUISITION_TONE	Indicates if program should beep at the end of each acquisiton	N/A
AFA_ARCHIVE_SET	Archives the set and all set images to the Image Database	N/A
AFA_AUTOEXPOSE	Stage of autoexposure	N/A
AFA_BACKGROUNDSET	Set number associated with background	N/A
AFA_BOTTOM_UP	Acquire set from the bottom of the stack upwards	N/A

sAttribute	**shData**	**sParam**
AFA_CAPTCHANNEL	Set channel active or inactive for this capture	Channel index
AFA_CAPTUREORDER	Enum describing capture order: AFA_ORDER_FOCUSFIRST – Iterate through focus, then change channels; useful only if manual filter changers are available for highest Z accuracy. AFA_ORDER_CHANNELFIRST – Iterate through channels, then change focus; ensures focal registration between channels.	N/A
AFA_CAPTURESUBSET	State of All/Selected channels. AFA_CAPT_ALL – Capture all defined channels. AFA_CAPT_SELECTED – Capture selected channels. See AFA_CAPTCHANNEL to set/get this state.	N/A
AFA_CAPTURETO	Destination type AFA_DEST_MEM – Keeps sets in memory. AFA_DEST_DISK – Writes directly to disk.	N/A
AFA_COMPOSITEMATCH	Does composite doc match?	N/A
AFA_COMPOSITEUPDATE	N/A The AFA settings for color composite are updated from the specified color composite document.	The document ID of the color composite document.
AFA_COPY_TO_ CLIPBOARD	Copies the experiment information to the clipboard, where it can be pasted into any text or document editor.	N/A

sAttribute	**shData**	**sParam**
AFA_CHAN_NAME	Select the dye for the channel, which sets the channel name (AFA_CHAN_NAME), tint (the new AFA_TINT command), emissions wavelength (AFA_WAVELENGTH), and excitation wavelength (the new AFA_EXWAVELENGTH command).	N/A
AFA_CHANGEPHASE	Change current time phase, return change state	N/A
	Defines for AFA_CHANGEPHASE, only valid during acquisition. Phase numbers of 0 to (AFA_NUMTIMEPHASES-1) will move directly to that portion of the time lapse acquisition. AFA_SET_PHASENEXT -1 // Go to next phase AFA_SET_PHASEPREV -2 // Go to previous phase	
AFA_DELCHANNEL	Delete channel by number	Channel index
AFA_DELTIMEPHASE	Delete time phase specified by sParam (write only)	N/A
AFA_DELSAMPLE	N/A The specified sampling position is deleted from the list of sampling positions.	Sampling position index
AFA_DIVISION	Division of channel	Channel index or time phase
AFA_EDOFSTYPE	Type of software focus	N/A
AFA_GENCOMPOSITE	State of color composite enabling	N/A
AFA_GENCOMPOSITE_ ACQ	Generate composite while acquiring	Set to 0
AFA_FOCUS	State of multiple focus (Z position) acquisition	N/A

sAttribute	**shData**	**sParam**
AFA_FOCUSCHANNEL	This command sets the channel used as the Focus Channel. The focus offset for the Focus Channel is also set to 0.0	N/A
AFA_HUE	Hue of specific channel. AFA_HUE is obsolete, and is supported for **IpAFASetInt** only for backward compatibility. The channel characteristics are set by selection of a dye (see the new command AFA_DYE) and the RGB tint of the dye can be adjusted by the new command AFA_TINT. Setting the channel's tint by either AFA_HUE or AFA_TINT modifies the dye file for the channel. When used with AFA 4.5 settings that do not refer to an existing dye file, a dye file will be created automatically	Channel index
AFA_INTEGRATION	Integration of channel	Channel index or time phase
AFA_ISMODIFIED	State of document modification	N/A
AFA_LAST_IMAGE_SET	Get the set manager ID of the set most recently acquired using IpAFASnap or the Acquire button on the AFA user interface. Bested us immediately after an acquisition.	N/A
AFA_MARKSAMPLE	If –1, add a user-defined sample to the set of stage positions. If 0 to n-1, stage position is updated to the current stage location.	N/A
AFA_MCHAN	State of multiple channel acquisition	N/A
AFA_MINTIME	State of minimum time lapse	N/A
AFA_MOVEMENT	Move microscope components	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_NUMALLTIMEPOINTS	Number of time points for all phases (read-only)	**N/A**

sAttribute	**shData**	**sParam**
AFA_NUMTIMEPOINTS	Number of time points	N/A
AFA_NUMTIMEPHASES	Number of time phases	**Time phase**
AFA_NUMFOCUS	Number of focal planes	**N/A**
AFA_PREVIEW	Start/stop preview	**N/A**
AFA_PREVIEWHOLD	Hold the dimension specified by sParam steady when viewing all in Preview	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_PREVIEWSET	Set the preview position for the dimension specified by sParam	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_RECORDLAYOUT	(write only) 1 = record layout from current set 0 = clear layout parameters	Not used, set to 0
AFA_RESTART_AFTER_ PAUSE	Set the current experiment's default resume option, which should be one of the following: AFA_RESTART_IMMEDIATELY = start the next acquisition immediately AFA_RESTART_ON SCHEDULE = start the next acquisition at the next regularly scheduled time point	
AFA_REFOCUS	State of refocus during acquisition. Equivalent to the state of the Focus while acquiring checkbox on the Focus tab of the AFA interface.	N/A

sAttribute	**shData**	**sParam**
AFA_REFOCUSFREQ	Frequency of refocusing AFA_REFOC_FRAME = Refocus every time the XY location changes AFA_REFOC_SCAN = Refocus before each scan, that is once per sample. AFA_REFOC_CHANNEL = Refocus every time the channel changes. AFA_REFOC-EACHTIME = Refocus on the first sample of each timepoint.	N/A
AFA_REFOCUSTYPE	Type of refocus during acquisition AFA_FOCUS_MANUAL = User will be prompted to manually refocus stage AFA_FOCUS_SOFTWARE = Software evaluation of focus will be performed AFA_FOCUS_HARDWARE = Requires hardware autofocus capability.	N/A
AFA_RETAIN	Type of image retained from focus AFA_RETAIN_STACK = Keep all planes of focus AFA_RETAIN_BESTFOCUS = Keep only the best focused image from the Z planes AFA_RETAIN_COMPOSITE = Create a composite image using the EDOF functions with every pixel individually focused. AFA_RETAIN_SINGLE = Keep a single plane at the focus point. See AFA_EDOFSTYPE to specify how the focus is determined.	N/A

sAttribute	**shData**	**sParam**
AFA_SAMPLESORT	N/A The user-defined sampling positions will be sorted for minimum travel during capture.	N/A
AFA_SCANAREA	State of scanned acquisition	N/A
AFA_SEND_TO_EXCEL	Sends the experiment information to an Excel spreadsheeet	N/A
AFA_SEND_TO_OUTPUT	Copies the experiment information to the Output Window	N/A
AFA_SETCOMPOSITE	Set number to composite	N/A
AFA_SETMATCH	Does set number match AFA set?	Set ID to compare
AFA_STAGE	State of multiple position acquisition	N/A
AFA_STAGETYPE	Type of stage movement AFA_STAGE_WELLS – Stage-Pro sample pattern of wells or slides AFA_STAGE_RANDOM – User defined positions.	N/A
AFA_SINGLEOBJECTIVE	Sets whether all channels should use the same objective information. When the single objective option is set to TRUE (any non-zero value), the lens information (AFA_NA, AFA_REFINDEX and AFA_LENS) will be set for all existing channels. Setting the single objective option to TRUE makes it unnecessary to specify the objective when adding new channels.	N/A

sAttribute	**shData**	sParam
AFA_TILEBLEND	Tiling blend method for scans	N/A
AFA_TILEDIRPOS	Stage movement positive	0 = X 1 = Y
AFA_TILEIMAGES	State of tiled acquisition	N/A
AFA_TILETYPE	Tiling method for scans	N/A
AFA_TIME	State of multiple time acquisition	N/A
AFA_TIMEPREVIEW	State of preview during time lapse	N/A
AFA_TIMEPHASE	Current time phase	N/A
AFA_USESHUTTER	Gets shutter behavior	See notes below
AFA_WRITEREVIEW	The Review of the current capture settings will be sent to the Output Window.	N/A

SParam for AFA_USESHUTTER. Must be one of the following:

Enumeration values:

AFA_SHUTTER_NONE	0	// Don't control the shutter at all
AFA_SHUTTER_ALL	1	// Close for any transition
AFA_SHUTTER_CHANNELS	2	// Leave open until all channels acquired
AFA_SHUTTER_ZSTACK	3	// Leave open for entire Z stack
AFA_SHUTTER_STAGE 4	// Open for entire stage position	
AFA_SHUTTER_TIMEPOINT	5	// Open for entire time point
AFA_SHUTTER_EXPERIMENT	6	// Open and close once for the experiment

See Also IpAFASetEx, IpAFASetSingle, IpAFASetStr, IpAFASetInt

IpAFAGetStr

Syntax **IpAFAGetStr** *(sCommand,, sParam, Value)*

Description This function gets the current value of an AFA string attribute.

Parameters

sAttribute	**Integer**	The setting to inquire. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table.
Value	**String**	A fixed-length string to receive the attribute's current value.

Return Value 0 if successful, a negative error code if failed.

Comments This function is used for all attributes returning strings.

Attribute	**Value**	**sParam**
AFA_CAPTUREFILE	Capture file of specific channel	Channel
AFA_CAPTUREPATH	Get path of Capture file	Channel
AFA_CHAN_NAME	Name of specific channel	Channel
AFA_DEFDIRNAME	Directory for saving .AFA files	N/A
AFA_DELCHANNELSTR	Delete channel by name (see also IpAFADelChanStr)	N/A
AFA_DESTDIR	Name of captured file destination directory	N/A
AFA_DESTEXT	Extension/file type for captured files. i.e. `.jpg, .tif`, etc.	N/A

Attribute	**Value**	**sParam**
AFA_DESCRIPTION	A description of the AFA experiment and image set.	N/A
AFA_DRIVERNAME	Name of capture driver/ camera	N/A
AFA_DYE	This command replaces AFA_CHAN_NAME and is used in a similar fashion. In addition to specifying the name for the channel specified by sParam, the AFA_DYE command also sets the channel tint (AFA_TINT), emissions wavelength (AFA_WAVELENGTH), and excitation wavelength (AFA_EXWAVELENGTH) from the characteristics of the specified dye	Channel
AFA_EXP_TITLE	The title of the experiement and the image set that goes with it. Also used as the default Set_Filename.	N/A
AFA_EXPERIMENTER	The experimenter or technician.	N/A
AFA_FILENAME	Name of settings	N/A
AFA_OBJECTIVE	Gets the objective. If sParam is -1 or the AFA_SINGLEOBJECTIVE option is set, the information for all channels will be updated – otherwise sParam should specify the channel to update. Setting the objective for one or more channels updates the numeric aperture (AFA_NA) and refractive index (AFA_REFINDEX) in addition to the objective name.	Channel to update
AFA_SAMPLEPATTERN	Name of the Stage-Pro sample pattern	N/A
AFA_SCANPATTERN	Name of the Stage-Pro scan area pattern	N/A
AFA_SCOPEFILE	Scope file of specific channel	Channel
AFA_SCOPEPATH	Get path of Scope file	Channel
AFA_SETFILENAME	Target IPS file for saves during acquisition	N/A

See Also IpAFAGet

IpAFALoad

Syntax	**IpAFALoad** *(fName)*		
Description	This function loads an AFA settings file.		
Parameters	*fName*	**String**	Specifies the settings file to load
Return Value	0 if successful, a negative error code if failed.		

IpAFAMacroGet

Syntax	**IpAFAMacroGet** *(nCallpoint, lpScriptFile, lpMacroName)*		
Description	This function gets the name and call point for an AFA macro.		
Parameters	*nCallPoint*	**Short**	An expression of the location where the macro is to be invoked. See Comments.
	lpScriptFile	**LPSTR**	A string specifiying the name of the script file
	lpMacroName	**LPSTR**	A string specifiying the name of the macro
Return Value	`IpAFAMacroGet` will return `IPCERR_INVARG` if nCallPoint is not in range, and -1 if there is no macro defined for that calling point.		

Comments These are the values for the Call Point parameter:

AFA_M_STRTACQ	0	// Before acquiring, setup
AFA_M_STRTTIME	1	// Time loop start
AFA_M_STRTSTAGE	2	// Stage loop start
AFA_M_STRTSCAN	3	// Scan loop start
AFA_M_STRTFOC	4	// Focus loop start
AFA_M_STRTCHAN	5	// Channel loop start
AFA_M_STRTSNAP	6	// Just before snap
AFA_M_ENDSNAP	7	// Just after snap
AFA_M_ENDCHAN	8	// Channel loop end
AFA_M_ENDFOC	9	// Focus loop end
AFA_M_ENDSCAN	10	// Scan loop end
AFA_M_ENDSTAGE	11	// Stage loop end
AFA_M_ENDTIME	12	// Time loop end
AFA_M_ENDACQ	13	// After acquiring, cleanup

See Also IpAFAMacroSet

IpAFAMacroSet

Syntax **IpAFAMacroSet** *(nCallpoint, lpScriptFile, lpMacroName)*

Description This function sets the name and call point for an AFA macro**.**

Parameters

nCallPoint	**Short**	An expression of the location where the macro is to be invoked. See Comments.
lpScriptFile	**LPSTR**	A string specifiying the name of the script file
lpMacroName	**LPSTR**	A string specifiying the name of the macro

Return Value `IpAFAMacroSet` will return `IPCERR_INVARG` if nCallPoint is not in range.

Comments These are the values for the Call Point parameter:

AFA_M_STRTACQ	0	// Before acquiring, setup
AFA_M_STRTTIME	1	// Time loop start
AFA_M_STRTSTAGE	2	// Stage loop start
AFA_M_STRTSCAN	3	// Scan loop start
AFA_M_STRTFOC	4	// Focus loop start
AFA_M_STRTCHAN	5	// Channel loop start
AFA_M_STRTSNAP	6	// Just before snap
AFA_M_ENDSNAP	7	// Just after snap
AFA_M_ENDCHAN	8	// Channel loop end
AFA_M_ENDFOC	9	// Focus loop end
AFA_M_ENDSCAN	10	// Scan loop end
AFA_M_ENDSTAGE	11	// Stage loop end
AFA_M_ENDTIME	12	// Time loop end
AFA_M_ENDACQ	13	// After acquiring, cleanup

See Also IpAFAMacroGet

IpAFANew

Syntax **IpAFANew** ***()***

Description This function creates a new AFA settings file

Return Value 0 if successful, a negative error code if failed.

Comments Create a new settings file with default values, the settings file name is reset so the original settings will not be overwritten. You must use **IpAFASaveAs** to save the settings since they will not have a default file name.

See Also IpAFASaveAs

IpAFASave

Syntax **IpAFASave *()***

Description This function saves the current AFA settings file under its existing file name

Return Value 0 if successful, a negative error code if failed.

Comments You must have loaded a settings file, or saved one using IpAFASaveAs, to have set the settings file name.

See Also IpAFASaveAs

IpAFASaveAs

Syntax **IpAFASaveAs *(fName)***

Description This function saves current settings under a new name.

Parameters

fName	**String**	Full path name of AFA file

Return Value 0 if successful, a negative error code if failed.

See Also IpAFASave

IpAFASetEx

Syntax **IpAFASetEx** ***(sAttribute, sParam, lpData)***

Description This function sets attribute values for AFA

Parameters

SAttribute	**Integer**	AFA attribute to set, from the following: AFA_SAMPLECOORD - XYZ coordinates of a sample position.
SParam	**Integer**	For AFA_SAMPLECOORD, the index of the sample position to modify. For AFA_TINT, sets the tint used to represent the channel specified. Modifying the tint will update the underlying dye file for that channel.
LpData	**Single**	An array of 3 singles for the XYZ coordinates (in that order).

Return Value 0 if successful, a negative error code if failed.

Comments This is the base form for setting values in AFA – the calls to IpAFASetInt, IpAFASetSingle, and IPAFASetStr all resolve to this call eventually.

sAttribute	shData	sParam
AFA_TILEOFFSET	POINTAPI of specificed offset	0 = X 1 = Y
AFA_TILESIZE	Size of tile (array of 2 hsort/interger) for mosaic	N/A

See Also IpAFASetInt, IpAFASetSingle, IpAFASetStr

IpAFASetInt

Syntax **IpAFASetInt** ***(sAttribute, sParam, lpData)***

Description This function sets AFA attributes taking an integer value to a new value.

Parameters

sAttribute	**Integer**	Attribute to modify. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table.
shData	**Integer**	New value for the attribute.

Return Value 0 if successful, a negative error code if failed.

Comments This function is used for all attributes taking integer values. For several attributes taking a dimension identifier in sParam, the following constants are used:

AFA_CHAN – Channel
AFA_Z – Z Position
AFA_SCAN – X/Y Scan position
AFA_SAMPLE – Sampling position (well, slide, or user-defined position)
AFA_TIMEPOINT – Time point.

sAttribute	shData	sParam
AFA_ACQUISITION_TONE	Indicates if program should beep at the end of each acquisiton	N/A
AFA_ARCHIVE_SET	Archives the set and all set images to the Image Database	N/A
AFA_AUTOEXPOSE	Stage of autoexposure	N/A
AFA_BACKGROUNDSET	Set number associated with background	N/A
AFA_BOTTOM_UP	Acquire set from the bottom of the stack upwards	N/A

sAttribute	shData	sParam
AFA_CAPTCHANNEL	Set channel active or inactive for this capture	Channel index
AFA_CAPTUREORDER	Enum describing capture order: AFA_ORDER_FOCUSFIRST – Iterate through focus, then change channels; useful only if manual filter changers are available for highest Z accuracy. AFA_ORDER_CHANNELFIRST – Iterate through channels, then change focus; ensures focal registration between channels.	N/A
AFA_CAPTURESUBSET	State of All/Selected channels. AFA_CAPT_ALL – Capture all defined channels. AFA_CAPT_SELECTED – Capture selected channels. See AFA_CAPTCHANNEL to set/get this state.	N/A
AFA_CAPTURETO	Destination type AFA_DEST_MEM – Keeps sets in memory. AFA_DEST_DISK – Writes directly to disk.	N/A
AFA_COMPOSITEMATCH	Does composite doc match?	N/A
AFA_COMPOSITEUPDATE	N/A The AFA settings for color composite are updated from the specified color composite document.	The document ID of the color composite document.
AFA_COPY_TO_ CLIPBOARD	Copies the experiment information to the clipboard, where it can be pasted into any text or document editor.	N/A

sAttribute	**shData**	**sParam**
AFA_CHAN_NAME	Select the dye for the channel, which sets the channel name (AFA_CHAN_NAME), tint (the new AFA_TINT command), emissions wavelength (AFA_WAVELENGTH), and excitation wavelength (the new AFA_EXWAVELENGTH command).	N/A
AFA_CHANGEPHASE	Change current time phase, return change state	N/A
	Defines for AFA_CHANGEPHASE, only valid during acquisition. Phase numbers of 0 to (AFA_NUMTIMEPHASES-1) will move directly to that portion of the time lapse acquisition. AFA_SET_PHASENEXT -1 // Go to next phase AFA_SET_PHASEPREV -2 // Go to previous phase	
AFA_DELCHANNEL	Delete channel by number	Channel index
AFA_DELTIMEPHASE	Delete time phase specified by sParam (write only)	N/A
AFA_DELSAMPLE	N/A The specified sampling position is deleted from the list of sampling positions.	Sampling position index
AFA_DIVISION	Division of channel	Channel index or time phase
AFA_EDOFSTYPE	Type of software focus	N/A
AFA_GENCOMPOSITE	State of color composite enabling	N/A
AFA_GENCOMPOSITE_ACQ	Generate composite while acquiring	Set to 0
AFA_FOCUS	State of multiple focus (Z position) acquisition	N/A

sAttribute	**shData**	**sParam**
AFA_FOCUSCHANNEL	This command sets the channel used as the Focus Channel. The focus offset for the Focus Channel is also set to 0.0	N/A
AFA_HUE	Hue of specific channel. AFA_HUE is obsolete, and is supported for **IpAFASetInt** only for backward compatibility. The channel characteristics are set by selection of a dye (see the new command AFA_DYE) and the RGB tint of the dye can be adjusted by the new command AFA_TINT. Setting the channel's tint by either AFA_HUE or AFA_TINT modifies the dye file for the channel. When used with AFA 4.5 settings that do not refer to an existing dye file, a dye file will be created automatically	Channel index
AFA_INTEGRATION	Integration of channel	Channel index or time phase
AFA_ISMODIFIED	State of document modification	N/A
AFA_LAST_IMAGE_SET	Get the set manager ID of the set most recently acquired using IpAFASnap or the Acquire button on the AFA user interface. Bested us immediately after an acquisition.	N/A
AFA_MARKSAMPLE	If –1, add a user-defined sample to the set of stage positions. If 0 to n-1, stage position is updated to the current stage location.	N/A
AFA_MCHAN	State of multiple channel acquisition	N/A
AFA_MINTIME	State of minimum time lapse	N/A
AFA_MOVEMENT	Move microscope components	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_NUMALLTIMEPOINTS	Number of time points for all phases (read-only)	**N/A**

sAttribute	**shData**	**sParam**
AFA_NUMTIMEPOINTS	Number of time points	N/A
AFA_NUMTIMEPHASES	Number of time phases	**Time phase**
AFA_NUMFOCUS	Number of focal planes	**N/A**
AFA_PREVIEW	Start/stop preview	**N/A**
AFA_PREVIEWHOLD	Hold the dimension specified by sParam steady when viewing all in Preview	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_PREVIEWSET	Set the preview position for the dimension specified by sParam	AFA_CHAN, AFA_Z, AFA_SCAN, AFA_SAMPLE, AFA_TIMEPOINT
AFA_RECORDLAYOUT	(write only) 1 = record layout from current set 0 = clear layout parameters	Not used, set to 0
AFA_RESTART_AFTER_PAUSE	Set the current experiment's default resume option, which should be one of the following: AFA_RESTART_IMMEDIATELY = start the next acquisition immediately AFA_RESTART_ON SCHEDULE = start the next acquisition at the next regularly scheduled time point	
AFA_REFOCUS	State of refocus during acquisition. Equivalent to the state of the Focus while acquiring checkbox on the Focus tab of the AFA interface.	N/A

sAttribute	shData	sParam
AFA_REFOCUSFREQ	Frequency of refocusing AFA_REFOC_FRAME = Refocus every time the XY location changes AFA_REFOC_SCAN = Refocus before each scan, that is once per sample. AFA_REFOC_CHANNEL = Refocus every time the channel changes. AFA_REFOC-EACHTIME = Refocus on the first sample of each timepoint.	N/A
AFA_REFOCUSTYPE	Type of refocus during acquisition AFA_FOCUS_MANUAL = User will be prompted to manually refocus stage AFA_FOCUS_SOFTWARE = Software evaluation of focus will be performed AFA_FOCUS_HARDWARE = Requires hardware autofocus capability.	N/A
AFA_RETAIN	Type of image retained from focus AFA_RETAIN_STACK = Keep all planes of focus AFA_RETAIN_BESTFOCUS = Keep only the best focused image from the Z planes AFA_RETAIN_COMPOSITE = Create a composite image using the EDOF functions with every pixel individually focused. AFA_RETAIN_SINGLE = Keep a single plane at the focus point. See AFA_EDOFSTYPE to specify how the focus is determined.	N/A

sAttribute	**shData**	**sParam**
AFA_SAMPLESORT	N/A The user-defined sampling positions will be sorted for minimum travel during capture.	N/A
AFA_SCANAREA	State of scanned acquisition	N/A
AFA_SEND_TO_EXCEL	Sends the experiment information to an Excel spreadsheeet	N/A
AFA_SEND_TO_OUTPUT	Copies the experiment information to the Output Window	N/A
AFA_SETCOMPOSITE	Set number to composite	N/A
AFA_SETMATCH	Does set number match AFA set?	Set ID to compare
AFA_STAGE	State of multiple position acquisition	N/A
AFA_STAGETYPE	Type of stage movement AFA_STAGE_WELLS – Stage-Pro sample pattern of wells or slides AFA_STAGE_RANDOM – User defined positions.	N/A
AFA_SINGLEOBJECTIVE	Sets whether all channels should use the same objective information. When the single objective option is set to TRUE (any non-zero value), the lens information (AFA_NA, AFA_REFINDEX and AFA_LENS) will be set for all existing channels. Setting the single objective option to TRUE makes it unnecessary to specify the objective when adding new channels.	N/A

<table>
<tr><th>sAttribute</th><th>shData</th><th>sParam</th></tr>
<tr><td>AFA_TILEBLEND</td><td>Tiling blend method for scans</td><td>N/A</td></tr>
<tr><td>AFA_TILEDIRPOS</td><td>Stage movement positive</td><td>0 = X
1 = Y</td></tr>
<tr><td>AFA_TILEIMAGES</td><td>State of tiled acquisition</td><td>N/A</td></tr>
<tr><td>AFA_TILETYPE</td><td>Tiling method for scans</td><td>N/A</td></tr>
<tr><td>AFA_TIME</td><td>State of multiple time acquisition</td><td>N/A</td></tr>
<tr><td>AFA_TIMEPREVIEW</td><td>State of preview during time lapse</td><td>N/A</td></tr>
<tr><td>AFA_TIMEPHASE</td><td>Current time phase</td><td>N/A</td></tr>
<tr><td>AFA_USESHUTTER</td><td>Sets shutter behavior</td><td>Must be one of the following:</td></tr>
<tr><td colspan="3">AFA_SHUTTER_NONE 0 // Don’t control the shutter at all
AFA_SHUTTER_ALL 1 // Close for any transition
AFA_SHUTTER_CHANNELS 2 // Leave open until all channels acquired
AFA_SHUTTER_ZSTACK 3 // Leave open for entire Z stack
AFA_SHUTTER_STAGE 4 // Open for entire stage position
AFA_SHUTTER_TIMEPOINT 5 // Open for entire time point
AFA_SHUTTER_EXPERIMENT 6 // Open and close once for the experiment</td></tr>
<tr><td>AFA_WRITEREVIEW</td><td>N/A
The Review of the current capture settings will be sent to the Output Window.</td><td>N/A</td></tr>
</table>

See Also IpAFASetEx, IpAFAGetInt, IpAFASetStr

IpAFASetSingle

Syntax **IpAFASetSingle** *(sAttribute, sParam, fData)*

Description This function sets AFA attributes taking a floating-point value to a new value.

Parameters

sAttribute	**Integer**	The attribute to modify. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table. (The sParam is 0-based.)
fData	**Float**	New value for the attribute.

Return Value 0 if successful, a negative error code if failed.

Comments This function is used for all attributes taking floating-point values.

sAttribute	**fData**	**sParam**
AFA_EXPOSURE	Exposure time of channel	Channel
AFA_NA	Numeric aperture (NA) of specific channel. Modifies the lens file for the objective specified for the channel. When used with AFA 4.5 settings that do not refer to an existing lens file, a lens file will be created automatically if the objective is known (see AFA_OBJECTIVE).	Channel
AFA_LAPSETIME	Seconds time lapse	N/A
AFA_HOLDTIME	Seconds time refocus hold	N/A
AFA_DELTAZ	Microns distance between planes	N/A
AFA_EXWAVELENGTH	Sets the excitation wavelength for the channel specified by the sParam parameter. Setting the excitation wavelength by using AFA_WAVELENGTH with IpAFASetSingle modifies the dye file for the channel	Channel

sAttribute	fData	sParam
AFA_FOCUSOFFSET	Sets the focus offset for the channel specified by the sParam parameter. The focus offset for a channel is applied to the Z focus position determined for the focus channel when determining the Z focus position for the channel of interest. The focus offset for the current focus channel should not be set – trying to do so will return an IPCERR_INVARG error code	Channel
AFA_REFINDEX	Refractive Index (RI) of immersion of specific channel. Modifies the lens file for the objective specified for the channel. When used with AFA 4.5 settings that do not refer to an existing lens file, a lens file will be created automatically if the objective is known (see AFA_OBJECTIVE).	Channel
AFA_PREVIEWTIME	Seconds time preview hold	N/A
AFA_TILEANGLE	Angle of tiling in radians	Double
AFA_TILESTAGESCALE	Stage movement	Calibrated pixel distance
AFA_WAVELENGTH	Modifies the dye file for the channel. When used with AFA 4.5 settings that do not refer to an existing dye file, a dye file will be created automatically.	Channel
AFA_Z_SCAN_NOMINAL	Z nominal position for a scan location	scan location
AFA_Z_STG_NOMINAL	Z nominal position for a stage location	stage location

Example

```
' Set stage position 4 to the current focus position.
' Start by getting the absolute (not relative) stage
' position in X, Y, Z:
Dim posArr(0 to 2) As Single
ret = IpStageGetAbsPosition(posArr(0))

' Set the 4th position to this Z value:
ret = IpAFASetSingle(AFA_Z_STG_NOMINAL, 3, posArr(2))
```

See Also IpAFASetEx, IpAFASetInt, IpAFASetStr

IpAFASetStr

Syntax **IpAFASetStr** *(sAttribute, sParam,Value)*

Description This function sets string values for AFA in IpBasic

Parameters

sAttribute	**Integer**	The attribute to modify. See Comments.
sParam	**Integer**	Optional parameter, usually not used (set to zero), or may specify the index of the channel of interest or other required parameter. See the sParam column in the Comments table.
sValue	**String**	New value for the attribute

Return Value 0 if successful, a negative error code if failed.

Comments This function is used for all attributes taking string values.

sAttribute	**sValue**	**sParam**
AFA_CAPTUREFILE	Capture file of specific channel	Channel index
AFA_CAPTUREPATH	Get path of Capture file	Channel index
AFA_CHAN_NAME	Name of specific channel	Channel index
AFA_DEFDIRNAME	Directory for saving .AFA files	N/A
AFA_DELCHANNELSTR	Delete channel by name	N/A
AFA_DESTDIR	Name of captured file destination directory	N/A
AFA_DESTEXT	Extension/file type for captured files: `.jpg, .tif`, etc.	N/A
AFA_DRIVERNAME	Name of capture driver/camera	N/A

sAttribute	**sValue**	**sParam**
AFA_DYE	This command replaces AFA_CHAN_NAME and is used in a similar fashion. In addition to specifying the name for the channel specified by sParam, the AFA_DYE command also sets the channel tint (AFA_TINT), emissions wavelength (AFA_WAVELENGTH), and excitation wavelength (AFA_EXWAVELENGTH) from the characteristics of the specified dye	Channel
AFA_DESCRIPTION	A description of the AFA experiment and image set.	N/A
AFA_EXP_TITLE	The title of the experiement and the image set that goes with it. Also used as the default Set_Filename.	N/A
AFA_EXPERIMENTER	The experimenter or technician.	N/A
AFA_FILENAME	Name of settings	N/A
AFA_OBJECTIVE	Sets the objective. If sParam is -1 or the AFA_SINGLEOBJECTIVE option is set, the information for all channels will be updated – otherwise sParam should specify the channel to update. Setting the objective for one or more channels updates the numeric aperture (AFA_NA) and refractive index (AFA_REFINDEX) in addition to the objective name.	Channel to update
AFA_SAVE_AS_TEXT	Saves the experiment information to the text file specified by the Value parameter	N/A
AFA_SAMPLEPATTERN	Name of the Stage-Pro sample pattern (wells or slides)	N/A
AFA_SCANPATTERN	Name of the Stage-Pro scan pattern (well) pattern	N/A
AFA_SCOPEFILE	Scope-Pro settings file of specific channel	Channel index
AFA_SETFILENAME	Target IPS file for saves during acquisition	N/A
AFA_TIMEPHASEDESCR	Phase number starting from 0	N/A

See Also IpAFASetEx, IpAFASetInt, IpAFASetSingle

IpAFAShow

Syntax	**IpAFAShow** *(Show)*		
Description	This function shows dialog or dialog tab		
Parameters	*Show*	**Integer**	AFA_HIDE – Hide AFA dialog AFA_SHOW – Shows with last tab used The remaining constants can be used to display the specified tab of the AFA dialog: AFA_TAB_EXPERIMENT –Experiment tab AFA_TAB_CHANNEL – Channel tab AFA_TAB_FOCUS – Focus tab AFA_TAB_STAGE – Stage tab AFA_TAB_TIMELAPSE – Time lapse tab AFA_TAB_PREVIEW – Preview tab AFA_TAB_MINIMAL – Minimal dialog
Return Value	0 if successful, a negative error code if failed.		
Comments	Some of tabs may only be shown if the corresponding dimension is selected on the Acquisition tab.		

IpAFASnap

Syntax	**IpAFASnap** *(nType)*		
Description	This function snaps one or more images from the current AFA set.		
Parameters	*nType*	**Integer**	AFA_ACQ_SNAP – Acquire with current settings AFA_ACQ_AUTOEXPOSE – Acquire at current position with exposure adjustments AFA_ACQ_BACKGROUND – Acquire all channels at current X, Y, Z positions for use as background images. AFA_ACQ_TILE – Synonym for AFA_ACQ_BACKGROUND
Return Value	0 if successful, a negative error code if failed.		

IpAffine

Syntax **IpAffine** *(Rotate, Scale, XShift, YShift)*

Description Use this function to Rotate, scale, and shift an image using rigid affine transformations. Images are bilinearly resampled for the new output, which is an image of the same size as the original

Parameters

fRotate	**Integer**	Radians rotation. Positive numbers rotate counter-clockwise. Rotation by pi is 180 degrees
fScale	**Integer**	Scaling factor for the new image
XShift	**Integer**	Horizontal shift for the center of the rotated/scaled image in pixels
YShift	**Integer**	Vertical shift for the center of the rotated/scaled image in pixels

Return Value ID of the new image if successful, an error message if failed

Example

```
Sub AffineTransform()

      Dim fRotate As Single

      Dim fScale As Single

      Dim xShift As Integer, yShift As Integer

      ret = IpStGetFloat("Enter the rotation angle (CCW in
radians)", fRotate, 0.0, -10.0, 10.0, 0.1)

      ret = IpStGetFloat("Enter the scaling factor", fScale,
1.0, 0.01, 100.0, 0.01)

      ret = IpStGetInt("Enter the X shift for the image
center", xShift, 0, -1000, 1000)

      ret = IpStGetInt("Enter the Y shift for the image
center", yShift, 0, -1000, 1000)

      ret = IpAffine(fRotate, fScale, xShift, yShift)

End Sub
```

IpAlignAdd

Syntax	**IpAlignAdd *(****docId, Frame)*		
Description	This function adds a new image or workspace to list of images to align		
Parameters	*docID*	**Short**	ID of the workspace to add to the document list
	Frame	**Short**	Workspace frame to be added, -1 to all all frames/workspaces/images
Return Value	0 if successful, -1 if failed, IPCERR_INVARG if document is not present.		

IpAlignApply

Syntax	**IpAlignApply***()*
Description	This function applies the alignment using the currently specified options, and the values either calculated or supplied by macro calls to `IpAlignSetEx( ).`
Return Value	The doc ID of the new workspace if successful, -1 if failed, IPCERR_EMPTY if there are no images specified.

IpAlignCalculate

Syntax	**IpAlignCalculate*()***
Description	This function calculates the alignment using the currently specified options.
Return Value	0 if successful, -1 if failed, IPCERR_EMPTY if there are no images specified.

IpAlignFindPattern

Syntax	**IpAlignFindPattern** *(TargetImageVri, TargetFrame, TargetRect, DoRotate, DoScale, DotTranslate, Phase, OutParam, NumExpectedObjects)*		
Description	Use this function to find the pattern on the target image and return the coordinates of the found objects.		
Parameters	*TargetImageVRI*	**Integer**	VRI of the target image
	TargetFrame	**Integer**	Frame number of the target image
	TargetRect	**RECT**	Rectangle within which the search will be performed
	DoRotate	**Integer**	Turns rotation on or off during pattern-finding: 0 = rotation off 1 = rotation on
	DoScale	**Integer**	Turns scaling on or off during pattern-finding: 0 = scaling off 1 = scaling on
	DoTranslate	**Integer**	Turns translation on or off during pattern-finding: 0 = translation off 1 = translation on

Phase	**Integer**	Defines the type of cross-correlation used during pattern finding: 0 = full correlation 1 = phase correlation only
NumExpectedObjects	**Long**	Indicates the number of expected objects
OutParam	**Any**	Array of doubles that receives values. The array has to be big enough to accommodate values for all found objects. `Total array size must be not less than ALGN_PM_OUT_SIZE*` **sNumExpectedObjects.** The array has the following structure per object:

OutParam	**DESCRIPTION**
ALGN_PM_OUT_X	X pixel coordinate position on the target image
ALGN_PM_OUT_Y	Y pixel coordinate position on the target image
ALGN_PM_OUT_ANGLE	Angle in radians (valid only for the first object)
ALGN_PM_OUT_SCALE	Scale (valid only for the first object)
ALGN_PM_OUT_RANK	Rank value showing the degree of cross-correlation

Example

```
Dim aoirect1 As RECT,actFrame As Long, NFoundPoints As Long,
Dim i As Long
'get AOI bounds
ret = IpAoiGet(GETBOUNDS, 0, aoirect1)
If ret<0 Then
    'no AOI, use whole image
    Dim dInfo1 As IPDOCINFO
    ret = IpDocGet(GETDOCINFO, DOCSEL_ACTIVE, dInfo1)
    aoirect1=dInfo1.Extent
End If

'get active frame
               ret=IpSeqGet(SEQ_ACTIVEFRAME,actFrame)
Dim hVri1%
ret = IpDocGet(GETDOCVRI, DOCSEL_ACTIVE, hVri1)

Dim MaxNumberOfObjects as long
‘we expect 10 objects
MaxNumberOfObjects = 10
Dim OutParam() As Double
'allocate enough memory for all expected objects
ReDim OutParam(ALGN_PM_OUT_SIZE*MaxNumberOfObjects) As Double

ret = IpTagShow(1)
ret = IpTagAttr(TAG_VIEW_POINTS, 1)
'delete old tags
      ret = IpTagDelete(-1)
```

Example

```
Dim NumFoundObjects As Long
NumFoundObjects=0
'find pattern using translation only and Full correlation
NFoundPoints=IpAlignFindPattern(hVri1, actFrame, aoirect1, _
0, 0, 1, 0, OutParam(0),MaxNumberOfObjects)

Dim AcceptanceThreshold as double
‘set acceptance threshold to ignore false objects
AcceptanceThreshold=0.5
Debug.Print "Number of found points = " & NFoundPoints
For i=0 To NFoundPoints-1
    'check rank with acceptance threshold
    If OutParam(4 + ALGN_PM_OUT_SIZE*i)>= _
AcceptanceThreshold Then
        'print data
        Debug.Print "Point Index = " & i
        Debug.Print "Position X=" & _
OutParam(ALGN_PM_OUT_X + ALGN_PM_OUT_SIZE*i)
        Debug.Print "Position Y=" & _
OutParam(ALGN_PM_OUT_Y + ALGN_PM_OUT_SIZE*i)
        ‘angle and scale values are valid only
        ‘for the first object
        If i=0 Then
            Debug.Print "Angle  =" & _
OutParam(ALGN_PM_OUT_ANGLE + ALGN_PM_OUT_SIZE*i)*180/3.1415
            Debug.Print "Scale  =" & _
OutParam(ALGN_PM_OUT_SCALE + ALGN_PM_OUT_SIZE*i)
        End If
        Debug.Print "Rank             =" & _
OutParam(ALGN_PM_OUT_RANK + ALGN_PM_OUT_SIZE*i)
```

```
'mark the position with a tag
        ret = IpTagPt(OutParam(ALGN_PM_OUT_X + _
 ALGN_PM_OUT_SIZE*i), _
OutParam(ALGN_PM_OUT_Y + _
ALGN_PM_OUT_SIZE*i), 0)
    End If
Next i
```

Return Value Number of found objects if successful, an error code if failed.

IpAlignGet

Syntax **IpAlignGet***(sAttribute, sParam, lpData)*

Description This function gets data about the images to be aligned.

Parameters

sAttribute	**Short**	Attribute to get, see list and comments below
sParam	**Short**	Number of items for the list to get, see list and comments below
lpData	**LPVOID**	Pointer to appropriate data array or value, see list and comments below

Integer Argument	**Description**
ALGN_ALGORITHM	Get the method for alignment calculations
ALGN_ANGLE_NUM	Get the number of angles – must be a power of two
ALGN_SCALE_NUM	Get the number of scales – must be a power of two
ALGN_OPTIONS	Get Options: scale, rotate, or translate
ALGN_CAL_ORDER	Gets the order of the images as per calibrated positions
ALGN_REF_FRAME	Gets the reference frame in the list
ALGN_ALG_OPTION	Gets the algorithm specific option
ALGN_GETNUMFRAMES	Gets the number of frames in the list
ALGN_GETFRAMELIST	Gets the list of frames
ALGN_TRIMBORDERS	Trim image borders down to fully-overlapping farmes
GETNUMDOC	Gets the number of images in the list
GETDOCLST	Get the list of doc IDs, maximum = sParam
ALGN_UPDATEUI	Determine if the user interface has been updated.
ALGN_INTERATE	Interate, setting the results to be the next input.

Single Point Argument	**Description**
ALGN_X_PERIMAGE	X pixel shift per image (stacks)
ALGN_Y_PERIMAGE	Y pixel shift per image (stacks)
ALGN_X_CAL_ANGLE	Calibrated X angle shift (stacks)
ALGN_Y_CAL_ANGLE	Calibrated Y angle shift (stacks)
These arguments are used to adjust shift and angle. Note that these are valid only after IpAlignCalculate is called or these values are set by a macro call. The second parameter is the index (see ALGN_GETNUMFRAMES)	

IpAlignGet only, for each frame, expressing how it is manipulated compared to the previous frame

Argument	**Description**
ALGN_OFFSET_COUNT	Number of matching offsets (short)
ALGN_ANGLE_COUNT	Number of matching angles (short)
ALGN_SCALE_COUNT	Number of matching scales (short)

Second parameter is the index (see ALGN_GETNUMFRAMES)

Argument	**Description**
ALGN_ALWAYSRECALC	Always recalcuate.
ALGN_ANGLE_VAL	List of single matching angles
ALGN_SCALE_VAL	List of single matching scales
ALGN_OFFSET_RANK	List of single relative match values
ALGN_ANGLE_RANK	List of single relative match values
ALGN_SCALE_RANK	List of single relative match values

List of the best alignment values. Second parameter is the index of the frames, 0 to n-1. DOCSEL_ALL gets/sets the entire list of ALGN_GETNUMFRAMES values

Argument	**Description**
ALGN_BEST_OFFSET	returns a POINT API array for ALGN_GETNUMFRAMES
ALGN_BEST_ANGLE	returns a list of ALGN_GETNUMFRAMES single point matching angles
ALGN_BEST_SCALE	Returns a list of ALGN_GETNUMFRAMES single point matching scales

ALGN_OPTIONS arguements

Argument	**Description**
ALGN_ROTATE	Calculate rotation
ALGN_SCALE	Calculate scaling
ALGN_TRANSLATE	Calculate translation
ALGN_ALWAYSRECALC	Always recalcuate. Use with IpAlignSetInt

ALGN_METHOD arguments. Additional methods can be added here, with ALGN_ALG_OPTION arguments for algorithm specific settings.

Argument	**Description**
ALGN_FFT	FFT correlation
ALGN_USER	User-specified offsets

ALGN_ALG_OPTION calls for ALGN_FFT, specific to that algorithm

Argument	**Description**
ALGN_FFTFULL	Set to full FFT correlation
ALGN_FFTPHASE	Set to FFT phase correlation
ALGN_FFT_NANGLES	Number of angles of rotation (power of 2)
ALGN_FFT_NSCALES	Number of scales (power of 2)
ALGN_FFT_APODIZE	Boolean, prefilter for rotation/scaling may help with some images.

ALGN_ALG_OPTION calls for ALGN_USER, specific to that algorithm. These are based on spatial calibration values	
Argument	**Description**
ALGN_USER_X	X shift per plane (single)
ALGN_USER_Y	Y shift per plane (single)
ALGN_USER_XANGLE	X shift angle (single, degrees)
ALGN_USER_YANGLE	Y shift angle (single, degrees)
ALGN_USER_XDIST	X shift distance (single, degrees)
ALGN_USER_YDIST	Y shift distance (single, degrees)
ALGN_USER_ZDIST	Z shift distance (single, degrees)

IpAlignOpen

Syntax	**IpAlignOpen***(FileName)*		
Description	This function loads the current offset values.		
Parameters	*FileName*	**LSPTR**	Load offset values. Fails if the number of offsets does not match the current number of selected frames/images, or if the tile layouts are different.
Return Value	0 if successful, -1 if failed, IPCERR_EMPTY if there are no values to load.		

IpAlignRemove

Syntax	**IpAlignRemove***(docID, Frame)*		
Description	This function removes the specified workspace/image/frame from the alignment list.		
Parameters	*docID*	**Short**	ID of the workspace to remove from the document list. DOCSEL_ALL to clear the list.
	Frame	**Short**	Workspace frame to be removed, -1 remove all frames/workspaces/images
Return Value	0 if successful, -1 if failed		

IpAlignSave

Syntax	**IpAlignSave***(FileName)*		
Description	This function saves the current offset values.		
Parameters	*FileName*	**LSPTR**	Save offset values. Fails if the number of offsets does not match the current number of selected frames/images, or if the tile layouts are different.
Return Value	0 if successful, -1 if failed, IPCERR_EMPTY if there are no values to save		

IpAlignSetEx

Syntax	**IpAlignSetEx** *(sAttribute, sParam, lpData***)**		
Description	This function sets the alignment attributes.		
Parameters	*sAttribute*	**Short**	Attribute to set, see list and comments in IpAlignGet
	sParam	**Short**	Number of items for the list to set, see list and comments in IpAlignGet
	lpData	**LPVOID**	Pointer to appropriate data array or value, see list and comments in IpAlignGet
Return Value	0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.		
See Also	IpAlignSetInt, IpAlignSetSingle		

IpAlignSetInt

Syntax	**IpAlignSetInt (***sAttribute, sParam, sData)*		
Description	This function sets the alignment attributes		
Parameters	*sAttribute*	**Short**	Attribute to set, see list and comments in **IpAlignGet**
	sParam	**Short**	Number of items for the list to set, see list and comments in **IpAlignGet**
	sData	**Short**	Pointer to appropriate data array or value, see list and comments in **IpAlignGet**
Return Value	0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.		

IpAlignSetSearchPattern

Syntax **IpAlignSetSearchPattern** *(RefImageVri, RefFrame, RefRect)*

Description This function sets the search pattern

Parameters

RefImageVri	**Integer**	VRI of the source image
RefFrame	**Integer**	Frame number of the source image
RefRect	**Long**	Rectange defining the search area on the source image

Return Value 0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.

Example

```
Dim aoirect1 As RECT,actFrame As Long
'get AOI bounds
ret = IpAoiGet(GETBOUNDS, 0, aoirect1)
If ret<0 Then
    'no AOI, use whole image
    Dim dInfo1 As IPDOCINFO
    ret = IpDocGet(GETDOCINFO, DOCSEL_ACTIVE, dInfo1)
    aoirect1=dInfo1.Extent
End If

'get active frame
ret=IpSeqGet(SEQ_ACTIVEFRAME,actFrame)

Dim hVri1%
ret = IpDocGet(GETDOCVRI, DOCSEL_ACTIVE, hVri1)
'set search pattern
ret=IpAlignSetSearchPattern(hVri1, actFrame, aoirect1)
```

IpAlignSetSingle

Syntax **IpAlignSetSingle** *(sAttribute, sParam, fData)*

Description This function sets the alignment attributes

Parameters

sAttribute	**Short**	Attribute to set, see list and comments in IpAlignGet
sParam	**Short**	Number of items for the list to set, see list and comments in IpAlignGet
fData	**Single**	Pointer to appropriate data array or value, see list and comments in IpAlignGet

Return Value 0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.

IpAlignShow

Syntax **IpAlignShow***(nDialgo, bShow)*

Description This function shows or hides the alignment dialog.

Parameters

nDialog	**Short**	Use one of the following to indicate which dialog to hide or show: ALGN_IMAGETAB ALGN_OPTIONTAB ALGN_PREVIEW
bShow	**Bool**	A value of 0 or 1, indicates whether to show or hide the selected alignment dialog 0 = hide the dialog 1 = show the dialog

Return Value 0 if successful, IPCERR_INVCOMMAND if the dialog cannot be shown

IpAnActivateAll

Syntax	**IpAnActivateAll***()*
Description	This function selects all annotation objects in the current window.
Return Value	Returns an error code if no annotation objects are present.
See Also	IpAnDeleteAll

IpAnActivateDefaultObj

Syntax	**IpAnActivateDefaultObj***(nObjType)*		
Description	Activates the default object of the specified type.		
Parameters	*nObjType*	**Integer**	Type of object created. Must be one of the following: GO_OBJ_LINE GO_OBJ_RECT GO_OBJ_ROUNDRECT GO_OBJ_ELLIPSE GO_OBJ_TEXT GO_OBJ_POLY
Return Value	Returns the object ID of the default object or an error code.		
See Also	IpAnCreateObj, IpAnDeleteObj		
Comments	Default objects are not displayed and used only to keep attributes. New object will be created with attributes, copied from the default object. This macro is not recorded.		

IpAnActivateObjID

Syntax	**IpAnActivateObjID***(nObjID)*		
Description	Activates the specified object.		
Parameters	*nObjID*	**Integer**	The document ID of the object to be activated.
See Also	IpAnCreateObj, IpAnDeleteObj		
Comments	This macro is recorded when the user selects an annotation object.		

IpAnActivateObjXY

Syntax **IpAnActivateObjXY***(X,Y)*

Description Activates the object at location x,y.

Parameters

X,Y	**Integer**	Coordinates of object location

Return Value Returns the object ID of the active object or an error code.

See Also IpAnCreateObj, IpAnDeleteObj,IpAnActivateObjID

Comments This macro is not recorded.

IpAnAddText

Syntax **IpAnAddText***(szText)*

Description Places additional lines of text in the active text object.

Parameters

szText	**String**	Character string of text to be placed in the object.

Example Multiline text is recorded as a series of macros:

```
Sub IpAnAddText_example()

' create a text object consisting of 3 lines

ret = IpAnCreateObj(GO_OBJ_TEXT)
ret = IpAnMove(0, 87, 268)
ret = IpAnText("This is the first line.")
ret = IpAnAddText(Chr$(10))
ret = IpAnAddText("This is the second line.")
ret = IpAnAddText(Chr$(10))
ret = IpAnAddText("This is the third line.")
ret = IpAnMove(5, 252, 328)

End Sub
```

Comments To record and playback multi-line text objects in a text annotation, use IpAnAddText (Chr$ (10)) . This indicates a line feed rather than a carriage return.

See Also IpAnText

IpAnBurn

Syntax **IpAnBurn*()***

Description This function permanently “burns” the drawing object into the image

Example

```
Sub IpAnBurn_example()

  ' draw a filled rectangle and then burn it into the image

  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 122, 248)
  ret = IpAnMove(5, 259, 339)
  ret = IpAnSet(GO_ATTR_PENWIDTH, 4)
  ret = IpAnSet(GO_ATTR_RECTSTYLE, GO_RECTSTYLE_BORDER_FILL)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 255)
  ret = IpAnSet(GO_ATTR_BRUSHCOLOR, 16711680)
  ret = IpAnBurn()

End Sub
```

IpAnCreateObj

Syntax **IpAnCreateObj*(nObjType)***

Description Creates an annotater object of the type *nObject*

Parameters

nObjType	**Integer**	Type of object created. Must be one of the following: GO_OBJ_LINE GO_OBJ_RECT GO_OBJ_ROUNDRECT GO_OBJ_ELLIPSE GO_OBJ_TEXT GO_OBJ_POLY

Return Value Returns the Object ID of the new object or an error code.

Example

```
Sub IpAnCreateObj_example()
  ' a line

  ret = IpAnCreateObj(GO_OBJ_LINE)
  ret = IpAnMove(0, 165, 88)
  ret = IpAnMove(2, 367, 141)

  ' a rectangle

  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 113, 182)
  ret = IpAnMove(5, 229, 271)

  ' a round rectangle

  ret = IpAnCreateObj(GO_OBJ_ROUNDRECT)
  ret = IpAnMove(0, 292, 236)
  ret = IpAnMove(5, 418, 321)

  ' an ellipse

  ret = IpAnCreateObj(GO_OBJ_ELLIPSE)
  ret = IpAnMove(0, 138, 327)
  ret = IpAnMove(5, 248, 437)

  ' a polygon

  ret = IpAnCreateObj(GO_OBJ_POLY)
  ret = IpListPts(Pts(0), "285 359 335 421 370 360 413 422 457
  359")
  ret = IpAnPolyAddPtArray(Pts(0), 5)

  ' a text entry

  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 175, 70)
  ret = IpAnText("Astrocyte boundary layer")
  ret = IpAnMove(5, 330, 90)

  End Sub
```

Comments

The Object ID of the new object may be used as a parameter in `IpAnActivateObj` to select the new object.

See Also

IpAnDeleteObj, IpAnActivateObjID

IpAnDeleteAll

Syntax

IpAnActivateAll()

Description

This function selects all annotation objects in the current window.

Return Value

Returns an error code if no annotation objects are present.

See Also

IpAnDeleteAll

IpAnDeleteObj

Syntax **IpAnDeleteObj*()***

Description Deletes the active object

Example

```
  Sub IpAnDeleteObj_example()

  ' create three rectangles then delete the second one

  Dim obj_id As Long ' variable to hold id of second rectangle

  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 86, 108)
  ret = IpAnMove(5, 189, 188)
  obj_id = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 228, 186)
  ret = IpAnMove(5, 345, 282)
  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 88, 298)
  ret = IpAnMove(5, 207, 389)

  ret = IpAnActivateObjID(obj_id) ' make second rectangle active
  ret = IpAnDeleteObj() ' delete it

  End Sub
```

See Also IpAnCreateObj, IpAnActivateObjID

IpAnGet

Syntax **IpAnGet***(sAttr, nValue)*

Description This function gets the annotation object attributes.

Parameters	*sAttr*	**Integer**	Determines the attribute to get. Must be one of the following: GO_ATTR_PENCOLOR GO_ATTR_BRUSHCOLOR GO_ATTR_TEXTCOLOR for text objects only GO_ATTR_PENWIDTH for text objects only, nValue in range 1-99 GO_ATTR_PENSTYLE see list below for nValue GO_ATTR_RECTSTYLE see list below for nValue GO_ATTR_LINESTART for line and poly objects only GO_ATTR_LINEEND for line and poly objects only (nValue is the same for LINESTART and LINEEND) see list below for nValue GO_ATTR_ZOOM determines if the objects should be zoomed with the image, nValue = 0 or 1 GO_ATTR_CONNECT indicates if poly objects should be closed, nValue = 0 or 1 GO_ATTR_TEXTWORDWRAP for text objects only, nValue = 0 or 1 GO_ATTR_TEXTCENTERED nValue = 0 or 1 GO_ATTR_FONTSIZE for text objects only, nValue = size in points GO_ATTR_FONTBOLD for text objects only, nValue = 0 or 1 GO_ATTR_FONTITALIC for text objects only, nValue = weight (0 - 800) GO_ATTR_FONTUNDERLINE for text objects only, nValue = 0 or 1 The following functions return the point definitions of the active annotation object (for IpAnGet only). These allow the macro writer to access and manipulate an existing annotation object: GO_ATTR_NUMPOINTS, return the number of control points in the object. sAttr: Integer GO_ATTR_POINTS, return the coordinates of the control points for the object. sAttr: POINTAPI. Note: sAttr must be an array large enough to contain the number of points present in the annotation object.

Parameters	*sAttr, con't*	**Integer**	*The following functions list any annotation objects present and obtain their ID's for selection (for IpAnGet only). These allow the macro writer to access and manipulate existing annotation objects, either from the entire set of existing objects or from the set of selected objects:* *GO_OBJ_NUMBER, return number of annotation objects in nValue.* *GO_OBJ_INDEX, return value is the object ID for the (zero-based) object specified by nValue. Returns IPCERR_INVARG if out of range.* *GO_OBJ_TYPE, This command allows you to get information about the currently active annotation object. It returns the type of the current object, using the object creation constants, such as GO_OBJ_LINE.* *GO_SEL_NUMBER, return number of selected (through the GUI) annotation objects in nValue.* *GO_SEL_INDEX, return value is the object ID for the selected object specified by nValue. Returns IPCERR_INVARG if out of range.*
Parameters	*nValue*	**Long**	Pointer to a long variable to receive the attribute's new setting: GO_PENSTYLE_SOLID GO_PENSTYLE_DASH GO_PENSTYLE_DOT GO_PENSTYLE_DASHDOT GO_PENSTYLE_DASHDOTDOT GO_RECTSTYLE_BORDER_NOFILL GO_RECTSTYLE_BORDER_FILL GO_RECTSTYLE_NOBORDER_FILL GO_LINEEND_NOTHING GO_LINEEND_SMALLARROW GO_LINEEND_ SMALLDIAMOND GO_LINEEND_LAREGARROW GO_LINEEND_LARGEDIAMOND GO_LINEEND_CIRCLE GO_LINEEND_SMALLTICKMARK GO_LINEEND_LARGETRICKMARK

Example

```
Sub IpAnGet_example()
  Dim obj_id As Long
  Dim pen_style As Long
  Dim rect_style As Long
  Dim pen_color As Long
  Dim brush_color As Long

  ' create a rectangle and then a second based on the first's
  attributes
  obj_id = IpAnCreateObj(GO_OBJ_RECT) ' create first rectangle
  and store its id
  ret = IpAnMove(0, 229, 77)
  ret = IpAnMove(5, 345, 159)
  ret = IpAnSet(GO_ATTR_PENSTYLE, GO_PENSTYLE_DOT)
  ret = IpAnSet(GO_ATTR_RECTSTYLE, GO_RECTSTYLE_BORDER_FILL)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 255)
        ret = IpAnSet(GO_ATTR_BRUSHCOLOR, 16711680)
```

Example

```
  ' activate first rectangle and get its attributes

  ret = IpAnActivateObjID(obj_id)
  ret = IpAnGet(GO_ATTR_PENSTYLE, pen_style)
  ret = IpAnGet(GO_ATTR_RECTSTYLE, rect_style)
  ret = IpAnGet(GO_ATTR_PENCOLOR, pen_color)
  ret = IpAnGet(GO_ATTR_BRUSHCOLOR, brush_color)

  ' create second rectangle and set its attributes

  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 229, 299)
  ret = IpAnMove(5, 345, 388)
  ret = IpAnSet(GO_ATTR_PENSTYLE, pen_style)
  ret = IpAnSet(GO_ATTR_RECTSTYLE, rect_style)
  ret = IpAnSet(GO_ATTR_PENCOLOR, pen_color)
  ret = IpAnSet(GO_ATTR_BRUSHCOLOR, brush_color)


  End Sub
  Sub get_annotation_object_coordinates()
  Dim numPoints As Integer
  Dim Points() As POINTAPI
  Dim i As Integer

  ret = IpAnGet(GO_ATTR_NUMPOINTS, numPoints)
  ReDim Points(numPoints) As POINTAPI
  ret = IpAnGet(GO_ATTR_POINTS, Points(0))

  For i = 0 To numPoints - 1
      Debug.Print "Point #" & (i + 1) & "; x, y = " & Points(i).x
  & ", " & Points(i).y
  Next i

End Sub
```

Comments

Note for `IpAnGet`: The object with the value that you are trying to get must be active in the image. That is, you can only get the textcolor if there is an active text box on the image.

IpAnGet is not recordable.

IpAnGetFontName

Syntax

IpAnGetFontName*(szFontName)*

Description

This function retrieves the font in the annotation text object.

Parameters

szFontName	**String**	Character string containing the font name

Example

```
Sub IpAnGetFontName_example()

  ' create a text annotation containing the name of
  ' the current font setting

  Dim font_name As String*20

  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 70, 214)
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnMove(5, 146, 241)
  ret = IpAnGetFontName(font_name)
  ret = IpAnText(font_name)


End Sub
```

Comments

The font name specified must be installed on your computer. To get a font name, there must be an active text box in the image.

See Also

IpAnText, IpAnSetFontName

IpAnMove

Syntax

IpAnMove*(nHandle, X, Y)*

Description

Moves the whole active object, or only one sizing handle to a new position.

Parameters

nHandle	**Integer**	If nHandle = 0, the entire object moves. If nHandle = a valid handle number, only that handle moves
X,Y	**Integer**	Indicates new location for handle or object.

Example

```
Sub IpAnMove_example()

  ' lines have 2 handles, one at each end

  ret = IpAnCreateObj(GO_OBJ_LINE)
  ret = IpAnMove(0, 53, 72)
  ' inital handle becomes handle 1 after object is drawn
  ret = IpAnMove(2, 228, 72)

  ' rectangles have 8 handles starting wth handle 1 at the upper left
  corner
  ' and proceeding clockwise

  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 54, 114)
  ret = IpAnMove(5, 174, 185) ' handle 5 is the lower right corner.

  ' roundrectangles have 1 additional handle (9) that adjusts the
  ' radius of the corners

  ret = IpAnCreateObj(GO_OBJ_ROUNDRECT)
  ret = IpAnMove(0, 55, 223)
  ret = IpAnMove(5, 172, 301)

  ' ellipses have 8 handles like rectangles

  ret = IpAnCreateObj(GO_OBJ_ELLIPSE)
  ret = IpAnMove(0, 264, 116)
  ret = IpAnMove(5, 347, 199)

  ' polygons have as many handles as vertices

  ret = IpAnCreateObj(GO_OBJ_POLY)
  ret = IpListPts(Pts(0), "247 233 287 299 322 234 360 302 403 232")
  ret = IpAnPolyAddPtArray(Pts(0), 5)

  ' text objects have 8 handles like rectangles

  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 45, 359)
  ret = IpAnText("Text example")
  ret = IpAnMove(5, 138, 378)

End Sub
```

See Also

IpAnDeleteObj, IpAnActivateObj

IpAnPolyAddPtArray

Syntax

IpAnPolyAddPtArray*(Points, nCount)*

Description

This function adds a point array for an active annotater poly object.

Parameters

Points	**POINTAPI**	The address (name) of the array of point coordinates (BASIC type, POINTAPI) that contains the number of coordinate points in the array.
NCount	**Integer**	A variable indicating the size of the array.

Example

```
Sub IpAnPolyAddPtAtrray_example()
  ret = IpAnCreateObj(GO_OBJ_POLY)
  ret = IpListPts(Pts(0), "67 105 133 204 198 98 274 211 336 98")
  ret = IpMorePts("400 214")
  ret = IpAnPolyAddPtArray(Pts(0), 6)
End Sub
```

Comments

The macro may be applied multiple times to concatenate arrays. This macro is recorded when a user creates a poly object as a set of `IpListPts()` and `IpMorePts()` functions. No more than 2048 points may be recorded. An attempt to record points array with larger number of points will automatically reduce number of points recorded, by recording over every other point.

See Also

IpAnAddPtString

IpAnPolyAddPtString

Syntax

IpAnPolyAddPtString*(Points, nCount)*

Description

This function adds a point string for an active annotater poly object.

Parameters

Points	**String**	String containing the list of points to be added to the polygon.
nCount	**Integer**	A variable indicating the length of the string.

Example

```
Sub IpAnPolyAddPtString_example()
  ret = IpAnCreateObj(GO_OBJ_POLY)
  ret = IpAnPolyAddPtString("67 105 133 204 198 98 274 211 336 98
  400 214")

End Sub
```

Comments

An array is defined as a string similar to the macro IpListPts() and IpMorePts(). The size of string is limited only by the compiler. If number of integer values in the string is not even, a zero value is added. If the string is empty, it is equal to (0,0) point. The macro may be applied multiple times to concatenate arrays.

See Also

IpAnAddPtArray

IpAnSet

Syntax **IpAnSet** *(sAttr, nValue)*

Description This function sets the object attributes.

Parameters

sAttr	**Integer**	Determines the attribute to get. Must be one of the following: GO_ATTR_PENCOLOR GO_ATTR_BRUSHCOLOR GO_ATTR_TEXTCOLOR for text objects only GO_ATTR_PENWIDTH for text objects only, nValue in range 1-99 GO_ATTR_PENSTYLE see list below for nValue GO_ATTR_RECTSTYLE see list below for nValue GO_ATTR_LINESTART for line and poly objects only GO_ATTR_LINEEND for line and poly objects only (nValue is the same for LINESTART and LINEEND) see list below for nValue GO_ATTR_ZOOM determines if the objects should be zoomed with the image, nValue = 0 or 1 GO_ATTR_CONNECT indicates if poly objects should be closed, nValue = 0 or 1 GO_ATTR_TEXTWORDWRAP for text objects only, nValue = 0 or 1 GO_ATTR_TEXTCENTERED nValue = 0 or 1 GO_ATTR_USEASDEFAULT for IpAnSetAttr only, nValue ignored GO_ATTR_FONTSIZE for text objects only, nValue = size in points GO_ATTR_FONTBOLD for text objects only, nValue = 0 or 1 GO_ATTR_FONTITALIC for text objects only, nValue = weight (0 - 800) GO_ATTR_FONTUNDERLINE for text objects only, nValue = 0 or 1
nValue	**Long**	Pointer to a long variable to receive the attribute's new setting: GO_PENSTYLE_SOLID GO_PENSTYLE_DASH GO_PENSTYLE_DOT GO_PENSTYLE_DASHDOT GO_PENSTYLE_DASHDOTDOT GO_RECTSTYLE_BORDER_NOFILL GO_RECTSTYLE_BORDER_FILL GO_RECTSTYLE_NOBORDER_FILL GO_LINEEND_NOTHING GO_LINEEND_SMALLARROW GO_LINEEND_LAREGARROW GO_LINEEND_LARGEDIAMOND GO_LINEEND_ SMALLDIAMOND GO_LINEEND_CIRCLE GO_LINEEND_SMALLTICKMARK GO_LINEEND_LARGETICKMARK

Example

```
Sub IpAnSet_example()

  ' line
  ret = IpAnCreateObj(GO_OBJ_LINE)
  ret = IpAnMove(0, 51, 59)
  ret = IpAnMove(2, 220, 59)
  ret = IpAnSet(GO_ATTR_PENWIDTH, 3)
  ret = IpAnSet(GO_ATTR_LINESTART, GO_LINEEND_SMALLDIAMOND)
  ret = IpAnSet(GO_ATTR_LINEEND, GO_LINEEND_LARGEARROW)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 4194368)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ' rectangle
  ret = IpAnCreateObj(GO_OBJ_RECT)
  ret = IpAnMove(0, 48, 107)
  ret = IpAnMove(5, 211, 208)
  ret = IpAnSet(GO_ATTR_RECTSTYLE, GO_RECTSTYLE_BORDER_FILL)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 16711680)
  ret = IpAnSet(GO_ATTR_BRUSHCOLOR, 255)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ' roundrectangle
  ret = IpAnCreateObj(GO_OBJ_ROUNDRECT)
  ret = IpAnMove(0, 57, 256)
  ret = IpAnMove(5, 209, 338)
  ret = IpAnSet(GO_ATTR_PENSTYLE, GO_PENSTYLE_DOT)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 4194368)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ' ellipse
  ret = IpAnCreateObj(GO_OBJ_ELLIPSE)
  ret = IpAnMove(0, 297, 75)
  ret = IpAnMove(5, 413, 191)
  ret = IpAnSet(GO_ATTR_RECTSTYLE, GO_RECTSTYLE_NOBORDER_FILL)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_BRUSHCOLOR, 12632256)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ' polygon
  ret = IpAnCreateObj(GO_OBJ_POLY)
  ret = IpListPts(Pts(0), "279 250 347 335 332 255 415 315")
  ret = IpAnPolyAddPtArray(Pts(0), 4)
  ret = IpAnSet(GO_ATTR_LINEEND, GO_LINEEND_LARGEARROW)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_PENCOLOR, 4194368)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ' text
  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 51, 382)
  ret = IpAnText("Text attributes")
  ret = IpAnSet(GO_ATTR_FONTSIZE, 24)
  ret = IpAnSet(GO_ATTR_FONTBOLD, 700)
  ret = IpAnSet(GO_ATTR_FONTITALIC, 1)
  ret = IpAnSet(GO_ATTR_FONTUNDERLINE, 1)
  ret = IpAnSetFontName("Times New Roman")
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnSet(GO_ATTR_TEXTCOLOR, 255)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnMove(5, 178, 406)
End Sub
```

IpAnSetFontName

Syntax

IpAnSetFontName*(szFontName)*

Description

This function changes the font in the annotation text object.

Parameters

szFontName	**String**	Character string containing the font name

Example

```
Sub IpAnSetFontName_example()

  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 97, 276)
  ret = IpAnSetFontName("Times New Roman")
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnText("This is Times New Roman")
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnMove(5, 291, 296)

End Sub
```

Comments

The font specified must be installed on your computer. To set a font, there must be an active text box in the image.

See Also

IpAnText, IpAnGetFontName

IpAnShow

Syntax

IpAnShow*(Show)*

Description

This function show or hides the annotation dialog.

Parameters

Show	**Integer**	Shows or hides the annotation dialog: 0 = hide the dialog, anything non-zerio shows it.

IpAnShowAnnot

Syntax

IpAnShowAnnot*(bShow)*

Description

This function show or hides the annotations on all images.

Parameters

bShow	**Integer**	Shows or hides the annotations: 0 = hide the annotations, anything non-zerio shows the annotations if they exist.

Comments

The IpAnShowAnnot function shows or hides image annotations on ALL of the currently open images. The annotations cannot be printed or modified in any way while they are hidden.

IpAnText

Syntax

IpAnText*(szText)*

Description

Places the first line of text in the active annotation text object.

Parameters

szText	**String**	Character string of text to be placed in the object.

Example

```
Sub IpAnText_example

  ret = IpAnCreateObj(GO_OBJ_TEXT)
  ret = IpAnMove(0, 97, 276)
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnSet(GO_ATTR_USEASDEFAULT, 1)
  ret = IpAnText("This is annotated text.")
  ret = IpAnSet(GO_ATTR_TEXTAUTOSIZE, 1)
  ret = IpAnMove(5, 291, 296)

End Sub
```

See Also

IpAnAddText

IpAnotAttr

Syntax **IpAnotAttr***(Attr, Value)*

Description Changes the attributes of line, rectangle, or ellipse objects.

Parameters

Attr	**Integer**	Attribute to be changed. Valid values are: DRAW_FILLCOLOR sets background color DRAW_LINECOLOR sets foreground color DRAW_LINEWIDTH sets width of lines
Value	**Long**	For DRAW_FILLCOLOR and DRAW_LINECOLOR, this value is used to pass the red, green, and blue values of the desired color. To set these values, use the following expression: Red x 65536 + Greeen x 256 + Blue Red, Green, and Blue can have values in the range 0 - 255. For DRAW_LINEWIDTH, the value indicates whether thick or thin lines should be drawn, according to the following: DRAW_THINLINE = thin lines = 1 pixel wide DRAW_THICKLINE = thick lines = 5 pixels wide

See Also IpDraw, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpDrawText, IpAnotLine, IpAnotBox, IpAnotEllipse

Comments This function is no longer recorded. It has been retained for compatibility with previous versions of *Image-Pro.* New macros should use the **IpAn** *Auto-Pro* functions.

IpAnotBox

Syntax **IpAnotBox*(****IpBoxRect, bFilled)*

Description Draws a box in the area indicated

Parameters

IpBoxRect	**RECT**	The name of the variable containing the box coordinates.
bFilled	**Integer**	Indicates if the box is filled or not

Example

```
  ipRect.left = 98
  ipRect.top = 46
  ipRect.right = 205
  ipRect.bottom = 137
  Ret =  IpAnotBox(ipRect, 1)
```

See Also IpAnotAttr, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotEllipse

Comments This function is no longer recorded. It has been retained for compatibility with previous versions of *Image-Pro.* New macros should use the **IpAn** *Auto-Pro* functions.

IpAnotEllipse

Syntax	**IpAnotEllipse***(lpCenter, XRadius, Yradius, bFilled)*		
Description	Draws an ellipse in the area indicated		
Parameters	*lpCenter*	**POINTAPI**	Indicates the center point of the ellipse
	XRadius	**Integer**	Indicates the length of the x-axis radius
	YRadius	**Integer**	Indicates the length of the y-axis radius
	bFilled	**Integer**	A value of 0 or 1 specifying if the ellipse will be filled or not. 0 = not filled 1 = filled
See Also	IpAnotAttr, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine		
Comments	This function is no longer recorded. It has been retained for compatibility with previous versions of *Image-Pro.* New macros should use the **IpAn** *Auto-Pro* functions.		

IpAnotLine

Syntax	**IpAnotLine***(IpPoints, Numpoints, Endtype, Filled)*		
Description	Draws a line throught the points indicated.		
Parameters	*IpPoints*	**LPPOINT**	The name and first element of an array containing the vertices of the line.
	Numpoints	**Integer**	Number of points to be drawn
	Endtype	**Integer**	For single lines, indicates the type of line ending. Must be one of the following
	Value		Description
	DRAW_PLAINLINE		No endpoints.
	DRAW_LARGEARROWRIGHT		A large arrow on the right endpoint.
	DRAW_LARGEARROWLEFT		A large arrow on the left endpoint.
	DRAW_LARGEARROWBOTH		A large arrow on both endpoints.
	DRAW_SMALLARROWRIGHT		A small arrow on the right endpoint.
	DRAW_SMALLARROWLEFT		A small arrow on the left endpoint.
	DRAW_SMALLARROWBOTH		A small arrow on both endpoints.
	DRAW_CIRCLEARROW		A circle on the left endpoint and a large arrow on the right endpoint

DRAW_ARROWCIRCLE		A largearrow on the left endpoint and a circle on the right endpoint
DRAW_DIAMONDBOTH		Diamonds on both endpoints
DRAW_CIRCLEBOTH		Circles on both endpoints
Filled	**Integer**	Indicates if the line is filled or not

Example

```
  ret = IpListPts(Pts(0), “36 151 99 87 130 171 147 111”)
  ret = IpAnotLine (Pts(0), 4, DRAWSMALLARROWRIGHT,0)
```

See Also

IpAnotAttr, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotBox,IpAnotEllipse

Comments

This function is no longer recorded. It has been retained for compatibility with previous versions of *Image-Pro.* New macros should use the **IpAn** *Auto-Pro* functions.

IpAoiChangeName

Syntax

IpAoiChangeName(*oldName, newName*)

Description

This function changes the name of the specified AOI. Equivalent to retyping the name of the selected AOI in the **AOI Manager** dialog box.

Parameters

oldName	**String**	A string specifying the name of the AOI that is to be renamed. Must not exceed 20 characters in length.
newName	**String**	A string specifying the new name to be given to the AOI. Must not exceed 20 characters in length.

Example

```
ret = IpAoiChangeName("Box1", "Quadrant0")
```

This statement will rename the “Box1” AOI to “Quadrant0”.

IpAoiCreateBox

Syntax

IpAoiCreateBox(*ipRect*)

Description

This function creates a rectangular AOI of the size specified by *ipRect*. Equivalent to drawing a rectangular AOI using the Rectangular AOI drawing tool on the Ribbon.

Parameters

ipRect	**RECT**	The name of the variable containing the AOI coordinates. By default this variable is defined as `ipRect`.

Example

The following statements will create a rectangular AOI positioned from 53,111 (upper-left corner) to 102,162 (lower-right corner). The ipRect definitions preceding the IpAoiCreateBox statement specify the AOI's coordinates.

```
   ipRect.left = 53
   ipRect.right = 102
   ipRect.top = 111
   ipRect.bottom = 162
   ret = IpAoiCreateBox(ipRect)
```

See Also

IpAoiCreateEllipse, IpAoiCreateIrregular, IpAoiShow

IpAoiCreateDonut

Syntax

IpAoiCreateDonut (*ipRect*,*Thickness*)

Description

This function creates an elliptical donut AOI bounded by a rectangle of the size specified by *ipRect*.

Parameters

ipRect	**RECT**	The name of the variable containing the AOI coordinates. By default this variable is defined as `ipRect`.
Thickness	**Integer**	The thickness in pixels of the donut AOI.

Example

The following statements will create a donut AOI positioned within the bounding box defined from 53,111 (upper-left corner) to 102,162 (lower-right corner) with a 10-pixel thickness. The ipRect definitions preceding the IpAoiCreateEllipse statement specify the AOI bounding box coordinates.

```
ipRect.left = 53
ipRect.right = 102
ipRect.top = 111
ipRect.bottom = 162
ret = IpAoiCreateDonut (ipRect,10)
```

See Also

IpAoiCreateEllipse, IpAoiCreateIrregular, IpAoiShow

IpAoiCreateEllipse

Syntax

IpAoiCreateEllipse(*ipRect*)

Description

This function creates an elliptical AOI, bound by a rectangle of the size specified by *ipRect*. Equivalent to drawing an elliptical AOI using the Elliptical AOI drawing tool on the Ribbon.

Parameters

ipRect	**RECT**	The name of the variable containing the coordinates of the elliptical AOI's rectangular bounding box. By default this variable is defined as `ipRect`.

Example

```
ipRect.left = 53
ipRect.right = 102
ipRect.top = 111
ipRect.bottom = 162
ret = IpAoiCreateEllipse(ipRect)
```

These statements will create an elliptical AOI positioned within the bounding box defined from 53,111 (upper-left corner) to 102,162 (lower-right corner). The `ipRect` definitions preceding the `IpAoiCreateEllipse` statement specify the AOI bounding box coordinates.

See Also

IpAoiCreateBox, IpAoiCreateIrregular, IpAoiShow

IpAoiCreateIrregular

Syntax

IpAoiCreateIrregular(*ipAoiPoint*, *NumPoints*)

Description

This function creates a freeform AOI of the size and shape specified by *ipAoiPoint* and *NumPoints*. Equivalent to drawing a polygonal AOI using the Freeform AOI drawing tool on the Ribbon.

Parameters

ipAoiPoint	**POINTAPI**	The name and first element of an array containing the coordinate-pairs specifying the position of each vertex in the shape. By default this array is defined as `Pts`.
NumPoints	**Integer**	An integer specifying the total number of coordinate-pairs defined in `Pts`.

Example

```
Sub IpAoiCreateIrregular_example()

  ret = IpListPts(Pts(0), "162 93 112 150 151 212 233 216 263 153 219 119
  210 67 ")
  ret = IpAoiCreateIrregular(Pts(0), 7)

End Sub
```

See Also

IpAoiCreateBox, IpAoiCreateEllipse, IpAoiShow

IpAoiGet

Syntax

IpAoiGet(*Cmd, Param, OutVal*)

Description

Use this function to get information relating to the active AOI. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of AOI information you want to retrieve. Must be one of the following: GETTYPE GETNUMPTS GETBOUNDS GETPOINTS AOIMGR_GET_NUM See definitions under Comments, below
Param	**Integer**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below for the values used by each command
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Return Value

The value returned by `IpAoiGet` depends upon the command that was used. The table below describes the return value produced by each command.

Cmd	**RETURN VALUE**
GETTYPE	None
GETNUMPTS	None
GETBOUNDS	None
GETPOINTS	Number of points stored in *OutVal*. If this value is equal to *Param*, *OutVal* was probably not big enough to hold the entire list of coordinates.
AOIMGR_GET_NUM	None

Example

The following example uses `IpAoiGet` to identify the active AOI's type, and then moves the AOI 100 pixels to the right.

```
Dim aoitype As Integer
Dim numpoints As Integer
Dim aoirect As RECT
Dim i As Integer
ret = IpAoiGet(GETTYPE, 0, aoitype)
If aoitype = AOI_BOX Then
    ret = IpAoiGet(GETBOUNDS, 0, aoirect)
    aoirect.left = aoirect.left + 100
    aoirect.right = aoirect.right + 100
    ret = IpAoiCreateBox(aoirect)
```

```
ElseIf aoitype = AOI_ELLIPSE Then
    ret = IpAoiGet(GETBOUNDS, 0, aoirect)
    aoirect.left = aoirect.left + 100
    aoirect.right = aoirect.right + 100
    ret = IpAoiCreateEllipse(aoirect)
ElseIf aoitype = AOI_POLYGON Then
    ret = IpAoiGet(GETNUMPTS, 0, numpoints)
    Redim aoipts(numpoints) As pointapi
    ret = IpAoiGet(GETPOINTS, numpoints, aoipts(0))
       For i = 0 To numpoints - 1
           aoipts(i).x = aoipts(i).x + 100
       Next i
    ret = IpAoiCreateIrregular(aoipts(0), numpoints)
End If
```

Comments

When passing an array from a BASIC program, pass the first element of the array by reference (see example above).

Cmd options are as follows:

Cmd **VALUE**	**DESCRIPTION**	***Param*** **VALUE**	***OutVal*** **TYPE**
GETTYPE	Use this command to determine the type of AOI that is active. *OutVal* will be set to one of the following: 0 AOI_BOX AOI_ELLIPSE AOI_POLYGON 0 signals that no AOI is currently active.	Not used by GETTYPE. Must be set to 0.	**Integer**
GETNUMPTS	Use this command to determine the number of points in the outline of a freeform AOI. *OutVal* will be set to this value.	Not used by GETNUMPTS. Must be set to 0.	**Integer**
	Note - GETNUMPTS is applicable to freeform AOIs, only (i.e., AOI_POLYGON).		
GETBOUNDS	Use this command to get the coordinates defining the AOI's bounding box. The coordinates will be written to *OutVal.*	Not used by GETBOUNDS. Must be set to 0.	**RECT**

Cmd **VALUE**	**DESCRIPTION**	***Param*** **VALUE**	***OutVal*** **TYPE**
GETPOINTS	Use this command to get the coordinates defining the outline of a freeform AOI. The coordinates will be written to the array specified in *OutVal.* *Note - this command is applicable to freeform AOIs, only (i.e., AOI_POLYGON).*	The maximum number of points that can be written to *OutVal* (i.e., the length of your array). *Note - you can use GETNUMPTS to determine the number of elements needed in this array.*	**POINTAPI** *Note - OutVal must specify an array***.**
AOIMGR_GET_NUM	Use this command to determine the number of AOIs available in the AOI manager.	Not used. Must be set to zero.	**LONG**

See Also IpAoiMove, IpAoiCreate, IpDocOpenAoi

IpAoiGetStr

Syntax **IpAoiGetStr**(*Cmd, Param, OutVal*)

Description Use this command to determine the name of an AOI in the AOI manager.

Parameters

Cmd	**String**	See below
Param	**Integer**	An integer specifying data with which *Cmd* will operate.
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Cmd **VALUE**	**DESCRIPTION**	***Param*** **VALUE**	***OutVal*** **TYPE**
AOIMGR_GET_NAME	Use this command to determine the name of an AOI available in the AOI manager.	The index of the AOI of interest, from 0 to the number of AOIs, -1.	**STRING**

Return Value The name of the available AOI.

IpAoiManager

Syntax

IpAoiManager(*FuncId, Name*)

Description

This function is used to manipulate AOIs in the AOI list. Equivalent to using **the Add, Del, Set, Load** and **Save** buttons in the **AOI Manager** dialog box.

Parameters

FuncId	**Integer**	An enumerated integer specifying the type of AOI management action that is to be performed. Must be one of the following: AOIADD AOIDELETE AOIHIDEDLG AOILOAD AOISAVE AOISET AOISHOWDLG See definitions under Comments, below.
Name	**String**	A string specifying the data upon which *FuncId* is to operate. See definitions under Comments, below, for the values allowed by each option.

Example

```
ipRect.left = 21
ipRect.top = 18
ipRect.right = 85
ipRect.bottom = 50
ret = IpAoiCreateBox(ipRect)
ret = IpAoiManager(AOIADD, "Box1")
```

This set of statements will create the rectangular AOI defined by `ipRect` and add it to the current AOI list as “Box1”.

Comments

When the Name parameter is an empty string, all AOIs are deleted from the list.
FuncId options are as follows:

VALUE	DESCRIPTION	*Name* VALUES
AOIADD	Adds the active AOI to the AOI list, assigning it the name specified by the *Name* parameter. *Note - If the name specified by the Name parameter is one that already exists in the current AOI list, the new AOI definition will replace the existing one.*	The string in *Nam*e must specify the name to be given to the added AOI.
AOIDELETE	Deletes the AOI specified by the *Name* parameter. When the *Name* paramter is an empty string, all AOIs are deleted from the list	The string in *Nam*e must specify the name of the AOI to be deleted or an empty string to delete all AOIs.

VALUE	**DESCRIPTION**	***Name* VALUES**
AOIHIDEDLG	Closes the **AOI Manager** dialog box if it is open.	The *Name* parameter is ignored when AOIHIDEDLG is used. When this is the case, just set *Name* to an empty string (i.e., "").
AOILOAD	Loads an AOI list from the file specified by *Name*.	The string in *Nam*e must specify the name of the file containing the AOI list.
AOISAVE	Saves the current AOI list to the file specified by *Name*.	The string in *Nam*e must specify the name of the file to which you want the AOI list stored.
AOISET	Assigns the AOI specified by *Name* to the active image.	The string in *Nam*e must specify the name of the AOI to be assigned.
AOISHOWDLG	Displays the **AOI Manager** dialog box.	The *Name* parameter is ignored when AOISHOWDLG is used. When this is the case, just set *Name* to an empty string (i.e., "").

See Also IpAoiChangeName

IpAoiMove

Syntax **IpAoiMove**(*deltaX, deltaY*)

Description This function moves the active AOI. Equivalent to dragging the current AOI to a new position with your mouse.

Parameters

deltaX	**Integer**	An integer specifying the distance, in pixels, by which the AOI is to be moved horizontally. Positive values move the AOI to the right; negative values to the left.
deltaY	**Integer**	An integer specifying the distance, in pixels, by which the AOI is to be moved vertically. Positive values move the AOI down; negative values up.

Example

```
ret = IpAoiMove(0, -20)
```

This statement will move the active AOI 20 pixels up from its current position.

IpAoiMultAppend

Syntax **IpAoiMultAppend***(Append)*

Description This function adds the current regular AOI to the current multiple AOI or clears the current multiple AOI.

Parameters

Append	**Integer**	1 = add the current AOI to the multiple AOI 0 = clear/reset the current multiple AOI

Example

```
ipRect.left = 94
ipRect.top = 131
ipRect.right = 200
ipRect.bottom = 189
ret = ApAoiCreateBox(ipRect)
ret = IpAoiMultShow(1)
ret = IpAoiMultAppend(1)
```

Comments IpAoiMultShow must be included in the commands for this macro to work.

See Also IpAoiMultShow

IpAoiMultShow

Syntax **IpAoiMultShow**(M*ode)*

Description This function shows or hides the current multiple AOI.

Parameters

Mode	**Integer**	1 = show the current multiple AOI 0 = hide the current multiple AOI

See Also IpAoiMultAppend

IpAoiShow

Syntax **IpAoiShow**(*FrameType*)

Description This function activates or deactivates the currently defined AOI. Equivalent to clicking any of the AOI tool buttons on the Ribbon.

Parameters *FrameType* **Integer** An enumerated integer specifying the kind of AOI to be activated. Must be one of the following:

FRAME_NONE
FRAME_RECTANGLE
FRAME_ELLIPSE
FRAME_IRREGULAR
FRAME_INVIEW
FRAME_RESET

See definitions under Comments, below.

Comments *FrameType* options are as follows:

VALUE	DESCRIPTION
FRAME_NONE	Deactivates the current AOI. Equivalent to clicking an enabled AOI tool button to deactivate it.
FRAME_RECTANGLE	Activates the currently defined rectangular AOI.
FRAME_ELLIPSE	Activates the currently defined elliptical AOI.
FRAME_RESET	Activates a new AOI.
FRAME_IRREGULAR	Activates the currently defined freeform AOI.
FRAME_INVIEW	Moves the AOI so it can be seen. Useful in Zoom and Pan modes.

See Also IpAoiShow, IpAoiCreateBox, IpAoiCreateEllipse, IpAoiCreateIrregular

IpAoiValidate

Syntax **IpAoiValidate**( )

Description This function refreshes the image's internal AOI description, based on the AOI currently shown on the screen. For performance reasons the internal AOI is not maintained in real-time (i.e., it is not updated every time the user moves, resizes or deactivates an AOI). Instead, it is the responsibility of each AOI-constrained operation to initialize this description (from the screen) when it begins. *Image-Pro* commands perform this function implicitly. Similarly, if you are developing your own AOI-constrained process, your procedure must call `IpAoiValidate` when it begins. This ensures that the region affected by your program is the one most recently defined by your user.

See Also IpAoiCreateBox, IpAoiCreateEllipse, IpAoiCreateIrregular

IpAppArrange

Syntax **IpAppArrange**(*mode*)

Description This function is used to arrange open image windows within the *Image-Pro* application window. Equivalent to the **Tile Images, Cascade Images** or **Arrange Images** commands.

Parameters

mode	**Integer**	An enumerated integer specifying the way in which the open image windows are to be arranged. Must be one of the following: DOCS_CASCADE DOCS_TILE DOCS_OVERLAP See definitions under Comments, below.

Example

```
ret = IpAppArrange(DOCS_OVERLAP)
```

This statement will arrange the windows one on top of the other.

Comments *mode* options are as follows:

VALUE	DESCRIPTION
DOCS_CASCADE	Layers all open image windows one on top of the other, such that all title bars are visible. Equivalent to the **Cascade** command.
DOCS_TILE	Arranges all open image windows in side-by-side (i.e., “tiled”) fashion. Equivalent to the **Tile** command.
DOCS_OVERLAP	Stacks all open image windows one on top of the other. Equivalent to the **Overlap** command.

See Also IpDocMinimize, IpDocMaximize, IpDocMove

IpAppCloseAll

Syntax **IpAppCloseAll**( )

Description This function closes all open image windows. Equivalent to the **Close All** command.

See Also IpAppExit, IpDocClose

IpAppCtl

Syntax **IpAppCtl***(CtlName,ParmCommand, ParmValue)*

Description Gets or sets value of a control in the currrently acctive dialog box.

Parameters

CtlName	**String**	The label, caption, or sting ID of the control.
ParmValue	**Long**	Values for ParmCommand
Command	**Value**	Description
ParmCommand	**Integer**	Commands to invoke. Must be one of the following
APC_GETWND	Variable that will receive the handle of the control.	Gets the window handle of a control.
APC_CLICK	Ignored.	Clicks a button (control).
APC_GETFOCUSID	Return value.	Returns the ID of the control in focus.
APC_SETFOCUSID	ID of control	Sets the ID of the control in focus.
APC_SETCHECK	0 = uncheck 1= check	Checks or unchecks a checkbox or radio button.
APC_GETCHECK	0 = uncheck 1= check	Gets the state of a checkbox or radio button.
APC_SETSCROLL	-1 = up -2 = down -3 = top most -4 = bottom most -5 = page up -6 = page down	Sets the scroll position with relative or absolute values. A positive value sets the scroll positon.
APC_GETSCROLL	Scroll position	Gets the scroll position of the scroll box.
APC_GETCURSEL	0 = topmost Current selection in a list box.	Gets the current selection in a list box or a drop-down combo box.
APC_SETCURSEL	0 = topmost	Sets the current selection in a list box or a drop-down combo box.
APC_SETPOSX	0 = first column	Sets the column position of a grid
APC_SETPOSY	0 = first row	Sets the row of a grid

See Also IpAppWindow, IpAppCtlText

IpAppCtlText

Syntax	**IpAppCtlText***(CtlName,Caption, Mode)*
Description	Gets or sets value of a caption of a control

Parameters

CtlName	**String**	The label, caption, or string ID of the control on the currently active window or dialog.
Caption	**String**	The caption of the control.
Mode	**Integer**	0 = Gets the caption into Caption. 1= Sets the caption of the control to Caption.

Example

```
The first example sets the edit text box following “File Name”
with “Germs.TIF”.
The second example copies the content of control ID 2342 into
the Caption.

  ret = IpAppCtlText(”FileName”, Germs.Tif,1)
  ret = IpAppCtlText( “#2342,Caption, 0)
```

See Also IpAppCtl

IpAppExit

Syntax	**IpAppExit**( )
Description	This function closes *Image-Pro*. Equivalent to the **Exit** command.
See Also	IpAppCloseAll, IpDocClose

IpAppGet

Syntax

IpAppGet(*Cmd, Param, OutVal*)

Description

Multi-purpose query function for application-related information.

Parameters

Cmd	**Integer**	A command ID. See table below for list of commands.
Param	**Integer**	Parameter of the command
OutVal	*See below*	The reference to a variable that will receive the results of the command. The type of this variable depends on the command.

Example

```
'Get the Windows handle for Image-Pro
Dim ipHandle as long
ret = IpAppGet(GETAPPWND, 0, ipHandle)
'Check that Image-Pro is running
if ipHandle = 0 then
   ' Image-Pro is not running.
   ...
end if
'Get the serial number of the copy protection plug:
Dim plugsn as integer
ret = IpAppGet (GETPLUGSN, 0, plugsn)
if ret <> 0 then
   'Plug was found. Check serial number.
   if plugsn = 1234 then
      ...
        end if
end if
...
```

Comments

Each copy of *Image-Pro* has a unique serial number which is printed on the box and programmed into the copy protection plug.

Command	Param	OutVal	Return Value	Description
GETAPPWND	Not used. Must be 0.	Long	None.	Gets the Windows handle to Image-Pro. When called from an external program, this command will return 0 if Image-Pro is not running.
GETPLUGSN	Not used. Must be 0.	Integer	0 if plug is not found. 1 if plug is found.	Gets the serial number of the copy protection plug. Each copy of Image-Pro has a unique serial number.
MACRO_ PAUSE_TYPE	Not used. Must be 0.	Integer	None	MACRO_PAUSE_ TYPE. This command is used to determine how the new IpMacroPause function will behave when the macro uses the MP_ RESPECTSETTING mode. When this mode is specified and the MACRO_PAUSE_ TYPE command is set to any non-zero value, the IpMacroPause function will behave like the MP_WAITFORRESPONSE mode was selected and will wait for the user to make a selection by clicking one of the dialog buttons.
PST_BLEND_P REVIEW	Not used. Must be 0.	Integer	None	Gets a value indicating whether paste preview will be blended (if the value is non-zero) or not.
PST_BLEND_A PPLY	Not used. Must be 0.	Integer	None	Gets a value indicating whether paste will be blended when it is applied to the image (if the value is non-zero) or not.

Command	Param	OutVal	Return Value	Description
PST_BLEND_SOURCE	Not used. Must be 0.	Integer	None	Gets a value indicating the contribution of the pasted data during blending. This is expressed as a percentage, where 100 indicates that the pasted data will be used with no blending, 50 indicates an equal contribution of the pasted data and target image data, and 0 indicates the target image data will not be modified by the paste. Note that the PST_BLEND_PREVIEW and PST_BLEND_APPLY attributes determine whether the blending percentage is used to preview or during paste application, or neither.
PST_APPLY_TYPE	Not used. Must be 0.	Integer	None	Gets a value indicating the type of blending that will apply when pasting, from the following types: PST_APPLY_ALL: All pasted data will be applied according to the current blending. PST_APPLY_LIGHTER:only pixels in the pasted data that are lighter than the destination image will be applied. PST_APPLY_DARKER:Only darker pixels will be applied.

Command	Param	OutVal	Return Value	Description
WINDOW_ TILING_ TYPE	Not used. Must be 0.	Integer	None	Controls whether to modify the standard behavior of the Windows, Tile command and the IpAppArrange(DOCS_TILE…) Auto-Pro function. The tiling type can be set to TILE_NORMAL (the standard Windows tiling behavior) or any combination of the following constants (with one exception noted below):
	TILE_ZOOM_TO_FIT Changes the zoom factor of the images to try to display as much of the image as possible in the tiled workspace. TILE_REORDER Reorders the workspaces by the age of the document, by columns first and then by rows. The oldest document will be in the top-left corner of the Image-Pro workspace, the next oldest under it in the first column, and so on until the first column is full and a new column is added to the right of the first. TILE_SAMESIZE All workspaces will be set to the same size as the smallest workspace. The workspaces may be different sizes after tiling if the images are different sizes, or in some cases when the tiled layout results in some columns having more images than others. TILE_COMPACT Arranges the workspaces so that they are directly next to each other in the columns and rows, such that any unused space in the Image-Pro Plus workspace will be found at the bottom and/or right side. TILE_COMPACT is only VALID when TILE_SAMESIZE is also specified.			

See Also IpDocGet, IpAppGetStr

IpAppGetStr

Syntax **IpAppGetStr**(*Cmd, Param, OutVal*)

Description Use this function to get string data for application-related information.

Parameters

Cmd	**Integer**	A command ID, see below.
Param	**Integer**	Parameter of the command
OutVal	**String**	The address of the string that will receive the results of the command.

Command	**Param**	**OutVal**	**Return Value**	**Description**
GETAPPVERSION	Not used. Must be 0.	Name of a fixed-length string variable.	None.	Returns the application's version number**.**
GETOSVERSION	Not used. Must be 0.	Name of a fixed-length string variable.	None.	Returns the OS name and version number**.**
GETAPPDIR	Not used. Must be 0.	Name of a fixed-length string variable.	None.	Returns the path to the directory where *Image-Pro* is installed
GETAPPSETTINGSDIR	Not used. Must be 0.	Name of a fixed-length string variable.	None.	Returns the full path to the *Image-Pro* settings folder.

Example

```
sub load_image0
  dim appdir as string*255
  ret = IpAppGetStr(GETAPPDIR, 0, appdir)
  ret = IpWsLoad(IpTrim(appdir) + "images\spots.tif",
"TIF")
end sub
```

See Also IpAppGet

IpAppHide

Syntax **IpAppHide**(*bHide*)

Description This function displays or suppresses the display of *Image-Pro* application window controls. Equivalent to toggling between **Show Border** and **Hide Border** views using the F4 key.

Parameters

bHide	**Integer**	A value of 0 or 1 specifying whether the control border is to be displayed or suppressed. Where: 0 - displays the control border 1 - suppress the control border

Example

```
ret = IpAppHide(1)
```

This statement will hide the control border.

IpAppMaximize

Syntax **IpAppMaximize**( )

Description This function maximizes (enlarges to maximum size) the *Image-Pro* application window. Equivalent to clicking the Maximize button on the Control bar.

See Also IpAppMinimize, IpAppRestore, IpAppSize, IpDocMaximize

IpAppMenuSelect

Syntax **IpAppMenuSelect**(*Id1, Id2, ItemName, Mode*)

Description This function is used to invoke a menu item from the main *Image-Pro* command bar. This command is never recorded; it is one that must be manually written into your macro if it is needed. It will work ONLY with the menu where it was created (see the Menu Selection portion of your Reference Guide).

Parameters

Id1	**Integer**	An integer specifying the menu or menu item to be invoked. The values required by *Id1* are determined by *Mode*. See *Mode* definitions below.
Id2	**Integer**	An integer specifying the sub-menu item to be invoked. The values required by *Id2* are determined by *Mode*. See *Mode* definitions below.
ItemName	**String**	A string specifying the menu item name, as it is defined in the IPWIN32.MNU file. This parameter is used when *Mode* is set to MENU_NAME.
Mode	**Integer**	An enumerated integer specifying the method by which the menu item is being specified. Must be one of the following: MENU_ID MENU_NAME MENU_COORD See definitions under Comments, below.

Example The following statements illustrate three ways in which the *Open* menu command could be invoked, assuming its default IPWIN32.MNU definition had not been modified.

```
ret = IpAppMenuSelect(102, 0, "", MENU_ID)
ret = IpAppMenuSelect(0, 0, "&Open...", MENU_NAME)
ret = IpAppMenuSelect(0, 1, "", MENU_COORD)
```

Comments *Mode* options, and their associated *Id1*, *Id2* and *ItemName* values are as follows. Shaded parameters are ones that are ignored when the described *Mode* is used. For the DLG commands to work, the dialog box containing the menu or tab must be active and in focus.

Mode	**DESCRIPTION**	**Id1**	**Id2**	**ItemName**
DLG_MENU_ID	Used to invoke the menu of an active dialog box by its menu ID.	An integer specifying the command's ID number.	*ID2* is ignored. Set it to 0.	*ItemName* is ignored. Set it to an empty string (i.e., "").
DLG_MENU_NAME	Used to invoke a menu or tab of an active dialog box by its name.	*ID1* is ignored. Set it to 0.	*ID2* is ignored. Set it to 0.	A string specifying the command's name.
DLG_MENU_COORD	Used to invoke a menu command or tab of an active dialog box by its position on the menu or tab.	Specifies the menu on which the command is located, where 0 is the first menu or tab, 1 is the second menu or tab and so forth.	Specifies the item number within the menu, where 0 is the first item in the menu, 1 is the second item and so forth.	*ItemName* is ignored. Set it to an empty string (i.e., "").
MENU_ID	Used to invoke a resident command by its IPWIN32.MNU ID number. See **important** note below about the use of MENU_ID.	An integer specifying the command's ID number as defined in IPWIN32.MNU.	*ID2* is ignored. Set it to 0.	*ItemName* is ignored. Set it to an empty string (i.e., "").
MENU_NAME	Used to invoke a menu command by its IPWIN32.MNU name.	*ID1* is ignored. Set it to 0.	*ID2* is ignored. Set it to 0.	A string specifying the command's name, as defined in IPWIN32.MNU.
MENU_COORD	Used to invoke a menu command by its position on the command bar.	Specifies the menu on which the command is located, where 0 is the first menu, 1 is the second menu and so forth.	Specifies the item number within the menu, where 0 is the first item in the menu, 1 is the second item and so forth.	*ItemName* is ignored. Set it to an empty string (i.e., "").

When MENU_ID is used, the *Id1* parameter must reference the *ID* value defined in the command's `progitem` or `progbutton` statement in the IPWIN32.MNU file. The *ID* value is the last value listed in such a statement, as shown below:

```
progitem Ne&w...,Make document.,0,101
progbutton SAVE,Save current document to disk.,783, 105
```

***Important -** the MENU_ID option can only be used to call commands that are resident within the main Image-Pro program, not commands that reside in a Dynamic Link Library (DLL). Therefore, it cannot be used to invoke commands that are defined with `item` or `button` statements in IPWIN32.MNU.*

When MENU_NAME is used, the *ItemName* parameter must contain the name of the command exactly as it is defined by the `progitem` or `item` statement in the IPWIN32.MNU file, including the & symbol and any embedded spaces or punctuation (such as an ellipsis). The name is contained in the *Title* parameter of a IPWIN32.MNU progitem or item statement, as shown in the examples below:

```
progitem Ne&w...,Make document.,0,101
item &Color Transform...,Color Models.,colordlg.dll,56,100
```

Note that the name includes all characters up to, but not including, the comma that separates the name from the following parameter.

See Also IpAppSize, IpDocMove

IpAppMinimize

Syntax **IpAppMinimize**( )

Description This function minimizes (reduces to an icon) the *Image-Pro* application window. Equivalent to clicking the **Minimize** button on the **Control** bar.

See Also IpAppMaximize, IpAppRestore, IpAppSize, IpDocMinimize

IpAppMove

Syntax **IpAppMove**(*X, Y*)

Description This function moves the *Image-Pro* application window to the screen position specified by *x,y*, where *x,y* specifies the new position for the upper-left corner of the window. Equivalent to dragging the *Image-Pro* application window to a new position.

Parameters

X	**Integer**	An integer specifying the x-coordinate of the pixel to which the upper-left corner of the *Image-Pro* window is to be moved.
Y	**Integer**	An integer specifying the y-coordinate of the pixel to which the upper-left corner of the *Image-Pro* window is to be moved.

Example

```
ret = IpAppMove(20,40)
```

This statement will move the *Image-Pro* application window to screen position 20,40.

See Also IpAppSize, IpDocMove

IpAppRestore

Syntax	**IpAppRestore**( )
Description	This function returns the *Image-Pro* application window to its previous screen position and size, from a minimized or maximized state. Equivalent to clicking the Restore button on a maximized window or double-clicking the icon of a minimized window.
See Also	IpAppMaximize, IpAppMinimize

IpAppRun

Syntax **IpAppRun**(*CommandLine, ShowMode, RunMode*)

Description This function executes a DOS or Windows application program. There is no *Image-Pro* command equivalent for this function; it is one that must be manually written to your macro with the macro editor.

Parameters

CommandLine	**String**	A string specifying the program file name (if it is a Windows application) or the PIF file name (if it is a DOS application) and any required arguments.
ShowMode	**Integer**	An enumerated integer specifying the way in which the application's window is to be displayed after the program is loaded. Must be one of the following: RUN_NORMAL RUN_MINIMIZED RUN_MAXIMIZED See definitions under Comments, below.
RunMode	**Integer**	An enumerated integer specifying the way in which control is to be transferred between *Image-Pro* and the application. Must be one of the following: RUN_AUTOCLOSE RUN_MODAL 0 See definitions under Comments, below.

Example

```
ret = IpAppRun("DEMO10.EXE", RUN_NORMAL, RUN_AUTOCLOSE)
```

This statement loads the DEMO10 program and displays its window at its normal size and position. This program will automatically close when *Image-Pro* is closed.

Comments Allowable *ShowMode* options are as follows:

ShowMode	DESCRIPTION
RUN_NORMAL	Displays the application window in its default size and position.
RUN_MINIMIZED	Displays the application window as an icon.
RUN_MAXIMIZED	Displays the application window in full-screen mode.

Allowed *RunMode* options are as follows:

RunMode	**DESCRIPTION**
0	The macro will continue executing after the application is loaded. The application will remain open when *Image-Pro* is closed.
RUN_AUTOCLOSE	The macro will continue executing after the application is loaded. The application will automatically close when *Image-Pro* is closed.
RUN_MODAL	The macro will stop and resume only after the other application is terminated (*Image-Pro* will be disabled while the application is active).

IpAppSelectDoc

Syntax **IpAppSelectDoc**(*DocId*)

Description This function makes the specified image window the active image, where *DocId* specifies the number associated with an open image.

Parameters

DocId	**Integer**	An integer identifying the ID of the open image (where the first image opened is image 0) or one of the following: DOCSEL_NEXTID DOCSEL_PREVID See definitions under Comments, below.

Example

```
ret = IpAppSelectDoc(2)
```

This statement will select image window number 2 as the active image.

Comments A document “ID” (*DocId*) is assigned to an image window when it is opened. It retains this ID for the duration of its existence. IDs are assigned consecutively, in the order in which images are opened. The next higher ID number is used when a new window is created — e.g., if image 4 is already open, the next image is assigned an ID of 5.

Because of the dynamic nature of *DocId* (the mix and sequence of images on your desktop varies from session to session), macros involving multiple images should be recorded and played back from an empty imaging area (i.e., one in which there are no images open), or images should be selected relatively using the DOCSEL_NEXTID and DOCSEL_PREVID options described below. These measures will ensure that the recorded image numbers select the intended images on playback.

DocId	**DESCRIPTION**
DOCSEL_NEXTID	Selects the image with the next-higher ID, relative to the active image. If the active image has the highest ID, the image with the lowest ID is selected.
DOCSEL_PREVID	Selects the image with the next-lower ID, relative to the active image. If the active image has the lowest ID, the image with the highest ID is selected.

IpAppSet

Syntax

IpAppSet(*Attribute, Value)*

Description

This function sets the application attributes.

Parameters

Attribute	**Integer**	Must be one of the following: PST_BLEND_PREVIEW = Set whether to blend on paste preview. PST_BLEND_APPLY = Set whether to blend on paste apply. PST_BLEND_SOURCE = Set the blending percentage. See Comments, below. PST_APPLY_TYPE = Set the type of blending that will be applied. See Comments, below. MACRO_PAUSE_TYPE = Determins how IpMacroPause will behave. See comments below.
Value	**Integer**	The new value for the specified attribute.

Comments

The PST attributes modify the behavior of the IpWsPaste function.
The PST_BLEND_PREVIEW and PST_BLEND_APPLY are flags where if the value is non-zero, the blending will be applied. The PST_BLEND_SOURCE value is only used if blending is applied, and must be specified as a percentage, where 100 indicates that the pasted data will be used with no blending, 50 indicates an equal contribution of the pasted data and target image data, and 0 indicates the target image data will not be modified by the paste.

The PST_APPLY_TYPE value modifies the paste so that an pixel-by-pixel intensity comparison is to decide whether to apply the paste, and must be one of the following values:
PST_APPLY_ALL = All pasted data will be applied according to the current blending.
PST_APPLY_LIGHTER = Only pixels in the pasted data that are lighter than the destination image will be applied.
PST_APPLY_DARKER = Only darker pixels will be applied.

Comments

WINDOW_TILING_TYPE= Modifies the selection oof the Windows, Tile command. The tiling type can be set to TILE_NORMAL (the standard Windows tiling behavior) or any combination of the following constants (with one exception noted below):

TILE_ZOOM_TO_FIT= Changes the zoom factor of the images to try to display as much of the image as possible in the tiled workspace.

TILE_REORDER = Reorders the workspaces by the age of the document, by columns first and then by rows. The oldest document will be in the top-left corner of the Image-Pro workspace, the next oldest under it in the first column, and so on until the first column is full and a new column is added to the right of the first.

TILE_SAMESIZE = All workspaces will be set to the same size as the smallest workspace. The workspaces may be different sizes after tiling if the images are different sizes, or in some cases when the tiled layout results in some columns having more images than others.

TILE_COMPACT = Arranges the workspaces so that they are directly next to each other in the columns and rows, such that any unused space in the Image-Pro Plus workspace will be found at the bottom and/or right side.

MACRO_PAUSE_TYPE = This command is used to determine how the new IpMacroPause function will behave when the macro uses the MP_RESPECTSETTING mode. When this mode is specified and the MACRO_PAUSE_TYPE command is set to any non-zero value, the IpMacroPause function will behave like the MP_WAITFORRESPONSE mode was selected and will wait for the user to make a selection by clicking one of the dialog buttons.

IpAppSize

Syntax

IpAppSize(*Width, Height*)

Description

This function changes the size of the *Image-Pro* application window to the specified width and height.

Parameters

Width	**Integer**	An integer specifying the width, in pixels, at which the *Image-Pro* application window is to be displayed.
Height	**Integer**	An integer specifying the height, in pixels, at which the *Image-Pro* application window is to be displayed.

Example

```
ret = IpAppSize(800, 400)
```

This statement will resize the *Image-Pro* application window to half-screen length on a super-VGA monitor.

Comments

Be aware that there is a minimum size to which the *Image-Pro* application window can be set. If you specify dimensions below this minimum, your values will be ignored, and the minimum will be used. The minimum values vary depending upon the resolution of your screen and the font that is used.

See Also

IpAppRestore, IpAppMove

IpAppUpdateDoc

Syntax

IpAppUpdateDoc(*DocId*)

Description

This function directs *Image-Pro* to repaint the specified image window, repaint all open image windows or refrain from repainting any image window. From an *Auto-Pro* macro, it can be used to force a repaint before macro termination, so that the results of intermediate macro steps can be viewed as they occur. From a Visual Basic or Visual C++ program, it can be used to improve program performance by selectively updating the screen.

There is no command equivalent for this function; it is one that must be manually written into your macro with the macro editor.

Parameters

DocId	**Integer**	An integer identifying the ID of the open image (where the first image opened is image 0) or one of the following: DOCSEL_ACTIVE DOCSEL_ALL DOCSEL_NONE See definitions under Comments, below.

Example

The following *Auto-Pro* macro segment will adjust the brightness and contrast characteristics of the active image, and then sharpen it. After each operation the image will be repainted. This allows the viewer to see the result of each step as it is executed. Without the `IpAppUpdateDoc` statements in this macro, the user would see only the final result when the macro was finished.

Note - if this segment were executed from a Visual Basic or Visual C++ program, the screen would automatically be updated after each step. See second example, below.

```
ret = IpLutSetAttr(LUT_BRIGHTNESS, 78)

ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
ret = IpLutSetAttr(LUT_CONTRAST, 60)
ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
ret = IpLutApply()
ret = IpFltSharpen(5, 8, 2)
```

If the following sequence were called from a Visual Basic or Visual C++ program, the active image would not be updated until the entire sequence of LUT and filtering statements had been performed.

```
ret = IpLutSetAttr(LUT_BRIGHTNESS, 78)

ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
ret = IpLutSetAttr(LUT_CONTRAST, 60)
ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
ret = IpLutApply()

ret = IpFltSharpen(5, 8, 2)

ret = IpAppUpdateDoc(DOCSEL_NONE)
ret = IpLutSetAttr(LUT_BRIGHTNESS, 78)
ret = IpLutSetAttr(LUT_CONTRAST, 60)
ret = IpLutApply()

ret = IpFltSharpen(5, 8, 2)
ret = IpFltMedian(5, 2)

ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
```

Comments

Update the image window only when it is truly necessary. Frequent repainting will slow down a macro.

DocId options are as follows:

DocId **VALUE**	**DESCRIPTION**
DOCSEL_ACTIVE	Specifies that the active image is to be repainted.
DOCSEL_ALL	Specifies that all open images are to be repainted.
DOCSEL_NONE	Specifies that no images are to be repainted until the next call to `IpAppUpdateDoc` with `DOCSEL_ACTIVE` or `DOCSEL_ALL` is performed. In a Visual Basic or Visual C++ program, you might want to use DOCSEL_NONE to eliminate screen painting for performance reasons, since the screen is, otherwise, updated every time an *Auto-Pro* function is called (DOCSEL_NONE can be set in an *Auto-Pro* macro, too, however, there is really no purpose in doing so, since by default, the screen is updated only when the macro ends or is interrupted by a message box). In any event, regardless of what program called DOCSEL_NONE, it must, at some point before its termination, disable this mode by calling DOCSEL_ALL or DOCSEL_ACTIVE. If this isn't done, the non-painting mode will continue to be in effect even after the macro or program terminates, and *Image-Pro* returns to its normal, interactive mode.

IpAppWindow

Syntax	**IpAppWindow**(*WindowName, WindowParm, Mode*)
Description	Gets the name and window ID of the active window, or activates a window.

Parameters

Window Name	**String**	The title of the active window.
Window Parm	**Long**	The ID or title of the active window.
Mode	**Integer**	0 = Gets the name of the active window in WindowName 1= Gets the ID of the active window in WindowParm 2 = Gets the handle of the active window in WindowParm 3 = Activates the window named in WindowName 4 = Activates a window with the ID equal to WindowParm 5 = Activates a window with the window handle equal to WindowParm

Example

The following example shows how the AppWindow parameters are used.

```
ret = IpAppWindow ("Untitled1",0,3)
ret = IpAppWindow ("", 1324,4)
ret = IpAppWindow (WindowName,0, 1,)
ret = IpAppWindow ("Bugs.TIF",WindowParm, 2,)
ret = IpAppWindow ("", WindowParm,5)
```

See Also IpAppCtl

IpAppWndPos

Syntax	**IpAppWndPos**(*WindowName, ipRect, Mode*)
Description	Sets or gets the position of a window using screeen coordinates

Parameters

Window Name	**String**	The name or ID of the window.
IpRect	**RECT**	Location of the window in screen coordinates.
Mode	**Integer**	0 = Gets the window position 1= Sets the window position

See Also IpAppWindow, IpAppWndState

IpAppWndState

Syntax **IpAppWndState**(*WindowName, Statet, Mode*)

Description Sets or gets the state of a window.

Parameters

Window Name	**String**	The name or ID of the window.
State	**Integer**	WST_ENABLED WST_VISIBLE WST_NORMAL WST_MINIMIZED WST_MAXIMIZED
Mode	**Integer**	0 = Get the window state 1= Set the window state

See Also IpAppWindow, IppAppWndPos

IpBayerGet Int

Syntax **IpBayerGetInt**(*Attribute, Value*)

Description This function can be used to get the current value of the Bayer Interpolation options.

Parameters

Attribute	**Integer**	Indicates the Bayer interpolation attribute to be inquired, from the following list (see IpBayerSetInt for details): **BAYER_INTERPOLATION_MODE** – The Bayer interpolation mode. **BAYER_PIXEL_FORMAT** – The pixel format. **BAYER_PIXEL_OFFSET** – The pixel offset. **BAYER_GREEN_PLANE** – The green plane option. **BAYER_OUTPUT** – The output option.
Value	**Integer**	An integer variable to receive the current value of the attribute.

See Also IpBayerSetInt

IpBayerInterpolate

Syntax **IpBayerInterpolate***()*

Description This function is used to process the active image using the current options.

Return Value If successful, the document ID of the first workspace created as the output of the interpolation, or an error code if the interpolation fails.

IpBayerSetInt

Syntax **IpBayerSetInt**(*Attribute, Value*)

Description This function can be used to set the Bayer Interpolation options.

Parameters

Attribute	**Integer**	Indicates the Bayer interpolation attribute to be set, from the following list: **BAYER_INTERPOLATION_MODE** – Sets the Bayer interpolation mode, to one of the following: BAYER_NO_INTERPOLATION, BAYER_BILINEAR, or BAYER_BICUBIC. **BAYER_PIXEL_FORMAT** – Sets the pixel format to one of the following: BAYER_FMT_R_GR_GB_B, BAYER_FMT_GR_R_B_GB, BAYER_FMT_GB_B_R_GR, or BAYER_FMT_B_GB_GR_R. **BAYER_PIXEL_OFFSET** – Sets the pixel offset to one of the following: BAYER_NO_OFFSET, BAYER_HORIZONTAL_OFFSET, BAYER_VERTICAL_OFFSET, or BAYER_BOTH_OFFSET. **BAYER_GREEN_PLANE** – Sets the green plane options to one of the following: BAYER_COMBINE_GREEN (the most common use, where both the Gr and Gb pixel planes are combined into the final green plane that is output), BAYER_USE_GR (where only the Gr plane is returned), or BAYER_USE_GB (where only the Gb plane is returned). Note: This attribute is only used for pixel replication, and will be ignored when the interpolation mode is set to the bilinear or bicubic options. **BAYER_OUTPUT** – Sets the output to BAYER_OUTPUT_RGB (where a single RGB image is output) or BAYER_OUTPUT_PLANES (where each plane is output separately as a new image workspace).
Value	**Integer**	Indicates the new value for the attribute (must be one of the above).

See Also IpBayerGetInt

IpBayerShow

Syntax **IpBayerShow***(Show)*

Description This function shows or hides the Bayer Interpolation feature

Parameters

Show	**Integer**	0 = hide Bayer Interpolation 1 (or greater) = show Bayer Interpolation

IpBitAttr

Syntax **IpBitAttr**(*Attribute, Value*)

Description This function selects, sets, or deselects options relating to the **Bitmap Analysis** command.

Parameters

Attribute	**Integer**	An enumerated integer identifying the option to be set. Must be one of the following: BIT_SAMPLE BIT_CALIB BIT_SAVEALL See definitions under Comments, below.
Value	**Integer**	An integer specifying how the option specified in *Attrib* is to be set. See definitions below for the values allowed by each option.

Example The following example sets the sampling rate to every other pixel on every other line.

```
ret = IpBitAttr(BIT_SAMPLE, 2)
```

Comments *Attrib* options are as follows:

Attribute	**DESCRIPTION**	*Value* **VALUES**
BIT_SAMPLE	Sets the sampling rate to the interval specified in *Value.* Equivalent to th**e Bitmap Analysis** window's **Sampling** command.	1 - Every pixel. 2 - Every other pixel. 3 - Every 3rd pixel. . . .
BIT_CALIB	Specifies whether the bitmap values are reported in calibrated or uncalibrated format. Equivalent to the **Bitmap Analysis** window's **Intensity Cal** command.	0 - Display actual. 1 - Display calibrated.
BIT_SAVEALL	Specifies whether the top row and left column will be saved with the bitmap values. Equivalent to the **Bitmap Analysis** window's **Pixel Values Only** command.	0 - Save pixels only. 1 - Save pixels with row and column legends.

See Also IpBitShow, IpBitSaveData

IpBitSaveData

Syntax **IpBitSaveData**(*Filename, SaveMode*)

Description

This function saves a block of image data in ASCII form to a file or to the Clipboard. Equivalent to the **Bitmap Analysis** window's **Save Data, Append Data,** and **Copy To Clipboard** commands.

Parameters

Filename	**String**	A string specifying the name of the file to which the bitmap analysis ASCII data will be written. This parameter is ignored when *SaveMode* is set to S_CLIPBOARD. When this is the case, set *FileName* to an empty string (i.e., "").
SaveMode	**Integer**	An enumerated integer specifying whether the bitmap data is to be stored as a new file, appended to an existing file or written to the Clipboard. Where: 0 - Stores data to a new file (if the file already exists, it will be overwritten). S_APPEND - Appends data to an existing file. S_CLIPBOARD - Copies data to the Clipboard. S_PRINT_TABLE - sends data to the printer S_LEGEND - Saves the legend with the data. Without the legend, equivalent to checking the "pixel values only" in the Bitmap Analysis dialog.

Return Value

This function will return a 0 if successful. A negative number, otherwise.

Example

The following example will save a block of image data from an AOI to the Clipboard.

```
' create a 16x16 box AOI.
ipRect.left = 100
ipRect.top = 100
ipRect.right = 115
ipRect.bottom = 115
ret = IpAoiCreateBox(ipRect)
' show the bitmap analysis tool.
ret = IpBitShow(1)
' set save attribute to pixels only.
ret = IpBitAttr(BIT_SAVEALL, 0)
' copy the 16x16 block to the clipboard.
ret = IpBitSaveData("", S_CLIPBOARD)
```

Comments

You must call `IpBitShow` to open the **Bitmap Analysis** window before calling this function. `IpBitSaveData` will fail if the **Bitmap Analysis** window is not displayed.

See Also IpBitShow, IpBitAttr

IpBitShow

Syntax

IpBitShow(*bShow*)

Description

This function is used to display, hide and update the **Bitmap Analysis**window. Equivalent to selecting the **Bitmap Analysis**command to open the window or clicking the **Update**menu or **Close** button within it to update or close it.

Parameters

bShow	**Integer**	An integer value of 0, 1 or 2, specifying whether the **Bitmap Analysis** command window is to be shown, closed or updated. Where: 0 - Closes the window if it is already open. 1 - Opens the window. 2 - Updates the window.

Example

```
ret = IpBitShow(1)
```

The statement above will open the **Bitmap Analysis** command window.

Comments

If you intend to save bitmap data using `IpBitSaveData`, you *must* first call this function with its *bShow* flag enabled. Otherwise, `IpBitSaveData` will fail.

See Also

IpBitSaveData, IpBitAttr

IpBlbCount

Syntax

IpBlbCount( )

Description

This function counts and measures the objects in the active image or AOI. Equivalent to clicking the **Count** button in the **Count/Size**command window.

Return Value

This function returns an integer representing the number of counted objects within range, or 0 if no objects were found.

Comments

Image-Pro will utilize the current intensity, option and measurement settings if you have not explicitly set them using the `IpBlbSetRange`, `IpBlbSetAttr` and `IpBlbEnableMeas` functions.

When it is necessary to ensure that your counting macro operates under specific intensity, options and measurement values, consider saving these values to an environment file. Your program can then initialize the environment by loading this file via the `IpBlbLoadSetting` function. Or you may set them explicitly via the `IpBlbSetAttr` function.

Generally, this is the second of three steps for obtaining measurement data from objects. The first and third steps are IpBlbEnableMeas and IpBlbData.

See Also

IpBlbSetAttr, IpBlbEnableMeas, IpBlbSetRange, IpBlbLoadSetting, IpBlbMeasure

IpBlbCreateMask

Syntax

IpBlbCreateMask( )

Description

This function makes a mask from the current count/size result. Equivalent to selecting the *Make Mask* command from the *Image* menu in the **Count/Size** window.

Comments

This statement does nothing if there is no count associated with the active image.

IpBlbData

Syntax

IpBlbData(*Measure, FromObj, ToObj, DataArray*)

Description

This function is used to get the measurement data associated with the active object count. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Measure	**Integer**	An enumerated integer specifying the measurement type for which data is to be obtained. See list in **IpBlbEnableMeas** for standard count/size measurements. This function also supports the following population density measurements: BPOP_OBJECTS - A population density measurement that returns an array containing the number of objects found in each site. BPOP_AREA - A population density measurement that returns an array containing the calibrated area of each site. BPOP_DENSITY - A population density measurement that returns an array containing the density of each site. Density is calculated as the object count divided by the calibrated area. BPOP_CORRDENSITY - A population density measurement that returns an array containing the corrected density of each site. Corrected density is calculated as thedensity minus the background density. Use the GETNUMSITES command for IpBlbGet to obtain the length of an array necessary to hold the population data.

		BPOP_OBJECTS_STATS – returns an array of 4 singles: mean, sum, background, and total, in that order. BPOP_AREA_STATS - returns an array of 4 singles: mean, sum, background, and total, in that order. BPOP_DENSITY_STATS - returns an array of 4 singles: mean, sum, background, and total, in that order. BPOP_CORRDENSITY_STATS - returns an array of 4 singles: mean, sum, background, and total, in that order. BCLUSTER_STATS - returns an array of 6 singles: original count, cluster count, single object count, number of objects in clusters, total objects, and total object area, in that order. BLEX_RADIUS - list of radii BLEX_DIAMETER - list of diameters BLEX_CALIPER - list of calipers BLEX_BRANCHLEN - list of branch lengths
FromObj	**Integer**	An integer representing the ID number of the first object for which you want measurements (the very first object in the counted set is considered object 0).
ToObj	**Integer**	An integer representing the ID number of the last object for which you want measurements (the very first object in the counted set is considered object 0).
DataArray	**Single**	The address (name) of the array (of BASIC type, **Single**) that will receive the measurement data. This array should be large enough to store (*ToObj* - *FromObj* + 1) numbers.

Comments

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (see example below).

Generally, this is the third of three steps for obtaining measurement data from objects. The first and second steps are IpBlbEnableMeas and IpBlbCount or IpBlbMeasure. You can find more information about segmentation range macros on the Media Cybernetics website.

For all of the BLOBM_ measurements, the FromObj parameter should specify the first object and the ToObj parameter the last object of the set of objects to inquire. Typically, FromObj is specified as 0 (zero) and ToObj specified as the number of objects - 1. For the BLEX_ measurements, the function returns an array of measurements per object. The FromObj parameter specifies the object number. For the BLEX_RADIUS, BLEX_DIAMETER, and BLEX_CALIPER measurements, the ToObj parameter is used to specify the number of radial measurements that should be calculated and returned. If ToObj is specified as 0 (zero), the function returns the number of measurements by default (32), or the number of measurements set via BLBCMD_SETNUMANGLES. For the BLEX_BRANCHLEN measurement, ToObj indicates the length of array provided. To inquire the number of branches for a given object, use IpBlbData to get the BLBM_DENDRITES measurement.

To save Count/Size data together with the active image, use IpGalAdd with an empty string parameter in your macro.

Return Value

0 if successful.

See Also

IpBlbGet, IpBlbCount, IpBlbMeasure, IpBlbFilter, IpBlbEnableMeas

Example

```
' this macro gets the list of area measurements
' for the current object count
  Sub GetAreaData()
  Dim lNum As Long
  Dim lObj As Long
  IpBlbGet(BLBGET_GETNUMOBJEX, 0, 2, lNum)
  ReDim fVals(lNum) As Single
  IpBlbData(BLBM_AREA, 0, lNum-1, fVals(0))
  For lObj = 0 To lNum - 1
    Debug.Print lObj+1; vbTab;
    Debug.Print fVals(lObj)
  Next lObj
End Sub
```

Example

```
Attribute VB_Name = "Module1"
'this macro prompts the user for how many radius measurements
'to perform and which  object to perform them on.

Sub get_radii()
Dim radii(90) As Single
Dim objid As Integer, i As Integer
Dim numangles As Integer
Dim fangle As Single

numangles = 32
ret = IpStGetInt("number of radii?", numangles, 32, _
    2, 90)
fangle = 360.0 / numangles

ret = IpOutputShow(1)
ret = IpOutputClear()

ret = IpBlbGet(GETHIT, 0, 0, objid)

If objid > 0 Then
    ret = IpBlbData(BLEX_RADIUS, objid-1, _
        numangles, radii(0))
    Debug.Print "object: " + Str$(objid) + _
        " # angles: " + Str$(numangles)
    Debug.Print "angle:" + vbTab + vbTab + _
        "radius:"

    For i = 0 To numangles - 1
        Debug.Print Str$(fangle * i) + vbTab _
            + vbTab + Str$(radii(i))
    Next i
End If

End Sub
```

Example

```
'same as above, but with diameters instead of radii.
Sub get_diameters()
Dim radii(90) As Single
Dim objid As Integer, i As Integer
Dim numangles As Integer
Dim fangle As Single

numangles = 16
ret = IpStGetInt("number of diameters?", _
    numangles, 16, 2, 90)
fangle = 180.0 / numangles

ret = IpOutputShow(1)
ret = IpOutputClear()

ret = IpBlbGet(GETHIT, 0, 0, objid)

If objid > 0 Then
    ret = IpBlbData(BLEX_DIAMETER, objid-1, _
        numangles, radii(0))
    Debug.Print "object: " + Str$(objid) + _
        " # angles: " + Str$(numangles)
    Debug.Print "angle:" + vbTab + vbTab + _
        "diameter:"
    For i = 0 To numangles - 1
        Debug.Print Str$(fangle * i) + _
            vbTab + vbTab + _
            Str$(radii(i))
    Next i
End If
End Sub
```

```
Sub GetMultiRangeData()
Dim iRng As Integer
Dim iNumRng As Integer
Dim iObj As Integer
Dim iNumObj As Integer

ret = IpBlbGet(GETNUMRANGES, 0, 0, iNumRng)
If (ret < 0) Then
    Exit Sub
End If

For iRng = 0 To iNumRng - 1
    IpBlbRange(iRng)
    ret = IpBlbGet(GETNUMOBJ, 0, 2, iNumObj)
    ReDim Ranges(iNumObj) As Single
    ret = IpBlbData(BLBM_SRANGE, 0, iNumObj-1, _
        Ranges(0))

    For iObj = 0 To iNumObj - 1
        Debug.Print iObj+1; vbTab;
        Debug.Print Ranges(iObj)
    Next iObj
Next iRng
End Sub
```

```
Sub GetCaliper()
Dim caliper(90) As Single
Dim i As Integer, objid As Integer

ret = IpBlbGet(GETHIT, 0, 0, objid)
ret = IpBlbData(BLEX_CALIPER, objid - 1, 90, _
    caliper(0))

Debug.Print "Object ID: "; objid
For i = 0 To 90 - 1
    Debug.Print i*2; " degrees "; caliper(i)
Next i
Debug.Print
End Sub
```

```
'The following is example code for getting population
'density and/or cluster data:

Dim iNumSites As Integer
Dim i As Integer
Dim sOut As String

ret = IpBlbGet(BLBGET_GETNUMSITES, 0, 0, iNumSites)
If ret = IPCERR_NONE And iNumSites > 0 Then
ReDim fObj(iNumSites) As Single
ReDim fArea(iNumSites) As Single
ReDim fDens(iNumSites) As Single
ReDim fCorr(iNumSites) As Single
ret = IpBlbData(BPOP_OBJECTS, 0, iNumSites-1, _
    fObj(0))
ret = IpBlbData(BPOP_AREA, 0, iNumSites-1, _
    fArea(0))
ret = IpBlbData(BPOP_DENSITY, 0, iNumSites-1, _
    fDens(0))
ret = IpBlbData(BPOP_CORRDENSITY, 0, iNumSites-1, _
    fCorr(0))
sOut = "# sites: " + CStr(iNumSites) + vbCrLf
ret = IpOutput(sOut)

For i = 0 To iNumSites - 1
    sOut = "#" + CStr(i + 1) + ":" + vbTab + _
        CStr(fObj(i)) + vbTab + _
        CStr(fArea(i)) + vbTab + _
        CStr(fDens(i)) + vbTab + _
        CStr(fCorr(i)) + vbCrLf
    ret = IpOutput(sOut)
Next i

ReDim fObj(4) As Single
ReDim fArea(4) As Single
ReDim fDens(4) As Single
ReDim fCorr(4) As Single
ret = IpBlbData(BPOP_OBJECTS_STATS, 0, 0, fObj(0))
ret = IpBlbData(BPOP_AREA_STATS, 0, 0, fArea(0))
ret = IpBlbData(BPOP_DENSITY_STATS, 0, 0, fDens(0))
ret = IpBlbData(BPOP_CORRDENSITY_STATS, 0, 0, _
    fCorr(0))
sOut = "Pop Dens statistics: " + vbCrLf
ret = IpOutput(sOut)

For i = 0 To 3
    sOut = "#" + CStr(i) + ":" + vbTab + _
        CStr(fObj(i)) + vbTab + _
        CStr(fArea(i)) + vbTab + _
        CStr(fDens(i)) + vbTab + _
        CStr(fCorr(i)) + vbCrLf
    ret = IpOutput(sOut)
Next i
End If
```

```
ReDim fObj(6) As Single
ret = IpBlbData(BCLUSTER_STATS, 0, 0, fObj(0))

If ret = IPCERR_NONE Then
sOut = "Cluster statistics: " + vbCrLf
ret = IpOutput(sOut)
sOut = "Original Count:   "  + vbTab + _
    CStr(fObj(0)) + vbCrLf
ret = IpOutput(sOut)
sOut = "Cluster Count:    "  + vbTab + _
    CStr(fObj(1)) + vbCrLf
ret = IpOutput(sOut)
sOut = "Single Count:     "  + vbTab + _
    CStr(fObj(2)) + vbCrLf
ret = IpOutput(sOut)
sOut = "Count in Clusters:"  + vbTab + _
    CStr(fObj(3)) + vbCrLf
ret = IpOutput(sOut)
sOut = "Total Count:      "  + vbTab + _
    CStr(fObj(4)) + vbCrLf
ret = IpOutput(sOut)
sOut = "Typical Object:   "  + vbTab + _
    CStr(fObj(5)) + vbCrLf
ret = IpOutput(sOut)
End If
```

IpBlbDelete

Syntax **IpBlbDelete**( )

Description This function clears the current set of counted objects and measurements. Equivalent to clicking the **Delete** button in the **Count/Size** command window.

IpBlbEnableMeas

Syntax	**IpBlbEnableMeas**(*MeasurementType*, *bEnable*)		
Description	This function enables or disables the specified measurement type in preparation for a **Count/Size** operation. Equivalent to selecting or deselecting a measurement type with the **Select Measurements** command.		
Parameters	*MeasurementType*	**Integer**	An enumerated integer specifying the measurement to be selected or deselected. Must be one of the following: BLBM_ALL BLBM_AREA BLBM_AREAPOLY BLBM_ASPECT BLBM_BLUE BLBM_BOXX BLBM_BOXY BLBM_BOX_AREA BLBM_BOX_XY BLBM_BRANCHLEN BLBM_CENTRX BLBM_CENTRY BLBM_CLASS BLBM_CLUMPINESS BLBM_CLUSTER BLBM_CMASSX BLBM_CMASSY BLBM_DENDRITES BLBM_DENSDEV BLBM_DENSITY BLBM_DENSMAX BLBM_DENSSMIN BLBM_DENSSUM BLBM_DIRECTION BLBM_ENDPOINTS BLBM_FRACTDIM BLBM_GREEN BLBM_HETEROGENEITY BLBM_HOLEAREA BLBM_HOLEAREARATIO BLBM_IOD BLBM_LENGTH BLBM_MAJORAX

Measurement Type, con't	***Integer***	BLBM_MARGINATION BLBM_MAXCALIP BLBM_MAXFERRET BLBM_MAXRADIUS BLBM_MEANCALIP BLBM_MEANFERRET BLBM_MINCALIP BLBM_MINFERRET BLBM_MINORAX BLBM_MINRADIUS BLBM_NUMHOLES BLBM_PCONVEX BLBM_PELLIPSE BLBM_PERAREA BLBM_PERIMETER BLBM_PERIMETER2 BLBM_PERIMETER3 BLBM_PERIIMETERLEN BLBM_PRATIO BLBM_RADIUSRATIO BLBM_RANGE BLBM_RED BLBM_ROUNDNESS BLBM_SIZECOUNT BLBM_SRANGE BLBM_WIDTH
BEnable	**Integer**	An integer value of 0 or 1 that will select or deselect the measurement type specified in *MeasurementType* as follows: 0 - Deselects the specified measurement 1 - Selects the specified measurement

Example

```
ret = IpBlbEnableMeas(BLBM_PERIMETER,1)
```

This statement selects the perimeter measurement. When the `IpBlbCount` or `IpBlbMeasure` function is subsequently performed, the perimeter measurement (and any other currently selected measurements) of all counted objects are recorded.

Comments

To ensure that your counting macro records all, and only, the measurement types you want, consider saving the settings to an environment file. Your program can then initialize the environment with the appropriate measurement types by loading this file via the `IpBlbLoadSetting` function.

Alternatively, while recoding your macro, (and before performing the first count) choose *File:Record Environment* from the **Count/Size** menu bar. This will record every setting in the **Count/Size** dialog.

Generally, this is the first of three steps for obtaining measurement data from objects. The second and third steps are IpBlbCount or IpBlbMeasure and IpBlbData.

BLBM_SRANGE returns zeros for the range number for all except the first range.

See Also IpBlbCount, IpBlbSetAttr, IpBlbLoadSetting , IpBlbMeasure, IpBlbData

IpBlbFilter

Syntax **IpBlbFilter**( )

Description This function eliminates counted objects whose measurements do not meet the specified measurement criteria. Equivalent to the “Filter Objects” button in the “Set Ranges” dialog box.

See Also IpBlbSetFilterRange

IpBlbFromAOI

Syntax **IpBlbFromAOI *(sResetAOI)***

Description This function converts an AOI to an object.

Parameters

sResetAOI	**Integer**	Indicates whether to reset the AOI after conversion or not. 0 does not reset the AOI. 1 resets the AOI.

Example

```
ret = IpBlbFromAOI(1)
```

IpBlbGet

Syntax **IpBlbGet**(*Cmd, Param1, Param2, OutVal*)

Description Use this function to get information relating to the object count in the current image. There is no command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETNUMOBJEX GETSTATUS GETPOINTS GETRANGE GETSTATS GETHIT GETTHRESH GETHBLOB GETMEASENABLED GETNUMSAMPLES GETNUMPTS GETNUMRANGES GETNUMSITES GETSITESTATS GETRANGESTATS GETIPPSETTINGS GETSEGMENTATION GETBOUNDS Or one of the BLOB attributes used with GETIPPSETTINGS. See definitions under Comments, below.
Param1	**Long**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command.
Param2	**Long**	An integer specifying additional data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Return Value `IpBlbGet` returns a 0 if successful except when used with the GETPOINTS command. Then it will return the number of points stored to *OutVal*. If this value is equal to *Param2*, chances are that *OutVal* was not large enough to hold all of the points. See GETPOINTS under Comments, below.

Example The following statements perform an XOR on the inside of all visible objects.

```
Redim blbpts(1000) As POINTAPI

Dim numpoints As Integer, numobj As Integer
Dim status As Integer, i As Integer

' get the total number of objects, in-range and out-of-range,
' hidden and visible.

ret = IpBlbGet(GETNUMOBJ, 0, 0, numobj)

For i = 0 To numobj - 1

   ret = IpBlbGet(GETSTATUS, i, 0, status)
   Debug.print ret ' (status)
   ' if object in-range and visible...
   If status >= 0 Then
     'get the outline of the object
   numpoints = IpBlbGet(GETPOINTS, i, 1000, blbpts(0))
   Debug.print numpoints
      If numpoints > 0 Then
         ' create AOI out of the object outline and XOR it.
         ret = IpAoiCreateIrregular(blbpts(0), numpoints)
         ret = IpOpNumberLogic(0, OPL_NOT, 0)
      End If
   End If

Next i
```

The following statements binarizes the active image based upon the threshold established by the count.

```
Dim threshold As Single

ret = IpBlbGet(GETTHRESH, 0, 0, threshold)
ret = IpLutBinarize(0, threshold, 0)
```

The following statement gets the number of points.

```
Sub testBlbGet()
   Dim iNum As Integer
   ret = IpBlbGet(GETNUMPTS, 22, 0, iNum)
   MsgBox("Returns " & CStr(iNum))
   ReDim ptTmp(iNum) As POINTAPI
   iNum = IpBlbGet(GETPOINTS, 22, iNum, ptTmp(0))
   MsgBox("Returns " & CStr(iNum))
End Sub
```

The following macro gets multiple ranges and other data.

```
Sub PrintObjectRanges()
   Dim iRng As Integer
   Dim iNumRng As Integer
   Dim iObj As Integer
   Dim iNumObj As Integer
   Dim NextRng As Integer
   Dim iAllObj As Integer
   Dim i As Integer, j As Integer

   'count the number of segmentation ranges
   ret = IpBlbGet(GETNUMRANGES, 0, 0, _
                                    iNumRng)
```

```
If (ret < 0) Then
   Exit Sub
End If

'Make sure that the Range measurement is
'enabled and get rid of hidden objects
ret = IpBlbEnableMeas(BLBM_AREA, 1)
ret = IpBlbEnableMeas(BLBM_SRANGE, 1)
ret = IpBlbMeasure()
ret = IpBlbUpdate(4)

'create arrays to hold all of the data
'from all ranges
ret = IpBlbGet(GETNUMOBJ, 0, _
                 BLB_ALLOBJECTS, iAllObj)
ReDim Areas(iAllObj) As Single
ReDim Ranges(iAllObj) As Single

NextRng = 0

'Label the output
ret = IpOutputShow(1)
ret = IpOutputClear()
Debug.Print "Objects by Range"
Debug.Print "Rng-Obj";
Debug.Print Chr(9); "Area"; Chr(9);
Debug.Print "Range"

'Iterate through the ranges
For iRng = 0 To iNumRng - 1
   IpBlbRange(iRng)
   ret = IpBlbGet(GETNUMOBJ, 0, _
                BLB_ACTIVERANGE, iNumObj)
   ReDim tmpAreas(iNumObj) As Single
   ReDim tmpRanges(iNumObj) As Single
   ret = IpBlbData(BLBM_AREA, 0, _
                  iNumObj-1, tmpAreas(0))
   ret = IpBlbData(BLBM_SRANGE, 0, _
                 iNumObj-1, tmpRanges(0))

   'iterate through the objects in the
   'current range and build data lists
   'for all objects in the image
   For iObj = 0 To iNumObj - 1
      Debug.Print iObj+1;
      Debug.Print Chr(9); tmpAreas(iObj);
      Debug.Print Chr(9); tmpRanges(iObj)

      Areas(NextRng + iObj) = _
                           tmpAreas(iObj)
      Ranges(NextRng + iObj) = _
                          tmpRanges(iObj)
   Next iObj

   NextRng = NextRng + iNumObj
Next iRng

'label the output
Debug.Print ""
```

```
   Debug.Print "The entire list of objects"
   Debug.Print "Obj #";
   Debug.Print Chr(9); "Area";
   Debug.Print Chr(9); "Range"

   'iterate through all objects in the image
   For iObj = 0 To iAllObj - 1
      Debug.Print iObj+1;
      Debug.Print Chr(9); Areas(iObj);
      Debug.Print Chr(9); Ranges(iObj)
   Next iObj
End Sub
' Requires that Count/Size be run with whatever segmentation
ranges have been
chosen
Sub GetSegmentation()
        Dim Range(10) As Single
        Dim i As Integer

        ret = IpBlbGet(GETRANGE, 0, 0, Range(0))
        Debug.Print Range(0); Range(1)

        ret = IpBlbGet(GETRANGE, 0, 1, Range(0))
        Debug.Print Range(0); Range(1)

        ret = IpBlbGet(GETRANGE, 0, 2, Range(0))
        Debug.Print Range(0); Range(1)

End Sub
```

Comments

When passing an array to the program from a BASIC program, be sure to pass the first element of the array by reference (see example, above).

Note that as of Ipp 6.1. GETNUMOBJ has been replaced with GETNUMOBJEX. Commands are listed below:

<table>
<tr><th><i>Cmd</i></th><th>DESCRIPTION</th></tr>
<tr><td>GETNUMOBJEX</td><td>This command gets the number of objects that have been counted in the active image. The variable to receive the object count must be a <b>long.</b> This number will be written to <i>OutVal</i>.
<table>
<tr><th><i>Param1</i> VALUE</th><th><i>Param2</i> VALUE</th><th><i>OutVal</i> TYPE</th></tr>
<tr><td>An integer from 1 to 255 specifying the class, or 0 for all classes.</td><td>BLB_ALLOBJECTS = 0
BLB_INRANGE = 1
BLB_ACTIVERANGE = 2</td><td><b>Long</b></td></tr>
</table>
</td></tr>
</table>

Cmd	**DESCRIPTION**		
GETSTATUS	*Param1* **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
GETSTATUS	Gets the status of the object specified in *Param1*. Status is written to *OutVal*, as follows: -1 - Object is out of range or hidden. 0 - Object is in range. 1 to 255 - object is in range and belongs to the indicated class (i.e., *OutVal* will report a value from 1 to 255 when data have been classified).		
	An integer specifying the requested object's number, where 0 is the first object, 1 is the second object, and so forth.	Not used by GETSTATUS. Must be set to 0.	**Integer**

Cmd	**DESCRIPTION**		
GETPOINTS	This command gets the list of coordinates defining the outline of the object specified in *Param1*. The coordinates will be written to the array you have specified in *OutVal.* *Note - the number of points written to OutVal will be returned by the IpBlbGet. If this value is equal to Param2, OutVal was probably not big enough to hold the entire list of coordinates.* *To close the polygon representing the outline of the object, a line from the* ***last*** *point in the array to the* ***first*** *point in the array will be required.*		
	Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
	An integer specifying the requested object's number, where 0 is the first object, 1 is the second object, and so forth.	The number of elements allocated in *OutVal* (i.e., the size of the array). See the GETNUMPTS command	**POINTAPI**

Cmd	**DESCRIPTION**
GETRANGE	This command returns the starting and ending values of the range specified in Param1. This range values will be written to *OutVal*. Note that *OutVal* must be an array of two singles. The starting value will be in the first and the ending value in the second.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
An integer specifying the range to inquire, from 0 to the number of ranges – 1.	Not used.	**Single**

Note: To return array values for upper and lower range limits, use:

```
Dim Array ( 0 to 1) as Single
…
IPBLBGET (GETRANGE, BLBM_AREA, 0, ARRAY (0))
1st single = lower range, 2nd single = upper range
```

Cmd	**DESCRIPTION**
GETSTATS	This command gets the statistical data for the measurement type specified by *Param2*. It will write the statistics to a 10-element array in *OutVal*, as follows:

OutVal (0)	- Mean value
OutVal (1)	- Standard Deviation
OutVal (2)	- Minimum measurement
OutVal (3)	- Maximum measurement
OutVal (4)	- Range
OutVal (5)	- Sum
OutVal (6)	- Object ID-1 with Minimum measurement
OutVal (7)	- Object ID-1 with Maximum measurement
OutVal (8)	- Number of objects
OutVal (9)	- Not Currently Used

		An integer from 1 to 255 specifying a specific class, or 0 for all classes.	An enumerated integer specifying the requested measurement type (e.g., BLBM_AREA, BLBM_ASPECT, BLBM_RED). See IpBlbEnableMeas for a complete list of the allowed measurement types.	**Single** *Note - OutVal must specify a 10-element array.*

Cmd	**DESCRIPTION**		
GETRANGESTATS	*Param1* **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
	An integer from 1 to 255 specifying a specific range, or 0 for all ranges (equivalent to using GETSTATS with class = 0).	An enumerated integer specifying the requested measurement type (e.g., BLBM_AREA, BLBM_ASPECT, BLBM_RED). See IpBlbEnableMeas for a complete list of the allowed measurement types.	**Single** *Note - OutVal must specify a 10-element array*.
	This commands gets the statistical data for a range of objects, instead of a class of obeject (use GETSTATS for a class). It will write the statistics to a 10-element array in *OutVal*, as follows: *OutVal (0)* - Mean value *OutVal (1)* - Standard Deviation *OutVal (2)* - Minimum measurement *OutVal (3)* - Maximum measurement *OutVal (4)* - Range *OutVal (5)* - Sum *OutVal (6)* - Object ID-1 with Minimum measurement *OutVal (7)* - Object ID-1 with Maximum measurement *OutVal (8)* - Number of object *OutVal (9)* - Not Currenly Used		

Cmd	**DESCRIPTION**		
GETHIT	*Param1* **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
	Not used by GETHIT. Must be set to 0.	Not used by GETHIT. Must be set to 0.	**Long**
	This command prompts the user to click on an object. It will write the object's label number to *OutVal*. A 0 will be written to *OutVal* if the user does not select a valid object. *Note - an object's label number is its external number —the one the user sees on the screen when the labels are displayed. External numbering begins with 1, not 0.*		

Cmd	**DESCRIPTION**
GETTHRESH	This command calculates the threshold between objects and background. It writes the threshold value to *OutVal.*

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETTHRESH. Must be set to 0.	Not used by GETTHRESH. Must be set to 0.	**Single**

Cmd	**DESCRIPTION**
GETNUMSAMPLES	This parameter gets information about the number sample measurements.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
BLEX_RADIUS BLEX_CALIPER BLEX_DIAMETER BLEX_BRANCHLEN	Indicates the number of samples taken while finding all the radial mesurements.	**Long**

Cmd	**DESCRIPTION**
GETNUMPTS	This command will return the number of points in the outline +1. Therefore, you should always check the return from the GETPOINTS command because it will never return the maximum number that you've passed. In all cases, GETPOINTS will return the number of valid points in your point array.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
An integer specifying the requested object's number, where 0 is the first object, 1 is the second object, and so forth.	Not used by GETNUMPTS. Must be set to 0.	**Integer**

Cmd	**DESCRIPTION**
GETNUMRANGES	This command returns the number of segmentation ranges to the integer variable provided.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETNUMRANGES. Must be set to 0.	Not used by GETNUMRANGES. Must be set to 0.	**Integer**

Cmd	**DESCRIPTION**
GETMEASENABLED	This command adds a new constant to indicate the number of measurements that can be returned: BLBM_NUM_MEAS. This can be used to DIM an array of integers to receive one value per measurment indicating if the corresponding measurement is enabled (non-zero indicates the measurment is enabled). The BLBM contants can be used to index the returned array

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Must be set to 0.	Length of the OUTVAL array provided.	**Integer**

Cmd	**DESCRIPTION**
GETNUMSITES	This command gets the number of population sites that have been analyzed. This will be the length of any measurement arrays that are returned from IpBlbData, using the BPOP_OBEJCTS, BPOP_AREA, BPOP_DENSITY, or BPOP_CORRDENSITY measurements.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETNUMSITES. Must be set to 0.	Not used by GETNUMSITES. Must be set to 0.	**Integer**

Cmd	**DESCRIPTION**
GETHBLOB	This command gets the handle to the active count structure. It writes the handle to *OutVal.*

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETHBLOB. Must be set to 0.	Not used by GETHBLOB. Must be set to 0.	**Long**

Cmd	**DESCRIPTION**
GETBOUNDS	Description: This command returns the top, left and bottom, right corners of the bounding box of the selected object. The Bounding box is the smallest rectangle, parallel to the axes of the image that completely encloses the object.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Object ID	Not use. Must be set to 0.	**Rect**

Cmd	**DESCRIPTION**
GETSITESTATS	This command gets the statistical data from the population density measurement type specified by *Param2.* It will write the statistics to a 4-element array in *OutVal.* As follows: OutVal (0) = Mean value OutVal (1) = Sum OutVal (2) = Background OutVal (3) = Total

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETSITESTATS. Must be set to 0.	An enumerated integer specifying the requested population density measurement type, See IpBlbData for a complete list of the allowed measurement types.	**Integer**

Cmd	**DESCRIPTION**
GETIPPSETTINGS	This command added to a BLOB attribute constant gets the current value of that attribute to an integer variable. See IpBlbSetAttr.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETIPPSETTINGS. Must be set to 0.	Not used by GETIPPSETTINGS. Must be set to 0.	**Integer**

Cmd	**DESCRIPTION**
GETSEGMENTATION	This command added to a BLOB attribute constant gets the three channel histogram ranges from Count/Size.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Not used by GETSEGMENTATION. Must be set to 0.	Not used by GESEGMENTATION. Must be set to 0.	**Integer**

Comments	Note: With regard to the GETNUMPTS and GETPOINTS commands, the outlines that are returned by these commands (the first returns the number of points, and the second the points themselves) are assumed to be closed polygons, but the last point that would close the polygon is NOT included in the count or the array of points. So to draw the polygon, you would draw an additional line from the last point of the array to the first point. When the outlines are saved to an outline file, the first point of the polygon is replicated at the end so that other software that may import these files will be able to tell that the outlines are closed polygons. Consequently, the outline files will show one more point per outline than you will see when using the *Auto-Pro* functions.
See Also	IpBlbCount, IpBlbData, IpBlbGetStr, IpBlbSetAttr

The following count/size constants may be used with GETSETTINGS:

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_ADDCOUNT	Specifies whether the measurements of new	0 -Adds new results to existing count.
	objects will replace, or be merged with, the existing measurement	1 -Replaces existing count with new results
	results. Equivalent to the Add Count check box in the Count/Size command window.	
BLOB_AUTORANGE	Specifies whether objects are to be extracted using Image-Pro's auto-matic intensity selection feature, or whether they are to be set according to the values specified by IpBlbSetRange. Equivalent to selecting the Automatic or Manual radio button in the Count/Sizecommand window.	0 -Selects manual intensity selection. 1 -Selects automatic intensity selection.
BLOB_BRIGHTOBJ	Specifies whether objects are comprised of dark or bright intensities relative to the back-ground. This attribute is relevant only when the Automatic intensity selection mode is set (BLOB_AUTORANGE enabled). Equivalent to selecting the Bright Objects or Dark Objects radio button in the Count/Size command window.	0 -Selects dark objects. 1 -Selects bright objects.
BLOB_CLEANBORDER	Specifies whether objects that intersect the edge of the active image or AOI are to be included in the count. Equivalent to the Clean Borders option in the Count/Size Options dialog box.	0 -Deselects clean border (objects at the edge are counted). 1 -All- Selects clean border (objects at the edges are excluded). 2 - East/West 4 - North/South 8 - North/West 16 - North/East 32 - South/West 64 - South/East
BLOB_CONVEX	Specifies convex objects	0 - Deselects convex objects 1 - Selects convex objects
BLOB_DISPLAY	Displays the count/size objects	0 - hides objects 1 - displays objects

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_FILLHOLES	Specifies whether all pixels encompassed by an object's perimeter belong to the object, or whether just the pixels possessing a value within the selected intensity range are part of the object. Equivalent to the Fill Holes option in the Count/Size Options dialog box.	1 - Selects fill holes 1 - Selects fill holes
BLOB_FILTEROBJECTS	Specifies whether the measurement criteria will be applied during the count process. Equivalent to the Apply Ranges check box in the Count/Sizecommand window.	0 -Ignore range criteria. 1 -Apply range criteria.
BLOB_LABELCOLOR	Specifies the color to be used to label the counted objects. Equivalent to selecting the label color in the Count/Size options dialog box.	0 - Red 1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black 8 - Dark Red 9 - Brown
BLOB_LABELMODE	Selects the label style	0 - None
	to be used to tag the	1 - Object #
	counted objects.	2 - Class
	Equivalent to selecting	
	the label style in the	
	Count/Size options	
	dialog box.	
BLOB_MEASUREOBJECTS	Specifies whether objects will simply be counted,	0 - Do not measure objects.
	or whether they will be counted and measured.	1 - Count and measure objects.
	Equivalent to the Measure Objects checkbox in the Count/Sizewindow.	
BLOB_MINAREA	Specifies whether the	0 - Deselects Pre-filter
	total object population	1 - Selects Pre-filter
	will be comprised of all intensity-matching objects, or just objects meeting the specified measurement criteria. Equivalent to the Pre-filter option in the Count/Sizeoptions dialog box	

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_OUTLINECOLOR	Selects the outline color	0 - Red
	to be used to outline the counted objects. Equivalent to selecting the outline color in the Count/Size options dialog box.	1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black 8 - Dark Red 9 - Brown
BLOB_OUTLINEMODE	Selects the outline style to be applied to the counted objects. Equivalent to selecting the outline style in the Count/Size options dialog box.	0 - None 1 - Outline 2 - With Holes 3 - Filled 4 - Ellipse 5 - Class
BLOB_SMOOTHING	Specifies how much smoothing is to be performed to the counted object's outline.	You may specify a value from 0 to 100, inclusive, where 0 specifies no smoothing, and 100 specifies maximum smoothing.
BLOB_8CONNECT	Selects 8-connected objects	1 - 8-connect on, 4-connect off 0 - 8 connect off, 4-connect on

IpBlbGetStr

Syntax **IpBlbGetStr(*Cmd, Param1, Param2, OutVal*)**

Description Use this function to get string information relating to the object count in the current image. This command is not recorded.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETLABEL
Param1	**Integer**	An integer specifying data with which *Cmd* will operate.
Param2	**Integer**	An integer specifying additional data with which *Cmd* will operate.
OutVal	**String**	The name of a fixed-length string variable that will receive the requested data.

Cmd	**DESCRIPTION**
GETLABEL	This command gets the name of a measurement.

Param1 **VALUE**	*Param2* **VALUE**	*OutVal* **TYPE**
Must be -1.	The measurement ID, i.e. BLBM_AREA	The name of afixed-length string variable.

Example

```
'debug.print the name of the perimeter measurement
Dim myStr as String * 64
ret = IpBlbGetStr(GETLABEL, -1, BLBM_PERIMETER, myStr)
Debug.print myStr
```

See Also IpBlbGet

IpBlbHideObject

Syntax **IpBlbHideObject *(sObjId, sRangeId, sAction)***

Description This function is used to show or hide objects in the count/size window.

Parameters

sObjId	**Integer**	Indicates the Object number
sRangeID	**Integer**	Indicates the intensity or color range of the object
sAction	**Integer**	An integer value of 0 or 1 specifying whether the object is visible or hidden, where: 0 = Hide 1 = Show 2 = Show even if out-of-range 3 = Show if hidden, hide if visible

Example

```
ret = IpBlbHideObject
```

Comments

In template mode, `IpBlbHideObject()` will bring up a dialog. The macro will resume as soon as the user is finished toggling objects and presses **Continue.**

IpBlbHitTest

Syntax

IpBlbHitTest *(X,Y)*

Description

This function tests whether the specified point is within the object.

Parameters

X	**Integer**	Indicates the horizontal position to test, in image coordinates
Y	**Integer**	Indicates the vertical position to test, in image coordinates

Return Value

Returns the object ID if the point is within an object, and -1 if the point is not.

Comments

Previously, the return value for this function could have been an integer; with IPP 6.1 it must now be a long.

IpBlbLoadOutline

Syntax

IpBlbLoadOutline(*OutlineFile*)

Description

This function loads a counted object, outline file into the active image. Equivalent to the **Load Outlines** command located on the **Count/Size** window's *File* menu.

Parameters

OutlineFile	**String**	A string specifying the name of the file from which the outlines are to be read.

Example

```
ret = IpBlbLoadOutline("C:\IPWIN\DATA.SCL")
```

This statement will load outlines from the file DATA.SCL in the \IPWIN directory on the C: drive.

Comments

The file specified by *OutlineFile must* be an *Image-Pro* binary .SCL file, not an ASCII outline file. See `IpBlbSaveOutline`.

See Also

IpBlbSaveOutline

IpBlbLoadSetting

Syntax

IpBlbLoadSetting(*SettingFile*)

Description

This function loads the environment values (i.e., the intensity, option and measurement selections) from an environment file. Equivalent to the **Load Settings** command located on the **Count/Size** window's *File* menu.

Example

```
ret = IpBlbLoadSetting("C:\IPWIN\SPORES.ENV")
```

This statement will initialize the environment with values from the SPORES.ENV file located in the \IPWIN directory on the C: drive.

Comments

Consider using this function to initialize the environment if you are developing a counting macro that must be executed under the same conditions each time it is run.

See Also

IpBlbSaveSetting

IpBlbMeasure

Syntax

IpBlbMeasure( )

Description

This function performs the selected measurements upon the current set of counted objects. Equivalent to clicking the **Measure** button in the **Select Measurements** dialog box.

Example

```
ret = IpBlbEnableMeas(BLBM_CENTRX, 1)
ret = IpBlbEnableMeas(BLBM_MAXFERRET, 1)
ret = IpBlbMeasure()
```

This set of statements will select the Centr-X (BLBM_CENTRX) and Max. Dia. (BLBM_MAXFERRET) measurements, and will then measure the counted objects.

See Also

IpBlbEnableMeas, IpBlbFilter, IpBlbData

IpBlbMultiRanges

Syntax

IpBlbMultiRanges(*intRanges, NumRanges)*

Description

This function sets multiple range limits for gray-scale images. It is equivalent to the "Select Ranges" command in the Count/Size window. Do not use this command with RGB-class images.

Parameters

intRanges	**Single(Basic)** **LPSINGLE (C)**	It contains 2*numranges of single type values specifying the starting and ending values of each range.
numranges	**Integer**	Indicates the total number of ranges specified.

See Also

IpBlbSetRange

IpBlbRange

Syntax

IpBlbRange *(Range)*

Description

This function selects a new active range.

Parameters

Ranges	**Integer**	Indicates the range to activate. Must be between 0 and the maximum range currently defined.

Return Value

0 if successful, an error code if failed.

See Also

IpBlbSetRange

IpBlbRemoveHoles

Syntax

IpBlbRemoveHoles( )

Description

This function eliminates counted objects that are embedded within other counted objects, and considers all pixels encompassed by the perimeter of an object as belonging to the object. Equivalent to the **Remove Holes** command on the *Edit* menu in the **Count/Size**command window.

See Also

IpBlbSetAttr

IpBlbSaveClasses

Syntax

IpBlbSaveClasses*(szDataFile, sAppend)*

Description

This function saves or appends the class data to a file, or writes the data to the Clipboard.

Parameters

szDataFile	**String**	A string specifying the name of the file to which the measurement data will be written. This parameter is ignored when *Append* is set to S_CLIPBOARD. When this is the case, set *DataFile* to an empty string (i.e., "").
SAppend	**Integer**	An enumerated integer specifying whether the measurement data is to be stored as a new file, appended to an existing file or written to the Clipboard. Where: 0 - Stores data to a new file (if the file already exists, it will be overwritten). S_APPEND - Appends data to existing file. S_CLIPBOARD - Copies data to the Clipboard.

Example

```
ret = IpBlbSaveClasses("C:\IPWIN\CLUSTER.CNT", 0)
```

IpBlbSaveData

Syntax

IpBlbSaveData(*DataFile*, *Append*)

Description

This function saves, or appends, the current measurements or statistics to a file or the Clipboard. Equivalent to the **Save Data**, **Append Data** and **Copy to Clipboard** commands on the **Measurements** and **Statistic**s windows' *File* menus.

Parameters

DataFile	**String**	A string specifying the name of the file to which the measurement data will be written. The file extension determines the file format. Where: .WK1 - Lotus® WK1 format. .XLS - Microsoft® Excel XLS format. Anything else specifies ASCII format.
Append	**Integer**	An expression involving the addition of two enumerated integers, where the first operand specifies whether the measurement data or statistics are to be stored, as follows: S_DATA - Measurement Data S_STATS - Measurement Statistics and the second operand specifies whether the measurement data is stored as a new file, appended to an existing file or written to the Clipboard, as follows: S_DDE - Sends data to an Excel worksheet S_APPEND - Appends data to existing file. S_CLIPBOARD - Copies data to the Clipboard S_PRINT_TABLE - sends the data to the printer If no second operand is supplied, the data is saved to a new file (if the file already exists, it will be overwritten). See the examples below for usage.

Example

```
ret = IpBlbSaveData("C:\IPWIN\DATA.CNT", S_DATA)
```

This statement will save the current measurement data to a new file called DATA.CNT in the \IPWIN directory on the C: drive.

```
ret = IpBlbSaveData("C:\IPWIN\DATA.CNT", S_DATA+S_APPEND)
```

This statement will append the current measurement data to a file called DATA.CNT in the \IPWIN directory on the C: drive.

```
ret = IpBlbSaveData("", S_STATS+S_CLIPBOARD)
```

This statement will append the current statistic data to the Clipboard. The *DataFile* parameter is set to a zero-length string, as this data is not required for a Clipboard operation.

IpBlbSaveOutline

Syntax **IpBlbSaveOutline**(*OutlineFile*)

Description This function saves the current counted-object outlines to a file. Equivalent to the **Save Outlines** command on the *File* menu in the **Count/Size**command window.

Parameters

OutlineFile	**String**	A string specifying the name of the file to which the current object outlines will be written. The file name's extension determines the format in which it is saved, where: .SCL - Specifies a binary outline file. Anything else specifies an ASCII-format outline file.

Example

```
ret = IpBlbSaveOutline("C:\IPWIN\PERIM.SCL")
```

This statement will save the current outlines in binary form to the PERIM.OUT file in the \IPWIN directory on the C: drive.

See Also IpBlbLoadOutline

IpBlbSavePopDensities

Syntax **IpBlbSavePopDensities**(*DataFile, Append*)

Description This function saves, or appends, the current population density results to a file or the Clipboard. Equivalent to the **Save**, **Append** and **Copy to Clipboard** commands on the **Population Density** windows' *File* menu.

Parameters

DataFile	**String**	A string specifying the name of the file to which the population density data will be written. This parameter is ignored when ***append*** is set to S_CLIPBOARD. When this is the case, set ***DataFile*** to an empty string (i.e., "").
Append	**Integer**	An enumerated integer specifying whether the population density data is to be stored as a new file, appended to an existing file or written to the Clipboard. Where: 0 - Stores data to a new file (if the file already exists, it will be overwritten). S_APPEND - Appends data to existing file S_CLIPBOARD - Copies data to the Clipboard S_PRINT_TABLE - Sends the data to the printer

Example

```
ret = IpBlbSavePopDensities("C:\IPWIN\PD1.cnt", 0)
```

This statement will save the contents of the **Population Density** window to the PD1.CNT file in the \IPWIN directory on the C: drive.

```
ret = IpBlbSavePopDensities("C:\IPWIN\PD1.cnt", S_APPEND)
```

This statement will append the contents of the **Population Density** window to the PD1.CNT file in the \IPWIN directory on the C: drive.

```
ret = IpBlbSavePopDensities("", S_CLIPBOARD)
```

This statement will save the contents of the **Population Density** window to the Clipboard. The *DataFile* parameter is set to a zero-length string, as this data is not required for a Clipboard operation.

Comments

The `IpBlbShowPopDens` function, with its *bShow* flag enabled, must be called before this function. Otherwise, no data will be saved.

See Also

IpBlbShowPopDen

IpBlbSaveSetting

Syntax

IpBlbSaveSetting(*SettingFile*)

Description

This function saves the current **Count/Size** intensity, option and measurement settings to a file. Equivalent to the **Count/Size** window's **Save Settings** command.

Parameters

SettingFile	**String**	A string specifying the name of the file to which the current environment settings will be written.

Example

```
ret = IpBlbSaveSetting("C:\IPWIN\SPORES.ENV")
```

This statement will save the current **Count/Size** environment settings to the SPORES.ENV file in the \IPWIN directory on the C: drive.

See Also

IpBlbLoadSetting

IpBlbSetAttr

Syntax

IpBlbSetAttr(*Attrib*, *Value*)

Description

This function selects, sets or deselects options relating to the **Count/Size** command.

Parameters

Attrib	**Integer**	An enumerated integer which identifies the option to be set. Must be one of the following: BLOB_ADDCOUNT BLOB_AUTORANGE BLOB_BRIGHTOBJ BLOB_CLEANBORDER BLOB_CONVEX BLOB_DISPLAY BLOB_FILLHOLES BLOB_FILTEROBJECTS BLOB_LABELMODE BLOB_LABELCOLOR BLOB_LABELMEAS BLOB_MEASUREOBJECTS BLOB_MINAREA BLOB_OUTLINEMODE BLOB_OUTLINECOLOR BLOB_SMOOTHING BLOB_8CONNECT See definitions under Comments, below.
Value	**Integer**	An integer specifying how the option specified in *Attrib* is to be set. See definitions below for the values allowed by each option.

Example

```
ret = IpBlbSetAttr(BLOB_LABELCOLOR,2)
```

This statement sets the label color to blue.

Comments

Attrib options are as follows:

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_ADDCOUNT	Specifies whether the measurements of new objects will replace, or be merged with, the existing measurement results. Equivalent to the **Add Count** check box in the **Count/Size** command window.	0 - Adds new results to existing count. 1 - Replaces existing count with new results
BLOB_AUTORANGE	Specifies whether objects are to be extracted using *Image-Pro's* automatic intensity selection feature, or whether they are to be set according to the values specified by `IpBlbSetRange`. Equivalent to selecting the **Automatic** or **Manual** radio button in the **Count/Size**command window.	0 - Selects manual intensity selection. 1 - Selects automatic intensity selection.
BLOB_BRIGHTOBJ	Specifies whether objects are comprised of dark or bright intensities relative to the background. This attribute is relevant only when the **Automatic** intensity selection mode is set (BLOB_AUTORANGE enabled). Equivalent to selecting the **Bright Objects** or **Dark Objects** radio button in the **Count/Size** command window.	0 - Selects dark objects. 1 - Selects bright objects.

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_CLEANBORDER	Specifies whether objects that intersect the edge of the active image or AOI are to be included in the count. Equivalent to the Clean Borders option in the Count/Size Options dialog box. Combinations of these values can be used to specify combinations of clean border settings. For example, 18 (16{N/E} + 2{E/W}) will specify clean N/W/E borders	0 - Deselects clean border (objects at the edge are counted). 1 - All- Selects clean border (objects at the edges are excluded). 2 - East/West 4 - North/South 8 - North/West 16 - North/East 32 - South/West 64 - South/East
BLOB_CONVEX	Specifies convex objects	0 - Deselects convex objects 1 - Selects convex objects
BLOB_DISPLAY	Displays the count/size objects	0 - hides objects 1 - displays objects
BLOB_FILLHOLES	Specifies whether <u>all</u> pixels encompassed by an object's perimeter belong to the object, or whether just the pixels possessing a value within the selected intensity range are part of the object. Equivalent to the **Fill Holes** option in the **Count/Size Options** dialog box.	1 - Selects fill holes
		1 - Selects fill holes
BLOB_FILTEROBJECTS	Specifies whether the measurement criteria will be applied during the count process.	0 - Ignore range criteria.
		1 - Apply range criteria.
	Equivalent to **the Apply Ranges** check box in the **Count/Size**command window.	
BLOB_LABELCOLOR	Specifies the color to be used to label the counted objects. Equivalent to selecting the label color in the **Count/Size options** dialog box.	0 - Red
		1 - Green
		2 - Blue
		3 - Yellow
		4 - Cyan
		5 - Magenta
		6 - White
		7 - Black
		8 - Dark Red
		9 - Brown

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_LABELMODE	Selects the label style to be used to tag the counted objects. Equivalent to selecting the label style in the **Count/Size options** dialog box.	0 - None 1 - Object # 2 - Class 3 – Selected measurement value
BLOB_MEASUREOBJECTS	Specifies whether objects will simply be counted, or whether they will be counted and measured. Equivalent to the **Measure Objects** checkbox in the **Count/Size**window.	0 - Do not measure objects. 1 - Count and measure objects.
BLOB_MINAREA	Specifies whether the total object population will be comprised of all intensity-matching objects, or just objects meeting the specified measurement criteria. Equivalent to the **Pre-filter** option in the **Count/Size**options dialog box	0 - Deselects Pre-filter 1 - Selects Pre-filter
BLOB_OUTLINECOLOR	Selects the outline color to be used to outline the counted objects. Equivalent to selecting the outline color in the **Count/Size options** dialog box.	0 - Red 1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black 8 - Dark Red 9 - Brown
BLOB_OUTLINEMODE	Selects the outline style to be applied to the counted objects. Equivalent to selecting the outline style in the **Count/Size options** dialog box.	0 - None 1 - Outline 2 - With Holes 3 - Filled 4 - Ellipse 5 - Class

ATTRIB	**DESCRIPTION**	**ALLOWED VALUES**
BLOB_SMOOTHING	Specifies how much smoothing is to be performed to the counted object's outline.	You may specify a value from 0 to 100, inclusive, where 0 specifies no smoothing, and 100 specifies maximum smoothing.
BLOB_8CONNECT	Selects 8-connected objects	1 - 8-connect on, 4-connect off 0 - 8 connect off, 4-connect on
BLOB_LABELMEAS	Sets the measuremnt that will be used as the object label when the BLOB_LABELMODE is set to 3, using the BLBM constants. The specified measurement must be selected for measurement or IpBlbSetAttr will return an error.	Any of the BLBM constants, such as BLBM_AREA.

See Also IpBlbSetRange,

IpBlbSetFilterRange

Syntax **IpBlbSetFilterRange**(*MeasurementType, min, max*)

Description This function sets measurement criteria. Equivalent to specifying the **Start** and **End** values for each measurement with the **Set Ranges** command on the **Measure** menu in the **Count/Size** command window.

Parameters

MeasurementType	**Integer**	An enumerated integer specifying the measurement to be selected or deselected. See list in IpBlbEnableMeas
min	**Single**	BLBM_RED BLBM_ROUNDNESS BLBM_SIZECOUNT BLBM_WIDTH See IpBlbEnableMeas for descriptions
max	**Single**	A number (of IPBasic type, Single) specifying the largest value to be allowed for the specified measurement.

Example

```
ret = IpBlbSetFilterRange(BLBM_PERIMETER, 95.0, 450.0)

ret = IpBlbSetFilterRange(BLBM_AREA + CALIB_UNIT 1.2, 3.4)
would be the same as

ret = IpBlbSetFilterRange(BLBM_AREA 240,680)
assuming that 240 pixels = 1.2 units, and 680 pixels = 3.4
units
```

This statement will set the range of allowable perimeter values from 95.0 to 450.0.

Comments

The *min* and *max* values are expessed by default in terms of pixels or pixel square. To pass the min and max values in terms of the current spatial calibration, add the flag CALIB_UNIT to the first parameter, as shown here:

```
ret = IpBlbSetFilterRange(BLBM_AREA + CALIB_UNIT, 0.01, 0.02)
```

CALIB_UNIT is defined as 0 x 4000 (in C) or &4000 (in Basic)

See Also

IpBlbFilter

IpBlbSetRange

Syntax

IpBlbSetRange(*Start*, *End*)

Description

This function specifies the range of intensities that define objects to be counted when **Automatic** intensity selection is disabled (BLOB_AUTORANGE off). Equivalent to clicking the **Set Range** button in the **Count/Size** command window and selecting the intensity range manually.

Parameters

Start	**Integer**	An integer between 0 and 255 (inclusive) that defines the smallest allowed value in the range.
End	**Integer**	An integer between 0 and 255 (inclusive) that defines the largest allowed value in the range.

Example

```
ret = IpBlbSetRange(58, 109)
```

This statement specifies that pixels possessing intensity values between 58 to 109 (inclusive) comprise objects.

Note - in 12-bit and single-point images, the normalized equivalents to these values will be used.

Comments

For RGB images, the *Start* and *End* values represent the values of the luminance channel.

See Also

IpBlbSetAttr(BLOB_AUTORANGE,0), IpBlbRange

IpBlbSetRangeEx

Syntax

IpBlbSetRangeEx(*Range*, *Start*, *End*)

Description

This function allows you to specify multiple intensity ranges.

Parameters

Range	**Integer**	Indicates the intensity range to add or modify.
Start	**Single**	Indicates the first value in the specified range.
End	**Single**	Indicates the last value in the specified range.

Return Value

0 if successful, a negative error code if failed.

See Also

IpBlbRange, IpBlbSetRange

IpBlbShow

Syntax **IpBlbShow**(*bShow*)

Description This function is used to open or close the **Count/Size**command window. Equivalent to selecting the **Count/Size** command to open the window, and clicking the **Close** button within it to close it.

Parameters

bShow	**Integer**	Am integer value of 0 or 1 specifying whether the **Count/Size** command window is to be shown. Where: `0` - Closes the window if it is already open. `1` - Opens the window.

Example

```
ret = IpBlbShow(1)
```

This statement will make the **Count/Size** command window visible during execution of the macro.

Comments The **Count/Size** command window does not have to be open during execution of any of the count macro functions. Its disposition, visible or hidden, is entirely your choice. You will want to display the window if your users will be required to make choices within it, but if your objective is simply to obtain measurement results, you may want to run without opening it.

See Also IpBlbSaveStatistics, IpBlbSaveClasses, IpBlbSavePopDensities

IpBlbShowAutoClass

Syntax **IpBlbShowAutoClass**(*ipClassifiers*, *NumMeas*, *NumClasses*, *bIterate*, *bShow*)

Description This function performs an auto-classification process on the current set of measurement results. Equivalent to the **Auto-classification** command located on the *Measure* menu in the **Count/Size**command window.

Parameters

ipClassifiers	**Integer (Basic)** **LPSHORT (C)**	The name and first element of an array containing the integers representing the measurement types that are to be used for classification. By default this array is defined as `ipClassifiers(0)`. See Comments, below, for valid classifier values.
NumMeas	**Integer**	An integer from 1 to 3 (inclusive) specifying the number of types by which auto-classification is to be done. Equivalent to counting the number of Classifiers selected in the **Auto-Classification** dialog box. This value identifies the number of elements in the `ipClassifiers` array.
NumClasses	**Integer**	An integer from 1 to 16 (inclusive) specifying the maximum number of categories into which the data will be classified. Equivalent to the value entered into the **Max. Classes**: field in t**he Auto-Classification** dialog box.

bIterate	**Integer**	An integer value of 0 or 1 specifying whether the iteration option is to be applied during classification. Where: 0 - Iterate option off. 1 - Iterate option on. Equivalent to deselecting/selecting the **Iterate** check box in the **Auto-Classification** dialog box.
bShow	**Integer**	An integer value of 0 or 1 specifying whether the Auto-Classification window is visible or hidden, where: 0 - Sets the window to be hidden. 1 - Sets the window to be visible.

Example

```
ipClassifiers(0) = BLBM_AREA
ipClassifiers(1) = BLBM_ASPECT
ipClassifiers(2) = BLBM_CENTRX
ret = IpBlbShowAutoClass(ipClassifiers(0), 3, 7, 1,1)
```

This set of statements performs an iterative auto-classification of the three classifiers into 7 categories. The auto-classification window is displayed during classification.

Comments

The `ipClassifiers` array must contain integers representing the measurement types that are to be used.

See Also

IpBlbEnableMeas

IpBlbShowCluster

Syntax

IpBlbShowCluster(*bShow*)

Description

This function performs a cluster analysis of the current measurements and displays the **Clusters Info** message box. Equivalent to the **Clusters** command located on the *Measure* menu in the **Count/Size** command window.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the “Clusters” dialog box. Where: 0 - Closes the dialog box. 1 - Opens the dialog box and performs the cluster analysis.

Example

```
ret = IpBlbShowCluster(1)
```

This statement will perform the cluster analysis, display the analysis results in the **Cluster** dialog box and wait for the user to click **OK** before proceeding to the next macro statement.

IpBlbShowData

Syntax	**IpBlbShowData**(*bShow*)		
Description	This function opens or closes the **Measurements** data window. Equivalent to the **Measurement Data** command located on the **Count/Size** window's *View* menu.		
Parameters	*bShow*	**Integer**	A value of 0 or 1 specifying whether to open or close the **Measurement** data window. Where: 0 - Closes the **Measurements** data window 1 - Opens the **Measurements** data window

Example

```
ret = IpBlbShowData(1)
```

This statement will display the measurements data window.

IpBlbShowHistogram

Syntax	**IpBlbShowHistogram**(*Measure, Bins, bShow*)		
Description	This function displays a histogram of the specified measurement. Equivalent to the **Histogram** command on the **Count/Size** command window's *View* menu. *Note - do not confuse this function with the **Histogram** command used to create intensity histograms. This functions plots measurement results. See IpHstCreate for intensity plotting.*		
Parameters	*Measure*	**Integer**	An enumerated integer specifying the measurement to be selected or deselected. See list in IpBlbEnableMeas.
	Bins	**Integer**	
	bShow	**Integer**	An integer value of 0 or 1 specifying whether the **Histogram** dialog box is to be displayed or hidden. Where: 0 - Hides the **Histogram** window. 1 - Displays the **Histogram** window.

Example

```
ret = IpBlbShowHistogram(BLBM_AREA,8,1)
```

This statement will display an 8-bin histogram of the area measurement, then wait for the user to close the dialog box before continuing to the next macro statement.

Comments

When the *bShow* value is set to 1, the histogram is displayed and macro execution halts until the user manually closes the histogram window. Once the window is closed, macro execution resumes at the next statement.

When the *bShow* value is set to 0, the `IpBlbShowHistogram` statement is ignored — no histogram window is shown, and execution is not halted. The function has been implemented this way to ensure its compatibility with future versions of *Auto-Pro.*

To set the range of the Histogram, see `IpBlbShowSingleClass`

See Also

IpBlbEnableMeas., IpBlbShowSingleClass

IpBlbShowObjectWindow

Syntax

IpBlbShowObjectWindow(*bShow*)

Description

This function displays the object window. Equivalent to the **Object Window** command located on the **Count/Size** command window's *View* menu.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the **Object** information window. Where: 0 - Closes the **Object** window. 1 - Opens the **Object** window.

Example

```
ret = IpBlbShowObjectWindow(1)
```

This statement will display the **Object** window.

IpBlbShowPopDens

Syntax

IpBlbShowPopDens(*OutlineFile*, *bShow*)

Description

This function performs a population density analysis. Equivalent to the **Population Density** command located on the **Count/Size**window's Measure menu.

Parameters

OutlineFile	**String**	A string specifying the name of the file from which the site outlines will be read.
bShow	**Integer**	An integer value of 0 or 1 specifying whether the **Population Density** window and the site outlines are to be displayed . Where: 0 - Closes the **Population Density** window if it is already open, or suppresses its display if a population density measurement is being performed. 1 - Displays the **Population Density** window and site outlines.

Example

```
ret = IpBlbShowPopDens("C:\IPWIN\CELLS.OUT", 1)
```

This statement will perform a population density analysis using the site outlines from the CELLS.OUT file in the \IPWIN directory on the C: drive. The **Population Density** window, and the cell site outlines will be displayed.

Comments

To close the **Population Density** window, set the *bShow* parameter to 0 and specify a zero-length string in *OutlineFile*, as shown in the following example:

```
ret = IpBlbShowPopDens("", 0)
```

If you intend to save population density information to the Clipboard or a file, you *must* first call this function with its *bShow* flag enabled. Otherwise, no data will be saved.

See Also

IpBlbSavePopDensities, IpBlbShow

IpBlbShowScattergram

Syntax

IpBlbShowScattergram(*xMeasure, yMeasure, bShow*)

Description

This function displays a scattergram of the specified measurement types. Equivalent to the **Scattergram** command on the **Count/Size**command window's *View* menu.

Parameters

xMeasure	**Integer**	An enumerated integer specifying the measurement to be selected or deselected. See list in IpBlbEnableMeas.
yMeasure	**Integer**	See list in IpBlbEnableMeas
bShow	**Integer**	An integer value of 0 or 1, specifying whether to open or close the **Scattergram** window. Where: 0 - Closes the **Scattergram** window. 1 - Opens the **Scattergram** window.

Example

```
ret = IpBlbShowScattergram(BLBM_AREA, BLBM_PERIMETER, 1)
```

This statement will display a scattergram of the area and perimeter measurements then wait for the user to close the scattergram before continuing to the next macro statement.

Comments

When the *bShow* value is set to 1, the scattergram is displayed and macro execution is halted until the user manually closes the scattergram window. Then, macro execution resumes with the next statement. When the *bShow* value is set to 0, the IpBlbShowScattergram statement is ignored — no scattergram is shown, and macro execution is not halted. The function has been implemented in this way to ensure its compatibility with future versions of *Auto-Pro.*

When a **Scattergram** command is recorded, the `IpBlbShowScattergram` function is not written to the script file until the **Scattergram** window is closed.

IpBlbShowSingleClass

Syntax

IpBlbShowSingleClass(*NumMeasurements, ipBins, NumClasses, bShow*)

Description

This function classifies the specified measurement type.

Parameters

*Num*Measurements	**Integer**	An enumerated integer specifying the measurement type that is to be classified. See *MeasurementType* parameter under `IpBlbEnableMeas` for allowed values.
ipBins	**Single (Basic)** **LPSINGLE (C)**	The name and first element of an array containing the values (of IPBasic type,Single) specifying the intervals into which the measurement is to be classified. The first value represents the beginning of the first interval, the second the beginning of the second interval and so forth. The last value in the array specifies the end of the range. Equivalent to the “Bins Start At” values in the **Classification** dialog box.
NumClasses	**Integer**	An integer specifying the number of classifications into which the measurement is to be divided.

bShow	**Integer**	An integer value of 0 or 1 specifying whether to display the **Classification** window. Where: 0 - Closes the **Classification** window. 1 - Opens the **Classification** window. 2 - Open the **Histogram** window and set the histogram range. When *bShow* is set to 0, the *Num***Measurements***, ipBins* and *NumClasses* parameters are ignored.

Example

The following set of statements divides the perimeter into 6 classes, as defined by the values in *ipBins*. The results are displayed in the **Classification** window and saved to the file CLASS2.CNT. The window is then closed.

```
ipBins(0) = 8.0
ipBins(1) = 51.83333
ipBins(2) = 95.66666
ipBins(3) = 139.50
ipBins(4) = 183.3333
ipBins(5) = 227.1667
ipBins(6) = 271.0
ret = IpBlbShowSingleClass(18, ipBins(), 6, 1)
ret = IpBlbSaveClasses("C:\IPWIN\CLASS2.CNT", 0)
ret = IpBlbShowSingleClass(0, ipBins(0), 0, 0)
```

The following example shows how to display the area classification results as a histogram with 10 equally spaced classes between 0 and 100 calibrated area units.

```
ipBins(0) = 0
ipBins(1) = 100
ret = IpBlbShowSingleClass(BLBM_AREA, ipBins(0), 10, 2)
```

When the class intervals are equal, you can display the classification data as a graph *(bShow* = 2), where each class is represented as a bar, and the height of the bar represents how many objects fall in the class. In this mode, calling `IpBlbShowSingleClass` is the same as calling `IpBlbShowHistogram`, with the added functionality of being able to set the start and end limits of the histogram (see example).

Comments

If you intend to save classification data to the Clipboard or a file, you must first call this function with its *bShow* flag enabled. Otherwise, no data will be saved. When *bShow* is set to 0, the *NumMeasurement*s, *ipBins*, and *NumClasses* parameters are ignored.

See Also

IpBlbSaveClasses, IpBlbShowHistogram

IpBlbShowStatistics

Syntax

IpBlbShowStatistics(*bShow*)

Description

This function calculates and, optionally, displays the statistics window. Equivalent to the **Statistics** command on the **Count/Size** command window's *View* menu.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the **Statistics** information window. Where: 0 - Closes the **Statistics** window. 1 - Opens the **Statistics** window. 2 - Closes the **Range Statistics** window. 3 - Opens the **Range Statistics** window

Example

```
ret = IpBlbShowStatistics(1)
```

This statement will calculate statistics for the current measurement results, show the **Statistics** window then append the data to the STATS.CNT file.

See Also

IpBlbSaveStats

IpBlbSmoothObjects

Syntax

IpBlbSmoothObjects(*smoothing*)

Description

This function smoothes object outlines. Equivalent to the **Smooth Objects** command on the Edit menu in the **Count/Size**command window.

Parameters

smoothing	**Integer**	An integer between 1 and 100 (inclusive) specifying the degree of smoothing that is to be applied.

Example

```
ret = IpBlbSmoothObjects(50)
```

This statement will apply smoothing to the counted outlines using a smoothing degree of 50.

See Also

IpBlbSetAttr

IpBlbSplitObjects

Syntax **IpBlbSplitObjects**(*bWatershed*)

Description This function splits counted objects within the active image or AOI using either the auto-split or watershed-split method. Equivalent to the **Auto-Split** and **Watershed Split** commands on the **Count/Size**command window's Edit menu.

Parameters

bWatershed	**Integer**	An integer value of 0, 1, or 2 specifying whether to use the Watershed, Limited Watershed, or Automatic splitting method. Where: 0 - Applies the "Auto-Split" method. 1 - Applies the "Watershed" method. 2 - 127 : Applies the "Limited Watershed" method, where the number of pixels eroded for separation testing is limited to N-1.

Example

```
ret = IpBlbSplitObjects(1)
```

This statement will split counted objects using the Watershed method.

IpBlbUpdate

Syntax **IpBlbUpdate**(*bRedrawImage*)

Description This function updates the active image window, as well as the **Measurements** and **Statistics** windows, if they are open. When a macro is recorded, this function is automatically inserted after any action that affects the display of counted objects in the image window, or the results that are presented in the data sheets. There is no equivalent command in *Image-Pro's* interactive mode, as the screen is automatically updated anytime a command affects it.

Parameters

bRedrawImage	**Integer**	An integer value of 0, 1 , 2 or 4 specifying whether to redraw the outlines in the image. Where: 0 - Redraws object outlines. 1 - Redraws image and outlines. 2 - Updates classification. 4 - Discards out-of-range objects. Equivalent to choosing *Edit:Delete Hidden Objects* from the **Count/Size** menu bar.

Example

```
ret = IpBlbUpdate(1)
```

This statement will update the count/size environment and redraw the image window.

IpCalGet

Syntax **IpCalGet***(ByVal, sAttrib)*

Description This function returns various attributes of the intensity or spatial calibration attached to the active image.

Parameters

<sAttrib>	**String**	Command (see list below):
<sOutput>	**fixed length String**	Result (see example)

Command Name	**Description**
iName	intensity calibration name
iUnitName	intensity unit name
iType	calibration type (0 = free form, 1 = OD, 2 = response curve)
iNumPoints	number of calibration points
iFitMode	fitting method
iBlack	black OD level
iIncidend	incident OD level
sName	spatial calibration name
sUnitName	spatial unit name
sXUnitPerPix	number of units per pixel horizontally
sYUnitPerPix	number of units per pixel vertically
sXOrigin	X-origin
sYOrigin	Y-origin
sAngleOffset	Angle offset (0 deg. = vertical axis

Comments IpCalGet can be called to inquire one of fourteen attributes. More attributes are likely to be added in future versions.

Return Value 0 if successful, -7 if no calibration found on active image.

Example The following example prints out all calibration settings to the output window.

```
sub get_calib_param()
dim szout as string * 255
dim xratio as single, yratio as single
ret = IpCalGet("iName", szout)
if ret < 0 then
   debug.print "no intensity calibration"
   goto end_intensity
end if

debug.print "intensity calibration:"
debug.print "calib name = " + szout
ret = IpCalGet("iUnitName", szout)
debug.print "unit name = " + szout
ret = IpCalGet("iType", szout)
if val(szout) = 0 then
```

```
   debug.print "type = free form"
   ret = IpCalGet("iNumPoints", szout)
   debug.print "number of points = " + str$(val(szout))
   ret = IpCalGet("iFitMode", szout)
   debug.print "fitting method = " + str$(val(szout))
end if
if val(szout) = 1 then
   debug.print "type = optical density"
   ret = IpCalGet("iBlack", szout)
   debug.print "black level = " + str$(val(szout))
   ret = IpCalGet("iIncident", szout)
   debug.print "incident level = " + str$(val(szout))
end if
if val(szout) = 2 then
   debug.print "type = response curve"
end if

end_intensity:
ret = IpCalGet("sName", szout)
if ret < 0 then
   debug.print "no spatial calibration"
   exit sub
end if

debug.print "spatial calibration:"
debug.print "calib name = " + szout
ret = IpCalGet("sUnitName", szout)
debug.print "unit name = " + szout

ret = IpCalGet("sXUnitPerPix", szout)
xratio = val(szout)
debug.print "unit/pix (x) = " + str$(xratio)
ret = IpCalGet("sYUnitPerPix", szout)
yratio = val(szout)
debug.print "unit/pix (y) = " + str$(yratio)
debug.print "aspect ratio = " + str$(yratio / xratio)

ret = IpCalGet("sXOrigin", szout)
debug.print "origin (x) = " + str$(val(szout))
ret = IpCalGet("sYOrigin", szout)
debug.print "origin (y) = " + str$(val(szout))
ret = IpCalGet("sAngleOffset", szout)
debug.print "angle offset = " + str$(val(szout))

end sub
```

IpCalLoad

Syntax **IpCalLoad**(*FileName*)

Description This function loads the specified calibration file from disk. Equivalent to the **Calibration** command's *Open* menu item.

Parameters

FileName	**String**	A string specifying the name of the file from which the calibration values will be read.

Example

```
ret = IpCalLoad("C:\IPWIN\MICRONS.CAL")
```

This statement will load the calibration values from the MICRONS.CAL file in the \IPWIN directory on the C: drive.

Comments All of the calibrations found in the specified file will be added to the lists of Spatial and Intensity Calibrations. None of the calibrations will be applied to the active image or made the active calibration. Note: It may be preferable to use IpICalLoad or IpScalLoad to load calibrations into either the General or Reference Calibration lists. This function is retained for backward compatibility with earlier versions.

IpCalSave

Syntax **IpCalSave**(*FileName*)

Description This function saves the current calibration values to disk. Equivalent to the **Calibration** command's **Save** menu item.

Parameters

FileName	**String**	A string specifying the name of the file to which the calibration values will be written.

Example

```
ret = IpCalSave("C:\IPWIN\MICRONS.CAL")
```

This statement will save the current intensity and spatial calibration values to the MICRONS.CAL file in the \IPWIN directory on the C: drive.

Comments If the file you specify already exists, it will automatically be overwritten.

IpCalSaveAll

Syntax **IpCalSaveAll**(*FileName*)

Description This function saves the current calibration values to disk. Equivalent to the **Calibration** command's *Save All* menu item.

Parameters

FileName	**String**	A string specifying the name of the file to which the calibration values will be written.

Example

```
ret = IpCalSaveAll("C:\IPWIN\MICRONS.CAL")
```

This statement will save the current intensity and spatial calibration values to the MICRONS.CAL file in the \IPWIN directory on the C: drive.

Comments If the file you specify already exists, it will automatically be overwritten.

IpCalSaveEx

Syntax **IpCalSaveEx**(*FileName, DocID, Mode*)

Description This function saves the current calibration values of the specified document to disk.

Parameters

FileName	**String**	A string specifying the name of the file to which the calibration values will be written.
DocID	**Integer**	Document ID of the image where calibration should be saved.
Mode	**Integer**	Can be zero, or any combination of NONAME and NOSYSTEM. If NONAME is specified, the calibration is saved without a calibration name. NOSYSTEM is used to prevent the saved calibration from becoming the default system calibration.

Return Value 0 if successful, an error code if failed.

See Also IpCalSave

IpCapArea

Syntax **IpCapArea**(*ipFrame, bCursor*)

Description This function captures the entire screen or a portion of the screen, and stores it to a file. Equivalent to selecting the Screen Capture hot key with the **Screen** or **Area** selection settings.

Parameters

ipFrame	**RECT**	The name of a variable containing the AOI coordinates, or 0 (zero). Where: Variable name - indicates that only a portion of the screen is to be captured, and specifies the name of the variable containing the upper-left and lower-right coordinates of that portion. By default, this variable is defined as `ipFrame`. 0 - specifies that the entire screen is to be captured.
bCursor	**Integer**	An integer value of 0 or 1 specifying whether the cursor is to be included in the captured image. Where: 0 - Saves the image without the cursor. 1 - Saves the image, including the cursor.

Example

```
Dim ipFrame as rect
ipFrame.left=92
ipFrame.top=51
ipFrame.right=374
ipFrame.bottom=280
ret = IpCapArea(ipFrame,0)
ret = IpBitSaveData(" ", S_CLIPBOARD)
```

This set of statements will capture and save the contents of the rectangular screen area from pixel position 92,51 to 374,280.

The following illustrates the statement that would be used to capture the *entire* screen:

```
ipFrame.left=-1
ret = IpCapArea(ipFrame,0)
```

Comments

Regardless of the value in *bCursor*, the cursor will not be captured by an **Area** capture operation (a non-zero *ipRect* parameter).

The image file name and format can be specified using the `IpCapFile` function. If these values are not explicitly set using IpCapFile, the options currently in effect for the system will be used.

See Also

IpCapFile, IpCapWindow

IpCapFile

Syntax

IpCapFile(*FileFormat*, *Directory*, *Prefix*, *Number*)

Description

This function specifies the file format, name and location to which **Screen Capture** data will be stored. Equivalent to setting the "File Format", "File Template" and "Destination Directory" fields in the **Capture Options** dialog box.

Parameters

FileFormat	**String**	A string specifying the file format in which the image is to be stored. Expressed in "*.XXX" format, where XXX identifies the standard extension used to designate the image file format (e.g., TIF, BMP, GIF). See Comments, below, for a list of valid formats.
Directory	**String**	A string specifying the directory into which the captured data will be stored.
Prefix	**String**	A string specifying the "prefix" to be used to compose the file names for the saved images.
Number	**Integer**	An integer specifying the number of digits to be used to generate the sequence number that will be appended to the string in *Prefix* to create a file name.

Example

```
ret = IpCapFile("*.PCX", "C:\IMAGES", "IMG", 4)
```

This statement will set the capture options so that captured images are stored in PCX format to the \IMAGES directory on the C: drive. The names of stored files will begin with the prefix "IMG", which will be followed by a 4-digit sequence number (e.g., IMG0000, IMG0001, IMG0002).

Comments

The length of the *Prefix* string must not exceed 4. The length of the *Prefix* string combined with the value of *Number* must not exceed 8.

The following table describes the file extensions that can be specified in the *FileFormat* parameter.

FileFormat	DESCRIPTION
AVI	AVI File Format
BMP	Windows™ Bitmap File Format
CUT	HALO® Device Independent Image File Format
EPS	Encapsulated Postscript® File Format
GIF	CompuServe Graphics Interface Format
HFF	HALO File Format
IPW	Image-Pro Workspace File Format
JPG	JPEG File Interchange Format

PCD	Kodak Photo CD File Format
PCT	Apple® Macintosh® PICT File Format
PCX	ZSoft™ Image File Format
SEQ	Sequence Format
TIF	Tagged Image File Format
TGA	Truevision® Targa® File Format
FLF	Flat File Format (user defined)

See Also IpCapArea, IpCapWindow, IpCapHotKey

IpCapHotKey

Syntax **IpCapHotKey**(*KeyName*, *bShift*, *bCtrl*, *bAlt*)

Description This function designates the key (or key combination) that will be used to invoke the **Screen Capture** utility. Equivalent to specifying the "Hot Key" in the **Capture Options** dialog box.

Parameters

KeyName	**String**	A string specifying the base key that is to be used to invoke Screen Capture. Expressed in "X=YYY" format, where X identifies the key and YYY specifies its ANSI number. See Comments, below.
bShift	**Integer**	An integer value of 0 or 1 specifying whether the "Shift" key is to be used with the base key specified in *KeyName*. Where: 0 - Shift is not part of the hot key combination. 1 - Shift is to be used with the base key in the hot key combination.
bCtrl	**Integer**	An integer value of 0 or 1 specifying whether the "Ctrl" key is to be used with the base key specified in *KeyName*. Where: 0 - Ctrl is not part of the hot key combination. 1 - Ctrl is to be used with the base key in the hot key combination.
bAlt	**Integer**	An integer value of 0 or 1 specifying whether the "Alt" key is to be used with the base key specified in *KeyName*. Where: 0 - Alt is not part of the hot key combination. 1 - Alt is to be used with the base key in the hot key combination.

Example

```
ret = IpCapHotKey("F12=123", 0, 1, 0)
```

This statement assigns "Ctrl+F12" as the hot key combination.

Comments The *bShift*, *bCtrl* and *bAlt* flags may be used simultaneously.

The following strings are allowed as base key definitions in *KeyName*.

String	**String**	**String**	**String**
`"A=65"`	`"N=78"`	`"0=48"`	`"F1=112"`
`"B=66"`	`"O=79"`	`"1=49"`	`"F2=113"`
`"C=67"`	`"P=80"`	`"2=50"`	`"F3=114"`
`"D=68"`	`"Q=81"`	`"3=51"`	`"F4=115"`
`"E=69"`	`"R=82"`	`"4=52"`	`"F5=116"`
`"F=70"`	`"S=83"`	`"5=53"`	`"F6=117"`
`"G=71"`	`"T=84"`	`"6=54"`	`"F7=118"`
`"H=72"`	`"U=85"`	`"7=55"`	`"F8=119"`
`"I=73"`	`"V=86"`	`"8=56"`	`"F9=120"`
`"J=74"`	`"W=87"`	`"9=57"`	`"F10=121"`
`"K=75"`	`"X=88"`		`"F11=122"`
`"L=76"`	`"Y=89"`		`"F12=123"`
`"M=77"`	`"Z=90"`		

See Also IpCapFile, IpCapArea, IpCapWindow

IpCapWindow

Syntax

IpCapWindow(*Title*, *bClientOnly*, *bCursor*)

Description

This function captures the specified window or the contents of the specified window, and stores it to a file. Equivalent to pressing the **Screen Capture** hot key with the *Window or Client* selection settings.

Parameters

Title	**String**	A string specifying the name of the window to be captured (as defined by the name in its Title bar). A zero-length string (i.e., "") can be used to specify the active window.
bClientOnly	**Integer**	An integer value of 0 or 1 specifying whether the entire window (including borders, Title bar and so forth) is to be captured, or just its contents. Where: 0 - Specifies that entire window is to be captured (including its borders and bars). 1 - Specifies that just the contents of the window is to be captured.
bCursor	**Integer**	An integer value of 0 or 1 specifying whether the cursor is to be included in the captured image. Where: 0 - Saves the image without the cursor. 1 - Saves the image, including the cursor.

Example

```
ret = IpCapWindow("Histogram - circuit.tif", 1, 1)
```

This statement will capture and save the contents of the "Histogram - circuit.tif" window. If the cursor is within the window when the capture is performed, it will be included in the image.

Comments

The image file name and format can be specified using the `IpCapFile` function. If these values are not explicitly set using `IpCapFile`, the options currently in effect for the system will be used.

See Also

IpCapFile, IpCapArea

IpChrt2DCreate

Syntax

IpChrt2DCreate ***(szTitle, sChartType)***

Description

This function creates a new chart window.

Parameters

szTitle	**String**	Title of the new chart window

sChartType	**Integer**	Defines the type of chart window to create. Must be one of the following:
		CHRT_TYPE_GRAPH = data graph
		CHRT_TYPE_HIST = histogram
		CHRT_TYPE_SCAT = scattergram

Return Value

The new chart ID if successful. A negative value with error code if failed.

Example

```
Dim ChartID%
‘create new data chart window
ChartID=IpChrt2DCreate("New Data Graph",CHRT_TYPE_GRAPH)
If (ChartID<0) Then
    Exit Sub 'Error
End If
```

IpChrt2DGet

Syntax **IpChrt2DGet** *(ChartID, lCommand, lpParam)*

Description This function gets various chart parameters.

Parameters

ChartID	**Long**	ID of the chart window returned by IpChrt2DCreate
lCommand	**Long**	See comments and list below.
lpParam	**Double**	Pointer to a double variable that receives the value

Return Value 0 if succesful, a negative error code if failed

Comments This macro takes the following commands:

lCommand	**lParam**	**Description**
CHRT_NUM_ GRAPHS	Not used, should be 0	Gets the number of displayed graphs
CHRT_RANGE_ MIN	Axis. 0= X, 1 = Y	Gets minimum axis value.
CHRT_RANGE_MAX	Axis. 0= X, 1 = Y	Gets maximum axis value.
CHRT_COLOR	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_GRAPHS.	Gets graph color. The value is in &Hbbggrr& format.

Example

```
example demonstrating IpChrt2DGet function
Dim ChartID%
   …
‘get axes ranges
Dim RetVal As Double
ret = IpChrt2DGet(ChartID,CHRT_RANGE_MIN,0,RetVal)
Debug.Print "X min = " & RetVal
ret = IpChrt2DGet(ChartID,CHRT_RANGE_MAX,0,RetVal)
Debug.Print "X max = " & RetVal
ret = IpChrt2DGet(ChartID,CHRT_RANGE_MIN,1,RetVal)
Debug.Print "Y min = " & RetVal
ret = IpChrt2DGet(ChartID,CHRT_RANGE_MAX,1,RetVal)
Debug.Print "Y max = " & RetVal
```

IpChrt2DGraphToClipboard

Syntax	**IpChrt2DGraphToClipboard *(ChartID)***		
Description	This function copies the graph to the Windows clipboard in enhanced metafile format.		
Parameters	*ChartID*	**Long**	ID of the chart returned by **`IpChrt2DCreate`**
Return Value	0 if successful, a negative error code if failed.		

IpChrt2DMove

Syntax	**IpChrt2DMove*(ChartID, X, Y)***		
Description	This function moves the chart window to a new location.		
Parameters	*ChartID*	**Long**	ID of the chart returned by **`IpChrt2DCreate`**
	X	**Long**	X coordinate of the top-left corner of the window
	Y	**Long**	Y coordinate of the top-left corner of the window
Return Value	The new chart ID if successful. A negative value with error code if failed.		

Example

```
Dim ChartID%
…
'move window to 93,32 coordinate
ret = IpChrt2DMove(ChartID, 93, 32)
```

IpChrt2DSet

Syntax	**IpChrt2DSet** *(ChartID, lCommand, lParam,dValue)*		
Description	This function sets various chart parameters.		
Parameters	*ChartID*	**Long**	ID of the chart window returned by IpChrt2DCreate
	lCommand	**Long**	See comments and list below.
	lParam	**Long**	Long option, which depends on the chart lCommand selected (see below)
	dValue	**Double**	Double option, which depends on the chart lCommand selected (see below)
Return Value	0 if succesful, a negative error code if failed		
Comments	This macro takes the following commands:		

lCommand	**lParam**	**dValue**	**Description**
CHRT_NUM_GRAPHS	Not used, should be 0	The number of graphs	Sets the number of graphs
CHRT_ADD_VALUE	Graph ID, the ID is 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS	The value.	adds one value point to graph. If the CHRT_BUFFER_SIZE is set and the new value exceeds the buffer size, the value from the head is removed from the buffer.
CHRT_BUFFER_SIZE	Not used, should be 0	The size of the buffer, or -1 to turn the rolling buffer off	Sets maximum buffer size (size of the rolling buffer)

lCommand	**lParam**	**dValue**	Description
CHRT_DATA_POOL	Not used, should be 0	ChartID of the window that holds the data pool. After executing of this function all chart data operations have to be done with ChartID (source data pool). The data will be updated automatically in the current chart when the window with ChartID is updated	Sets the data pool of another chart to share data
CHRT_DSPL_MEAS	Not used, should be 0	Measurement index. Selecting one measurement the index is 0-based and has to be less than the number of graphs set is CHRT_NUM_GRAPHS. If the value is CHDSP_MEAS_ALL , all added measurements are shown in the graph CHDSP_MEAS_SEL, only selected measurements are shown. See CHRT_RESET_SEL_MEAS and CHRT_ADD_EL_MEAS.	Sets the display measurements for the data graph and histogram
CHRT_DSPL_LABEL	Not used, should be 0	Measurement index, 0-based and must be less than the number of graphs set by CHRT_NUM_ GRAPHS. If the value is CHDSP_ LABEL_OBJ, the object number is used as a label.	Sets the label measurement for the data graph
CHRT_DSPL_MEAS_X	Not used, should be 0	Measurement index, 0-based and must be less than the number of graphs set by CHRT_NUM_ GRAPHS	Sets X measurement for scatterplot

lCommand	lParam	dValue	Description
CHRT_DSPL_MEAS_Y	Not used, should be 0	Measurement index, 0-based and must be less than the number of graphs set by CHRT_NUM_ GRAPHS	Sets Y measurement for scatterplot
CHRT_RESET_SEL_ MEAS	Not used, should be 0	Not used, should be 0	Resets the list of selected measurements
CHRT_ADD_SEL_MEAS	Not used, should be 0	Measurement index, 0-based and must be less than the number of graphs set by CHRT_NUM_ GRAPHS	Adds measurement to the selected list. After adding of all measurements the CHRT_DSPL_MEAS has to be set to CHDSP_MEAS_SEL.
CHRT_HIST_BINS	Not used, should be 0	The number of bins	Sets number of bins in histogram
CHRT_RANGE_AUTO	Axis: 0 = X, 1 = Y	1= on 0 = off	Sets auto-range chart parameter

lCommand	**lParam**	**dValue**	Description
CHRT_RANGE_MIN	Axis: 0 = X, 1 = Y	The value	Sets minimum range value. Auto-range must be turned off.
CHRT_RANGE_ MAX	Axis: 0 = X, 1 = Y	The value	Sets maximum range value. Auto-range must be turned off.
CHRT_SHOW_ LEGEND	Not used, should be 0	1= show 0 = hide	Turns chart title/legend on or off
CHRT_CHART_ TYPE	Not used, should be 0	Chart type, must be one of the following:	Sets chart type

	CHRT_2DTYPE_PLOT = Line chart.
	CHRT_2DTYPE_BAR = Bar chart. CHRT_2DTYPE_PIE=Pie chart.
	CHRT_2DTYPE_STACKINGBAR = Stacking bar chart. CHRT_2DTYPE_AREA = Area chart.
	CHRT_2DTYPE_HILO = HiLo chart.
	CHRT_2DTYPE_HILOOPENCLOSE = HiLoOpenClose chart. CHRT_2DTYPE_CANDLE = Candle chart.
	CHRT_2DTYPE_POLAR = Polar chart
	CHRT_2DTYPE_RADAR = Radar chart
	CHRT_2DTYPE_FILLEDRADAR = Filled radar chart. CHRT_2DTYPE_BUBBLE =Bubble chart.		

CHRT_CHART_ BACKG_COLOR	Not used, should be 0	Color in &Hbbggrr& format. For example &H000080& is dark red	Sets chart background color
CHRT_CHART_ FOREGR_COLOR	Not used, should be 0	Color in &Hbbggrr& format. For example &H000080& is dark red	Sets chart foreground color (axis, frame, text)
CHRT_DEPTH_3D	Not used, should be 0	Depth value	Set chart 3D viewing depth
CHRT_ ELEVATION_3D	Not used, should be 0	Elevation value in degrees	Set chart 3D viewing elevation
CHRT_ROTATION_3D	Not used, should be 0	Rotation value in degrees	Sets chart 3D viewing rotation

lCommand	**lParam**	**dValue**	**Description**
CHRT_COLOR	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS.	Color in &Hbbggrr& format. For example &H000080& is dark red	Sets color for measurement graph (set to bar,line,symbol). The color is linked to the data pool, so if the data pool is shared other graphs will use this color displaying the measurement.
CHRT_LINE_STYLE	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS.	Line style, can be one of the following:	Sets line style for measurements. Can be used only with CHRT_2DTYPE_PLOT chart type

		CHRT_2DLINE_STYLE_NONE = None
		CHRT_2DLINE_STYLE_SOLID = Solid
		CHRT_2DLINE_STYLE_LONGDASH = Long Dash
		CHRT_2DLINE_STYLE_DOTTED = Dotted
		CHRT_2DLINE_STYLE_SHORTDASH = Short Dash
		CHRT_2DLINE_STYLE_LONGSHORTLONGDASH = Long Short Long Dash
		CHRT_2DLINE_STYLE_DASHDOT = Dash Dot	

CHRT_LINE_WIDTH	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS.	Line width	Sets line width for measurements. Can be used only with CHRT_2DTYPE_PLOT chart type
CHRT_SYMB_SIZE	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS.	Symbol size	Sets symbol size for measurements. Can be used only with CHRT_2DTYPE_PLOT chart type
CHRT_SYMB_STYLE	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_ GRAPHS.	Symbol style, can be one of the following:	Sets symbol style for measurements. Can be used only with CHRT_2DTYPE_PLOT chart type

lCommand	lParam	dValue	Description

CHRT_SYMB_STYLE		CHRT_2DSYMB_STYLE_NONE = None
		CHRT_2DSYMB_STYLE_DOT = Dot
		CHRT_2DSYMB_STYLE_BOX= Box
		CHRT_2DSYMB_STYLE_TRIANGLE = Triangle
		CHRT_2DSYMB_STYLE_DIAMOND = Diamond
		CHRT_2DSYMB_STYLE_STAR = Star
		CHRT_2DSYMB_STYLE_VERTICALLINE = Vertical Line
		CHRT_2DSYMB_STYLE_HORIZONTALLINE = Horizontal Line CHRT_2DSYMB_STYLE_CROSS = CrossCHRT_2DSYMB_STYLE_CIRCLE = Circle
		CHRT_2DSYMB_STYLE_SQUARE = Square
		CHRT_2DSYMB_STYLE_INVERTTRIANGLE = Inverted Triangle
		CHRT_2DSYMB_STYLE_DIAGONALCROSS = Diagonal Cross
		CHRT_2DSYMB_STYLE_OPENTRIANGLE= Open Triangle
		CHRT_2DSYMB_STYLE_OPENDIAMOND = Open Diamond
		CHRT_2DSYMB_STYLE_OPENINVERTTRIANGLE = Open Inverted Triangle	

CHRT_PREDEF_ TYPE	Not used, should be 0	Predefined chart type, should be one of the following: CHARTTYPE_PLOT2D CHARTTYPE_AREA2D CHARTTYPE_BAR2D CHARTTYPE_PLOT3D CHARTTYPE_AREA3D CHARTTYPE_BAR3D	One of the predefined chart types

lCommand	lParam	dValue	Description
CHRT_DC_BLOCKS	Not used, should be 0	Predefined chart type, should be one of the following: CHRT_BLOCKS_LAST = last block of data in the data collector CHRT_BLOCKS_ALL_IN_ONE = all blocks of data in the data collector, one measurement in one graph CHRT_BLOCKS_ALL_SEPARATE = all blocks of data in the data collector; every block in separate graph (only 1 measurement possible), number of graphs corresponds to the number of blocks CHRT_BLOCKS_ALL_SEP_BY_VAL = chart all blocks of data in the data collector; every measurement value in a block in a separate graph; number of graphs corresponds to the number of values in the longest measurement	Sets block configuration. Can be used only with Data Collector charts.
CHRT_NUM_SGNF_ DIG	Not used, should be 0	Number of significant digits	Sets the number of significant digits in the data values.
CHRT_NUM_X_ ARRAYS	Not used, should be 0	The number of X arrays	Sets the number of X arrays. If the number is not set or 0, then the object index is used as X coordinate; if the value is set the X coordinates set by CHRT_ADD_X_VALUE used for the graphs. If the value is 1, points with the same index on multiple graphs will use the same X value. The name of the X axis in that case can be set using CHRT_X_NAME option. If the number of X arrays is more than 1, every graph will use separate XY coordinate pairs. The option can be used only with Data Graphs.

lCommand	**lParam**	**dValue**	Description
CHRT_ADD_X_ VALUE	Graph ID, the ID is 0-based and has to be less than the number of graphs set is CHRT_NUM _X_ARRAYS	The value	Add one X coordinate value to graph. The function should be paired with CHRT_ADD_VALUE. The option can be used only with Data Graphs. If the CHRT_BUFFER_SIZE is set and the new value exceeds the buffer size, the value from the head is removed from the buffer.
CHRT_RESET_ALL	Not used, should be 0	Not used, should be 0	Resets the graph and the data pool associated with the graph

CHRT_TITLE_TXT_ROTATION	Not used, should be 0	Rotation, can be one of the following:
		CHRT_2D_ROTATENONE = No rotation.
		CHRT_2D_ROTATE90DEGREES = Rotate 90 degrees.
		CHRT_2D_ROTATE270DEGREES =Rotate 270 degrees.
			Sets Y-axis text title rotation

Example

```
‘example demonstrating multiple graphs
Sub RollingMultiGraph()
Dim ChartID%,HistID%,ScattID%
ChartID=IpChrt2DCreate("New Data Graph",CHRT_TYPE_GRAPH)
If (ChartID<0) Then
    Exit Sub 'Error
End If

HistID=IpChrt2DCreate("New Histogram",CHRT_TYPE_HIST)
If (HistID<0) Then
    Exit Sub 'Error
End If

ScattID=IpChrt2DCreate("New Scatterplot",CHRT_TYPE_SCAT)
If (ScattID<0) Then
    Exit Sub 'Error
End If

'share ChartID data pool with HistID and ScattID
ret = IpChrt2DSet(HistID,CHRT_DATA_POOL,0,ChartID)
ret = IpChrt2DSet(ScattID,CHRT_DATA_POOL,0,ChartID)

'set rolling buffer size to 100
ret = IpChrt2DSet(ChartID,CHRT_BUFFER_SIZE,0,100)

ret=IpChrt2DShow(ChartID,1)
ret=IpChrt2DShow(HistID,1)
ret=IpChrt2DShow(ScattID,1)

'set data to ChartID and it will be automatically
‘shown in HistID and ScattID
ret = IpChrt2DSet(ChartID,CHRT_NUM_GRAPHS,0,3)
'set measurement names
ret = IpChrt2DSetStr(ChartID,CHRT_GRAPH_NAME,0,"Energy")
ret = IpChrt2DSetStr(ChartID,CHRT_GRAPH_NAME,1,"Entropy")
ret = IpChrt2DSetStr(ChartID,CHRT_GRAPH_NAME,2,"Efficiency")

'set colors
ret=IpChrt2DSet(ChartID,CHRT_COLOR,0,&H000080&)
ret=IpChrt2DSet(ChartID,CHRT_COLOR,1,&H008000&)
ret=IpChrt2DSet(ChartID,CHRT_COLOR,2,&H800000&)

'update chart
ret=IpChrt2DUpdate(ChartID)

'display ALL measurements in data graph
ret = IpChrt2DSet(ChartID,CHRT_DSPL_MEAS,0,CHDSP_MEAS_ALL)
'object number as label
ret = IpChrt2DSet(ChartID,CHRT_DSPL_LABEL,0,CHDSP_LABEL_OBJ)
```

Example

```
'display 2 measurements in histogram
ret = IpChrt2DSet(HistID,CHRT_RESET_SEL_MEAS,0,0)
ret = IpChrt2DSet(HistID,CHRT_ADD_SEL_MEAS,0,0)'measurement
0
ret = IpChrt2DSet(HistID,CHRT_ADD_SEL_MEAS,0,2)'measurement
2
ret = IpChrt2DSet(HistID,CHRT_DSPL_MEAS,0,CHDSP_MEAS_SEL)
'set 12 bins
ret = IpChrt2DSet(HistID,CHRT_HIST_BINS,0,12)      'set
scatterplot measurements
'set measurement 2 as X
ret = IpChrt2DSet(ScattID,CHRT_DSPL_MEAS_X,0,2)
'set measurement 0 as Y
ret = IpChrt2DSet(ScattID,CHRT_DSPL_MEAS_Y,0,0)

Dim i%
’add random data, run loop to 10000
For i=0 To 10000
    ret = IpChrt2DSet(ChartID,CHRT_ADD_VALUE,0,Rnd()*200+0)
    If (ret<0) Then
        'chart is closed
        Exit Sub
    End If
    ret = IpChrt2DSet(ChartID,CHRT_ADD_VALUE,1,Rnd()*100+100)
    ret = IpChrt2DSet(ChartID,CHRT_ADD_VALUE,2,Rnd()*120+0)

    'update chart
    ret=IpChrt2DUpdate(ChartID)
Next i
End Sub
```

IpChrt2DSetArr

Syntax

IpChrt2DSetArr *(ChartID, lCommand,lMeasID, InumValues, lpParam)*

Description

This function sets the data array values

Parameters

ChartID	**Long**	ID of the chart window returned by IpChrt2DCreate
lCommand	**Long**	Type of the data, can be one of the following: CHRT_ARR_DOUBLE = array of double values CHRT_ARR_SINGLE = array of single values CHRT_ARR_LONG = array of long values CHRT_ARR_SHORT = array of short integer values
lMeasID	**Long**	Measurement index, 0-based and has to be less than the number of graphs set in CHRT_NUM_GRAPHS
lNumValues	**Long**	Number of values to set
lpParam	**Any**	Pointer to the array of data. The type of the array is defined by lCommand.

Return Value

0 if succesful, a negative error code if failed

Example

```
Dim ChartID%
…
ReDim ValuesArray(NPoints) As Single

Dim i As Long, j As Long
For j=0 To NGraphs-1
  For i=0 To NPoints-1
      ValuesArray(i)=5*i*i*i/(NPoints*NPoints*NPoints)
  Next i
  ‘set data as array
  ret =
IpChrt2DSetArr(ChartID,CHRT_ARR_SINGLE,j,NPoints,ValuesArr
ay(0))
Next j
‘update chart
ret=IpChrt2DUpdate(ChartID)
```

IpChrt2DSetStr

Syntax

IpChrt2DSetStr *(ChartID, lCommand, lParam,szStr)*

Description

This function sets some chart string parameters.

Parameters

ChartID	**Long**	ID of the chart window returned by IpChrt2DCreate
lCommand	**Long**	See comments and list below.

lParam	**Long**	Long option, which depends on the chart lCommand selected (see below)
szStr	**String**	Sting, which depends on the chart lCommand selected (see below)

Return Value 0 if succesful, a negative error code if failed

Comments This macro takes the following commands:

lCommand	**lParam**	**szStr**	**Description**
CHRT_GRAPH_ NAME	Graph ID, the ID is 0-based and has to be less than the number of graphs set is CHRT_NUM_ GRAPHS	Graph name	Sets graph name
CHRT_X_NAME	X array ID, the ID is 0-based and has to be less than the number of graphs set is CHRT_NUM _X_ARRAYS	X array name	Sets the name for the corresponding X array. If the number of the X array is one, the name is displayed in the Label combo box. This option can only be used with Data Graphs.
CHRT_AXIS-TITLE	0 = X axis 1 = Y axis	Axis title	Sets X or Y axis title. This option can be used with Data Graph and Histogram
CHRT_TEMPLATE	0 = load 1 = save	Template name	Loads/saves chart template. It can be used to set multiple display options such as colors, chart types, fonts etc.
CHRT_EXPORT_ DATA	Destination type, must be one of the following:	File name, ignored for Data Export	Exports chart data to file or data exchange

	CHRT_EXPORT = export to data exchange target program (Excel, Origin)
	CHRT_FILE_TAB = save to tab-delimited file
	CHRT_FILE_CSV =comma-delimited file
	CHRT_FILE_HTML = html file		

Example

```
  Dim ChartID%
  …

  Dim TmplName As String
  TmplName="C:\Temp\TestHistTemplate.oc2"
  'load new histogram template
  ret = IpChrt2DSetStr(ChartID,CHRT_TEMPLATE,0,TmplName)
  ‘update window
  ret=IpChrt2DUpdate(ChartID)
  …

  ‘export data to Excel (or Origin)
  ret =
  IpChrt2DSetStr(ChartID,CHRT_EXPORT_DATA,CHRT_EXPORT,"")
‘save data to tab-delimited file
  ret = IpChrt2DSetStr(ChartID,CHRT_EXPORT_DATA,_
  CHRT_FILE_TAB,"C:\TabFile.txt")
  ‘save data to HTML file
  ret = IpChrt2DSetStr(ChartID,CHRT_EXPORT_DATA,_
        CHRT_FILE_HTML,"C:\ TestHTML.htm")
  ‘save data to CSV file
  ret = IpChrt2DSetStr(ChartID,CHRT_EXPORT_DATA,_
              CHRT_FILE_CSV,"C:\ TestCSV.csv")
```

IpChrt2DShow

Syntax **IpChrt2DShow** ***(ChartID, bShow)***

Description This function shows or hides the chart window.

Parameters

ChartID	**Long**	ID of the chart returned by **`IpChrt2DCreate`**
sChartType	**Integer**	1 = show chart 0 = hide chart

Return Value 0 if successful, a negative error code if failed.

Example

```
Dim ChartID%
 ‘create new data chart window
ChartID=IpChrt2DCreate("New Data Graph",CHRT_TYPE_GRAPH)
If (ChartID<0) Then
    Exit Sub 'Error
End If
‘show chart
ret=IpChrt2DShow(ChartID,1)
```

IpChrt2DSize

Syntax **IpChrt2Size** ***(ChartID, X, Y)***

Description This function resizes the chart window.

Parameters

ChartID	**Long**	ID of the chart returned by **`IpChrt2DCreate`**
X	**Long**	New width of the chart window
Y	**Long**	New height of the chart window

Return Value 0 if successful, a negative error code if failed.

Example

```
Dim ChartID%
   …
'set new chart window size 1076x494
    ret = IpChrt2DSize(ChartID, 1076, 494)
```

IpChrt2DUpdate

Syntax **IpChrt2Update** ***(ChartID)***

Description This function updates the data and/or display options in the chart window.

Parameters

ChartID	**Long**	ID of the chart returned by **`IpChrt2DCreate`**

Return Value 0 if successful, a negative error code if failed.

Example

```
'set colors
ret=IpChrt2DUpdate(ChartID,CHRT_COLOR,0,&H000080&)
ret=IpChrt2DUpdate(ChartID,CHRT_COLOR,1,&H008000&)
ret=IpChrt2DUpdate(ChartID,CHRT_COLOR,2,&H800000&)

'update chart
ret=IpChrt2DUpdate(ChartID
```

IpClprClipboard

Syntax **IpClprClipboard*(nCommand)***

Description This function cuts, copies, or pastes the sampling tool to the clipboard.

Parameters

nCommand	**Integer**	Must be one of the following: CLPR_CUT - cut the selected tool(s) to the clipboard CLPR_COPY - copies the selected tool(s) to the clipboard CLPR_PASTE - pastes the selected tool(s) from the clipboard

IpClprCreateDerivativeEdge

Syntax **IpClprCreateDerivativeEdge*(szName, szLabel, lColor, nOffset, nStyle)***

Description This function creates a edge detector using the derivative method.

Parameters

szName	**String**	Name of the edge detector without the label, i.e. “Peak”.
szLabel	**String**	Single character label, i.e. “A”.
lColor	**Long**	Color of the markers. Value is in BGR format.
nOffset	**Integer**	Number of pixels from the detected position to where the marker will be displayed. Negative number puts the marker before the detected position. Positive number puts the marker after the detected position.
nStyle	**Integer**	CLPR_PEAK – peak CLPR_VALLEY – valley CLPR_RISING – rising point of inflection CLPR_FALLING – falling point of inflection. Peak is found where the first derivative is zero and the second derivative is negative number. Valley if found where the first derivative is zero and the second derivative is positive number. Rising point of inflection is found where the second derivative is zero and the first derivative is a positive number. Falling point of inflection is found where the second derivative is zero and the first derivative is a negative number

Example

```
Sub IpClprCreateDerivativeEdge_ex()

  ' create 4 edge detectors, 1 of each type and make them different colors

  ret = IpClprCreateDerivativeEdge("Peak", "A", 255, 0, CLPR_PEAK)
  ret = IpClprCreateDerivativeEdge("Valley", "B", 4259584, 0, CLPR_VALLEY)
  ret = IpClprCreateDerivativeEdge("Rising", "C", 16711680, 0,
       CLPR_RISING)
  ret = IpClprCreateDerivativeEdge("Falling", "D", 33023, 0, CLPR_FALLING)

End Sub
```

See Also IpClprCreatePatternMatchEdge

IpClprCreateMeas

Syntax **IpClprCreateMeas*(nType, szFromName, szToName)***

Description This function creates a caliper measurement.

Parameters

nType	**Integer**	Selects a measurement type: CLPR_MEAS_POSX – x position of markers in the image. Values are in image coordinate. CLPR_MEAS_POSY – y position of markers in the image. Values are in image coordinate. CLPR_MEAS_DIST - distance of markers from the origin of the sampling tool. CLPR_MEAS_DIST1- distance of markers between two consecutive markers of the same edge detector. CLPR_MEAS_DIST2- distance of markers between two markers of two different edge detectors.
szFromName	**String**	Name of the starting edge detector.
SzToName	**String**	Name of the destination edge detector. Ignored if the *nType* is not CLPR_MEAS_DIST2

Example

```
Sub IpClprCreateMeas_example()
  ' clear any existing measurements
  ret = IpClprDeleteMeas(-1, "", "")
  ' create measurements
  ret = IpClprCreateMeas(CLPR_MEAS_POSX, "Peak", "") ' x coord
  ret = IpClprCreateMeas(CLPR_MEAS_POSY, "Peak", "") ' y coord
  ret = IpClprCreateMeas(CLPR_MEAS_DIST, "Peak", "") ' dist from
  beginning of sampler
  ret = IpClprCreateMeas(CLPR_MEAS_DIST1, "Peak", "") ' dist
  between detectors of same type
  ret = IpClprCreateMeas(CLPR_MEAS_DIST2, "Peak", "Valley") '
  dist between different detectors
End Sub
```

See Also IpClprDeleteMeas

IpClprCreatePatternMatchEdge

Syntax **IpClprCreatePatternMatchEdge*(szName, szLabel, lColor, nOffset, nThreshold, ptPattern, nNumPoints)***

Description This function creates an edge detector using the pattern match method.

Parameters

szName	**String**	Name of the edge detector without the label, i.e. “Pattern”.
szLabel	**String**	Single character label, i.e. “A”.
lColor	**Long**	Color of the markers. Value is in BGR format.
nOffset	**Integer**	Number of pixels from the detected position to where the marker will be displayed. Negative number puts the marker before the detected position. Positive number puts the marker after the detected position.
nThreshold	**Integer**	Number in the range of 0 to 100 indicating the degree of match. 100% = perfect match.
ptPattern	**Single LPSINGLE (C)**	Pattern template. Values are normalized to numbers between 0 and 100.
nNumPoints	**Integer**	Number of points in *ptPattern.*

Example

```
Sub IpClprCreatePatternMatchEdge_e()
  ' gather up points for pattern
  ipPattern( 0) = 77.28 : ipPattern( 1) = 77.06 : ipPattern( 2) = 77.09
  ipPattern( 3) = 75.31 : ipPattern( 4) = 73.87 : ipPattern( 5) = 72.13
  ipPattern( 6) = 70.16 : ipPattern( 7) = 68.04 : ipPattern( 8) = 65.85
  ipPattern( 9) = 63.66 : ipPattern(10) = 61.54 : ipPattern(11) = 59.54
  ipPattern(12) = 57.69 : ipPattern(13) = 56.13 : ipPattern(14) = 54.57
  ipPattern(15) = 53.33 : ipPattern(16) = 52.32 : ipPattern(17) = 51.56
  ipPattern(18) = 51.02 : ipPattern(19) = 50.70 : ipPattern(20) = 50.59
  ' create first detector
    ret = IpClprCreatePatternMatchEdge("Pattern1", "A", 255, 0, 50,
  ipPattern(0), 21)
End Sub
```

See Also IpClprCreateDerivativeEdge

IpClprCreateSampler

Syntax **IpClprCreateSampler*(nType, szName, Pt, nNumPoints)***

Description This function creates a sampling tool.

Parameters

nType	**Integer**	Selects the type of sampling tool. Must be one of the following: CLPR_LINE - two point line CLPR_CWCIRCLE - clockwise circle CLPR_CCWCIRCLE - counter - clockwise circle CLPR_POLYLINE - a line containing more than two points
szName	**String**	Name of the sampling tool, for example, "C1".
Pt	**POINTAPI** **LPPOINT (C)**	Array of two points for line and circles to indicate the anchor (index 0) and the opposite corner on the bounding rectangle (index 1). Array of *nNumPoints* vertices for polyline. In any case, the point specified at index 0 becomes the anchor or the position of the object
nNumPoints	**Integer**	Ignored by line and circles. Used by the polyline to indicate the number of points.

Example

```
Sub IpClprCreateSampler_example()
  ' create a line sampling tool
  ret = IpListPts(Pts(0), " 25 84 147 84")
  ret = IpClprCreateSampler(CLPR_LINE, "L1", Pts(0), 2)
  ' create a clockwise circle sampling tool
  ret = IpListPts(Pts(0), " 32 32 480 480")
  ret = IpClprCreateSampler(CLPR_CWCIRCLE, "C1", Pts(0), 2)
  ' create a 3 segment polyline sampling tool
  ret = IpListPts(Pts(0), " 29 427 490 427 21 255 490 255")
  ret = IpClprCreateSampler(CLPR_POLYLINE, "P1", Pts(0), 4)

End Sub
```

Return Value This function returns the object ID of the sample.

See Also IpClprSelectSampler, IpClprDeleteSampler, IpClprEditSampler, IpClprClipboard

IpClprDeleteEdge

Syntax **IpClprDeleteEdge*()***

Description This function deletes the currently active or selected edge detector in the edge detector list box.

IpClprDeleteMeas

Syntax **IpClprDeleteMeas*(nType, szFromName, szToName)***

Description This function deletes a caliper measurement.

Parameters

nType	**Integer**	Selects a measurement type: CLPR_MEAS_POSX – x position of markers in the image. Values are in image coordinate. CLPR_MEAS_POSY – y position of markers in the image. Values are in image coordinate CLPR_MEAS_DIST - distance of markers from the origin of the sampling tool. CLPR_MEAS_DIST1- distance of markers between two consecutive markers of the same edge detector. CLPR_MEAS_DIST2- distance of markers between two markers of two different edge detectors.
SzFromName	**String**	Name of the starting edge detector.
SzToName	**String**	Name of the ending edge detector. Ignored if the *nType* is not CLPR_MEAS_DIST2

Example

```
Sub IpClprDeleteMeas_example()
' create a measurement
  ret = IpClprCreateMeas(CLPR_MEAS_DIST2, "CLPR_PEAK", 
"CLPR_PEAK")
' now delete it
ret = IpClprDeleteMeas(CLPR_MEAS_DIST2, "CLPR_PEAK", 
"CLPR_PEAK")
               End Sub
```

Comments -1 indicates all measurements, therefore `IpClprDeleteMeas(-1, "" , "")` will clear all measurements.

See Also IpClprCreateMeas

IpClprDeleteSampler

Syntax **IpClprDeleteSampler*()***

Description This function deletes the currently active or selected sampling tool.

IpClprDetGetInt

Syntax **IpClprDetGetInt*(sAttribute, sSampler, sDetector, fValue)***

Description This function gets the current value of a detector or marker attibute

Parameters

sAttribute	**Integer**	Attribute to inquire. See comments below.
sSampler	**Integer**	The index of the sampler to inquire. See comments.

sDetector	**Integer**	The index of the detector to inquire. See comments.
fValue	**Single**	A single variable to receive the current value of the attribute.

Comments

This function can be used to inquire the number of detectors, the type of each detector, as well as the number of the markers that have been found by the detector or added by the user.

CLPR_GET_NUM_DETECTORS: Returns the number of detectors defined for the current sampler. The *sDetector* parameter is ignored.

CLPR_GET_NUM _TYPE: Integer variable to receive type.

CLP_GET_DETECTOR_TYPE : The type of the specified detector which will be either CLPR_DERIVATIVE or CLPR_PATTERN_MATCH.

CLPR_GET_DET_NUM_MARKERS: Returns the number of markers detected by the specified detector.

See Also

IpClprDetGetSng

IpClprDetGetSng

Syntax

IpClprDetGetSng*(sAttribute, sSampler, sDetector, sIndex, fValue)*

Description

This function returns the current value for a detector marker attibute

Parameters

sAttribute	**Integer**	Attribute to inquire, either CLPR_GET_DET_MARKER_x or CLPR_GET_DET_MARKER_Y
sSampler	**Integer**	The index of the sampler to inquire. See comments.
sDetector	**Integer**	The index of the detector to inquire. See comments.
sIndex	**Integer**	The index of the marker to inquire. See comments
fValue	**Single**	An single variable to receive the current value of the attribute.

Comments

This function can be used to inquire the position of the markers that have been found by the detector (or added by the user) Use IpClprGetIntEx to determine the number of samplers. Use IpClprDetGetInt to determine the number and type of detectors on each sampler, as well as the number of markers detected by each detector. This function can then be used to return the position of each of the detected markers.

See Also

IpClprGetIntEx, IpClprDetGetInt

IpClprEditSampler

Syntax **IpClprEditSampler*(nHandle, X, Y)***

Description This function moves or resizes a sampling tool.

Parameters

nHandle	**Integer**	Must be one of the following: Handle number: 0 – Moves the position of the object. The position must be specified for the anchor of the object. The anchor is the first point specified in IpClprCreateSampler. For line: 1 – Resizes the object by moving the anchor of the line. 2 – Resizes the object by moving the end point of the line. For circles: 1,3,5,7 - Resizes the circle by moving the handle where handle 1 is the anchor (not the center) of the circle, 5 is the opposite end of handle 1, and the rest are corners of the bounding rectangle numbered in clockwise direction. For poly line: 1-n Moves the vertices of a poly line where 1 is the first vertex and n is the last vertex.
X	**Integer**	X position of the image coordinates.
Y	**Integer**	Y position of the image coordinates.

See Also IpClprCreateSampler

IpClprGet

Syntax **IpClprGet** ***(sAttr, fData)***

Description This function gets the caliper tool attributes.

Parameters *sAttr* **Integer** See list below:

Attribute Value	**Description**
CLPR_AUTOREFRESH	Turn on/off Auto-Refresh flag during multiple attribute settings. 0 to turn-off auto-refresh, 1 to turn it back on.
CLPRE_COLOR	Color of the currently selected edge detector
CLPRE_OFFSET	Offset of the currently selected edge detector
CLPRE_STYLE	Style of the currently selected derivative edge detector
CLPR_CIRCLE_ORIGIN	Origin of circle sampling tool. Number is specified in angle (degree). 90 degree is at the top of the circle.
CLPRO_SMOOTHING	Gaussian smoothing factor kernel size.
CLPRO_THICKNESS	Sampling tool line thickness.
CLPRO_APPLY_ICAL	Apply intensity calibration to luminance profile.
CLPRO_APPLY_SCAL	Apply spatial calibration to measurement numbers.
CLPRO_AUTO_SCALE	Scale luminance profile to fit minimum and maximum profile value to the graph area.
CLPR_SENS	Set the sensitivity threshold.
CLPRO_SHOW_LABEL	Show edge detector label on markers
CLPRO_SHOW_NUMBER	Show marker’s sequence number
CLPRO_PRECISION	Set number of digits after decimal point

fData	**Single**	Attribute value.

Example

```
                  Sub IpClprGet_example
         Dim caliper_attr_singles(14) As Integer
         Dim caliper_attribute_strings(2) As Integer
         Dim i As Integer
         Dim attribute_f As Single

      caliper_attr_singles(1) = CLPR_AUTOREFRESH
      caliper_attr_singles(2) = CLPR_CIRCLE_ORIGIN
      caliper_attr_singles(3) = CLPRE_COLOR
      caliper_attr_singles(4) = CLPRE_OFFSET
      caliper_attr_singles(5) = CLPRE_STYLE
      caliper_attr_singles(6) = CLPRE_THRESHOLD
      caliper_attr_singles(7) = CLPRO_SMOOTHING
      caliper_attr_singles(8) = CLPRO_THICKNESS
      caliper_attr_singles(9) = CLPRO_APPLY_ICAL
      caliper_attr_singles(10) = CLPRO_APPLY_SCAL
      caliper_attr_singles(11) = CLPRO_AUTO_SCALE
      caliper_attr_singles(12) = CLPRO_SHOW_LABEL
      caliper_attr_singles(13) = CLPRO_SHOW_NUMBER
      caliper_attr_singles(14) = CLPRO_PRECISION

         ' open output window and clear it

      ret = IpOutputShow(1)
      ret = IpOutputClear()

      ' loop through the numeric attributes and debug.print their
   values

      For i = 1 To UBound(caliper_attr_singles)
           ret = IpClprGet(caliper_attr_singles(i),
           attribute_f)
          ret = IpOutput(Str(attribute_f) + Chr(13) + Chr(10))
      Next i
                  End Sub
```

See Also IpClprSet, IpClprGetStr, IpClprSetStr

IpClprGetData

Syntax **IpClprGetData*(Command, nParam1, nParam2,szRetVal)***

Description This function retrieves information from the measurement and statistics tables.

Parameters

Command	**Integer**	Must be one of the following commands: CLPD_GETROWCOUNT – get the number of rows (including column header) CLPD_GETCOLCOUNT – get the number of columns (including row header) CLPD_GETCELL – get cell data These commands can be OR-ed with CLPD_STAT to obtain the statistics table. If CLPD_STAT is not specified, the information is retrieved from the measurement table which is the top part of the Measurement Tab.
nParam1	**Integer**	Used only by CLPD_GETCELL to specify the row number.
nParam2	**Integer**	Used only by CLPD_GETCELL to specify the column number.
SzRetVal	**String**	This return value is always a string.

Example

```
  Sub IpClprGetData_example
     Dim return_string As String*16
      Dim rows As Integer
      Dim i As Integer

      ' open output window and clear it
        ret = IpOutputShow(1)
        ret = IpOutputClear()

       ' figure out the number of rows in the table

       ret = IpClprGetData(CLPD_GETROWCOUNT, 0, 0, return_string)
        rows = Val(return_string) - 1 'take into account the
  column headings

        ' loop through the table and debug.print the values in
  the first column

          For i = 1 To rows
              ret = IpClprGetData(CLPD_GETCELL, i, 1,
  return_string)
         ret = IpOutput(return_string + Chr(13) + Chr(10))
          Next i
End Sub
```

See Also IpClprSave, IpClprSettings

IpClprGetDataEx

Syntax **IpClprGetDataEx*(MeasureIndex, Number, Values)***

Description This function retrieves information from the measurement and statistics tables.

Parameters

MeasureIndex	**Integer**	Index of the measurement to return, from 0 to the number of measurements - 1 (use the CLPR_NUM_MEASUREMENTS attribute to determine the number of measurements available).
Number	**Integer**	The number of values to return (use the CLPR_NUM_MEAS_VALUES to determine the number of values available for a particular measurement)
Values	**Single**	An array of Singles re-dimensioned to contain the specified number of measurement values.

Return Value 0 if successful, or a negative value if measurements are not available.

See Also IpClprGetData

IpClprGetIntEx

Syntax **IpClprGetIntEx*(sAttribute, Index, Value)***

Description This function gets the current value of the specified attribute.

Parameters			
	Attribute	**Integer**	Must be one of the following commands: CLPR_ACTIVE_DETECTOR – Returns the index of the active detector CLPR_NUM_SAMPLERS - Returns the number of samplers. The index parameter is not used. CLPR_SAMPLER_ID - Returns the ID of the sample specified by the index parameter (0 to the number of samplers -1) CLPR_NUM_PROFILE_POINTS Returns the number of points in the caliper profile along the sampler specified by the Index parameter. The number of points can be used to dimension an array to receive the caliper luminance profile (see the CLPR_PROFILE command to **IpClprGetSngEx**). CLPR_NUM_SAMPLER_POINTS returns the number of CLPRPTS_SAMPLER that will be returned by IpClprGetPoints when that of point return is selected. Note that you can use the existing attribute CLPR_NUM_PROFILE_POINTS to get the number of points returned for CLPRPTS_PROFILE.
	Index	**Integer**	Used to specify the sampler of interest.
	Value	**Integer**	ID number of the sampler

See Also IpClprGetInt, IpClprSetIntEx

IpClprGetPoints

Syntax **IpClprGetPoints** ***(Sampler, PointType, NumberofPoints, Points)***

Description This function gets the number and type of points in the sampler.

Parameters

Sampler	**Integer**	The index of the sampler of interest, from 0 to the number of samplers minus 1 (the CLPR_NUM_SAMPLERS attribute can be used to determine the number of samplers defined)
PointType	**CLPRPOINT_ TYPES**	The type of sampler points requested. This can be CLPRPTS_SAMPLER to return a small number of points that define the sampler (for instance the bounding box that contains a circular sampler), or CLPRPTS_PROFILE to return the points on the image sampled (for instance all of the points along a line sampler). The CLPR_NUM_SAMPLER_POINTS attribute can be used with IpClprGetIntEx to get the number of CLPRPTS_SAMPLER points, and CLPR_NUM_PROFILE_POINTS to get the number of points returned for CLPRPTS_PROFILE.
NumberofPoints	**Integer**	The size of the points array, i.e. the largest number of points that can be returned.
Points	**POINTAPI**	An array of POINTAPI structures to receive the requested points, in image coordinates

IpClprGetSngEx

Syntax **IpClprGetSngEx*(Attribute, Index, Value)***

Description This function gets the current value of the specified attribute.

Parameters

Attribute	**Integer**	CLPR_PROFILE - Returns the caliper luminance profile. The Index parameter should specify the sampler index of the sampler whose profile should be returned. The Data parameter should be a Single array with enough elements to receive the number of profile intensities indicated by the CLPR_NUM_PROFILE_POINTS
Index	**Integer**	Used to specify the sampler of interest.
Value	**Single**	ID number of the sampler

IpClprGetStr

Syntax **IpClprGetStr*(sAttr, lpString)***

Description This function gets the caliper string attribute values.

Parameters

sAttr	**Integer**	CLPR_NAME - name of the currently-selected edge detector CLPR_LABEL - label of the currently-selected edge detector
lpString	**String**	Attribute value (null terminated string)

Example

```
Sub IpClprGetStr_example
   Dim caliper_attribute_strings(2) As Integer
   Dim i As Integer
   Dim attribute_s As String*16
        caliper_attribute_strings(1) = 
CLPRE_NAME
        caliper_attribute_strings(2) = 
CLPRE_LABEL
   ' open output window and clear it
        ret = IpOutputShow(1)
        ret = IpOutputClear()
        ' loop through the string attributes and 
print their values
        For i = 1 To 
UBound(caliper_attribute_strings)
        attribute_s = ""
        ret = 
IpClprGetStr(caliper_attribute_strings(i), 
attribute_s)
   ret = IpOutput(IpTrim(attribute_s) + Chr(13) 
+ Chr(10))
        Next i
 End Sub
```

See Also IpClprSet, IpClprGet, IpClprSetStr

IpClprGetStrEx

Syntax **IpClprGetStrEx*(Attribute, Index,BYREF Value)***

Description This function gets the current value of the specified attribute.

Parameters

Attribute	**Integer**	Must be CLPR_SAMPLER_NAME – Returns the name of the sampler specified by the Index parameter using an index from 0 to the number of samples minus 1 (See also the IpClprGetIntEx attribute CLPR_NUM_SAMPLERS). CLPR_DETECTOR_NAME: Returns the name of the detector specified by the Index parameter, using an index from 0 to the number of detectors minus 1 (see also the IpClprDetGetIntEx attribute CLPR_NUM_DETECTORS).
Index	**Integer**	Used only by CLPR_SAMPLER_NAME to get the sample name
Value	**String**	Name of the sampler

IpClprSave

Syntax **IpClprSave*(szFileName, nSaveMode)***

Description This function sends caliper data to the clipboard, file, DDE, or printer.

Parameters

szName	**String**	Name of the output file.
nSaveMode	**Integer**	A combination of the following: One of: S_DATA1 – Luminance Profile S_DATA2 – Measurement Table One of: S_FILE – Send data to file. SzFileName should be specified. S_CLIPBOARD – Send data to clipboard S_DDE – Send data to Excel S_PRINTER – Send data to printer Optional: S_APPEND – Append to existing file. Use with S_FILE only.

Example

```
Sub IpClprSave_example()
  ' send the luminance profile and measurements
  ' table to the debug.printer

  ret = IpClprSave("", S_DATA1 + S_DEBUG.PRINTER)
  ret = IpClprSave("", S_DATA2 + S_DEBUG.PRINTER)

  ' append the measurements table to a file

  ret = IpClprSave("C:\IPWIN7\example.cpm", S_DATA2 + S_APPEND)
End Sub
```

Comments Luminance Profile (S_DATA1) can only be sent to clipboard and printer.

See Also IpClprSettings, IpClprGetData

IpClprSelectEdge

Syntax **IpClprSelectEdge*(szName)***

Description This function selects or activates an edge detector in the edge detector list box.

Parameters

szName	**String**	Name of the edge detector without the label, i.e. “Peak”.

See Also IpClprCreateDerivativeEdge, IpClprCreatePatternMatchEdge, IpClprDeleteEdge

IpClprSelectSampler

Syntax **IpClprSelectSampler*(nID)***

Description This function selects or activates a sampling tool.

Parameters

nID	**Integer**	The object ID of the sampling tool.

See Also IpClprCreateSample, IpClprEditSampler, IpClprDeleteSampler, IpClprClipboard

IpClprSet

Syntax **IpClprSet *(sAttr, fData)***

Description This function sets the caliper tool attributes.

Parameters

sAttr	**Integer**	See list below:
fData	**Single**	Attribute value.

Attribute Value	**Description**
CLPR_AUTOREFRESH	Turn on/off Auto-Refresh flag during multiple attribute settings. 0 to turn-off auto-refresh, 1 to turn it back on.
CLPRE_COLOR	Color of the currently selected edge detector

Attribute Value	**Description**
CLPRE_OFFSET	Offset of the currently selected edge detector
CLPRE_STYLE	Style of the currently selected derivative edge detector
CLPR_CIRCLE_ORIGIN	Origin of circle sampling tool. Number is specified in angle (degree). 90 degree is at the top of the circle.
CLPRO_SMOOTHING	Gaussian smoothing factor kernel size.
CLPRO_THICKNESS	Sampling tool line thickness.
CLPRO_APPLY_ICAL	Apply intensity calibration to luminance profile.
CLPRO_APPLY_SCAL	Apply spatial calibration to measurement numbers.
CLPR_SENS	Sets sensitivity threshold
CLPRO_AUTO_SCALE	Scale luminance profile to fit minimum and maximum profile value to the graph area.
CLPRO_SHOW_LABEL	Show edge detector label on markers
CLPRO_SHOW_NUMBER	Show marker’s sequence number
CLPRO_PRECISION	Set number of digits after decimal point
CLPRO_LOAD_AS_TEMPLATE	Activates the Load as Template checkbox on the Caliper Input/Output page.

Example

```
Sub IpClprSet_example()
  ' set color of current edge detector to white
  ret = IpClprSet(CLPRE_COLOR, 16777215)
End Sub
```

See Also IpClprGet, IpClprGetStr, IpClprSetStr

IpClptSetIntEx

Syntax **IpClprSetIntEx*(sAttribute,sValue)***

Description This function sets the new value for a specified attribute.

Parameters

sAttribute	**Integer**	CLPR_ACTIVE_SAMPLER: Sets the active sampler, using an index from 0 to the number of samplers minus 1 (see also Comments and the IpClprGetIntEx attribute CLPR_NUM_SAMPLERS). CLPR_ACTIVE_DETECTOR: Sets the active detector to the specified index, using an index from 0 to the number of detectors minus 1 (see also the IpClprDetGetInt attribute CLPR_GET_NUM_DETECTORS, and IpClprSetIntEx)
sValue	**Integer**	The new value for the attribute. See comments.

Comments The active sampler is set when you select a sampler using the selection tool. The active sampler determines the set of measurements that are available, as only the measurements for the active sampler are displayed on the Measurements page or available using IpClprGetDataEx. The desired sampler is specified by its index, from zero to the number of samplers minus 1. The number of samplers can be determined using IpClprGetIntEx with the CLPR_NUM_SAMPLERS attribute.

The active detector is set when you select a detector in the detector list. The active detector can be deleted using IpClprDeleteEdge. The desired detector is specified by its index, from zero to the number of detectors minus 1. The number of detectors can be determined using IpClprGetDetIntEx with the CLPR_NUM_DETECTORS attribute.

IpClprSetStr

Syntax **IpClprSetStr*(sAttr, lpString)***

Description This function sets the caliper string attribute values.

Parameters

sAttr	**Integer**	CLPR_NAME - name of the currently-selected edge detector CLPR_LABEL - label of the currently-selected edge detector
lpString	**String**	Attribute value (null terminated string)

Example

```
Sub IpClprSetStr_example()

  ' change name and label of edge detector to Peak-Z and Z

  ret = IpClprSetStr(CLPRE_NAME, "Peak-Z")
  ret = IpClprSetStr(CLPRE_LABEL, "Z")


End Sub
```

See Also IpClprGet, IpClprGetStr, IpClprSet

IpClprSettings

Syntax	**IpClprSettings*(szFileName, bSave)***		
Description	This function saves or loads caliper tool settings, including sampling tools, edge detectors, measurements, and options.		
Parameters	*szFileName*	**String**	Name of the settings file where the information will be stored.
	bSave	**Integer**	1 = save settings file 0 = load settings file

Example

```
Sub IpClprSettings_example()
  ' save current caliper settings
  ret = IpClprSettings("C:\IPWIN7\caliper_example.cps", 1)
End Sub
```

IpClprShow

Syntax	**IpClprShow*(nShow)***		
Description	This function shows or hides the caliper tool.		
Parameters	*nShow*	**Integer**	A value of 0 or 1, indicating whether to show or hide the caliper tool dialog: 0 - hides the dialog 1 - shows the first tab in the dialog (Luminance Profile) 2 - shows the Measurements tab 3 - shows the Input/Output tab 4 - shows the Options tab

IpClprToggleMarker

Syntax **IpClprToggleMarker** ***(X,Y)***

Description This function adds or deletes a marker at the specified x, y position.

Parameters

X	**Integer**	X position in image coordinates
Y	**Integer**	Y position in image coordinates

Example

```
Sub IpClprToggleMarker_example()

  ' toggle markers

  ' if they exist at the specified coordinates they
  ' are deleted otherwise they are created using the
  ' currently selected edge detector

  ret = IpClprToggleMarker(166, 294)
  ret = IpClprToggleMarker(164, 270)
  ret = IpClprToggleMarker(166, 266)
  ret = IpClprToggleMarker(169, 238)


End Sub
```

Comments If a marker doesn’t exist at the specified position, a new marker is added.   This function always deletes the marker belonging to any edge detector, but only it only adds a marker belonging to the currently selected/active edge detector.

IpClprTool

Syntax **IpClprTool*(NewTool)***

Description This function selects a caliper tool for interactive use on the active image.

Parameters		
NewTool	**Integer**	The tool to select, from: CLPRTOOL_NONE = Set to no active tool. CLPRTOOL_SELECT = Set to selection tool. CLPRTOOL_LINE = Set to line sampler creation tool CLPRTOOL_CWCIRCLE = Set to clockwise circular sampler creation tool CLPRTOOL_CCWCIRCLE = Set to counter-clockwise circular sampler creation tool CLPRTOOL_POLYLINE = Set to poly-line sampler creation tool CLPRTOOL_MARKER = Set to marker edit tool

Return Value 0 (zero) if successful or a negative error code otherwise.

Comments The CLPRTOOL_MARKER tool requires that there be at least one caliper sampler and at least one caliper detector on active image, even if the detector is empty (no markers detected).

IpCmChannelExtract

Syntax

IpCmChannelExtract(*cmColor*, *cmComp*, *Channel*)

Description

This function extracts the specified color channel from the active image or AOI. Equivalent to the **Extract Channel** command.

Parameters

cmColor	**Integer**	An enumerated integer identifying the color model in which the active image is currently expressed. Must be one of the following: CM_RGB CM_HSI CM_HSV CM_YIQ See definitions under Comments, below.
cmComp	**Integer**	An enumerated integer specifying the color model from which the channel is to be extracted. Must be one of the following: CM_RGB CM_HSI CM_HSV CM_YIQ See definitions under Comments, below.
Channel	**Integer**	An integer specifying which of the channels is to be extracted. See definitions under Comments, below.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpCmChannelExtract(CM_RGB, CM_YIQ, 1)
```

This statement will extract the In-Phase channel under YIQ mode from an RGB image.

Comments

The following table describes the values allowed in the *cmColor, cmComp* and *Channel* parameters:

		***Channel* VALUES**		
OPTION	**DESCRIPTION**	0	1	2
CM_RGB	Red, Green and Blue (RGB) model.	Red	Green	Blue
CM_HSI	Hue, Saturation and Intensity (HSI) model	Hue	Saturation	Intensity
CM_HSV	Hue, Saturation and Value (HSV) model	Hue	Saturation	Value
CM_YIQ	Luminance, In-Phase and Quadrature (YIQ) model.	Luminance	In-Phase	Quadrature

To select multiple channels,start with a value of 8 for multiple channels. Then add:
1 to select channel 0 (red, hue, or luminance)
2 to select channel 1 (green, saturation, or in-phase)
4 to select channel 2 (blue, intensity, value, or quadrature)

Therefore, to select blue and green, the channel parameter would be 8 +4 (blue) + 2 (green) = 14

See Also IpCmChannelMerge, IpCmTransform

IpCmChannelMerge

Syntax **IpCmChannelMerge**(*DocId*, *cmColor*, *Channel*)

Description This function merges the specified channel from the active image or AOI into the specified image. Equivalent to the **Merge Channel** command.

Parameters

DocId **Integer** An integer specifying the ID number of the image into which the active image or AOI is to be merged.

cmColor **Integer** An enumerated integer identifying the color model by which the active image is to be merged. Must be one of the following:
CM_RGB
CM_HSI
CM_HSV
CM_YIQ
See definitions under Comments, below.

Channel **Integer** An integer specifying the channel into which the active image data is to be merged. See definitions under Comments, below.

Example

```
ret = IpCmChannelMerge(4, CM_HSI, 1)
```

This statement will merge the active image as the saturation channel in image 4.

Comments The active image must be of *Gray Scale* class. The image into which the active image is merged must be *True Color* class. The following table describes the values allowed in the *cmColor* and *Channel* parameters:

		Channel **VALUES**		
cmColor	DESCRIPTION	0	1	2
CM_RGB	Red, Green and Blue (RGB) model.	Red	Green	Blue
CM_HSI	Hue, Saturation and Intensity (HSI) model	Hue	Saturation	Intensity
CM_HSV	Hue, Saturation and Value (HSV) model	Hue	Saturation	Value
CM_YIQ	Luminance, In-Phase and Quadrature (YIQ) model.	Luminance	In-Phase	Quadrature

See Also IpCmChannelExtract, IpCmTransform

IpCmChannelMerge3

Syntax **IpCmChannelMerge3** *(colorDoc, redDoc, greenDoc, blueDoc, cModel,bNewImage)*

Description This functions merges a color channel or channels into another image.

Parameters

colorDoc	**Integer**	ID of the destination color image, or -1 for a new color image
redDoc	**Integer**	ID of the red image, or -1 for no image.
greenDoc	**Integer**	ID of the green image or -1 for no image.
blueDoc	**Integer**	ID of the blue image or -1 for no image.
cModel	**Integer**	The color model: RGB, HIS, etc,
bNewImage	**Integer**	1 = create new image 0 = use the image specified by *colorDoc* as the destination image

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

See Also IpCmChannelMerge, IpCmChannelExtract

IpCmmCorrectColors

Syntax **IpCmmCorrectColors** *(IpInData, IpOutData, nPixels, ImClass)*

Description This function converts pixel colors using the current profile.

Parameters

IpInData	**Any**	Pointer to input data
IpOutData	**Any**	Pointer to output data
nPixels	**Long**	Number of pixels to convert
ImClass	**Integer**	Image class, can be IMC_RGB, IMC_RGB36, or IMC_RGB48

Example

```
Sub TestRaw()

        Dim InArray(3) As Byte
        Dim OutArray(3) As Byte

        InArray(0)=79
        InArray(1)=79
        InArray(2)=79

        ret=IpCMMCorrectColorsRaw(InArray(0),OutArray(0),1,IMC_RGB)

        Debug.Print "Out Red: " & OutArray(0)
        Debug.Print "Out Green: " & OutArray(1)
        Debug.Print "Out Blue: " & OutArray(2)

End Sub
```

IpCmmGet

Syntax **IpCmmGet** ***(sAttribute, sParam, pValue)***

Description This function gets the various parameters of the Color-Pro module.

Parameters

sAttribute	**Long**	The command ID. See table below.
sParam	**Integer**	A parameter of the command. See table below.
pValue	**Integer**	Integer value to receive the data

sAttribute	**sParam**	**pValue**	**Description**
CMM_ENABLE	Ignored, should be 0	1 = enable 0 = disable□	Returns the enabled flag for color correction on the monitor and/or printer.
CMM_ENABLE_CAM_CORR	Ignored, should be 0	1 = enable 0 = disable	Returns the enabled flag for captured image correction
CMM_INP_INTENT	Ignored, should be 0	0 = picture (default) 1 = proof 2 = graphics 3 = match print	Returns the rendering intent for color correction.

Return Value 0 if successful, a negative error code if failed

See Also IpCmmSetInt, IpCmmSetStr

IpCmmSelectCameraProfile

Syntax **IpCmmSelectCameraProfile** *()*

Description This function shows or hides the camera color profile selection dialog.

Example

```
ret = IpCmmSelectCameraProfile()
```

IpCmmSetInt

Syntax **IpCmmSetInt *(sAttribute, sParam)***

Description This function sets the various parameters of the Color-Pro module.

Parameters

sAttribute	**Long**	The command ID. See table below.
sParam	**Integer**	A parameter of the command. See table below.

sAttribute	**sParam**	**Description**
CMM_ENABLE	1 = enable 0 = disable	Enables/disables color correction on the monitor and/or printer
CMM_USE_IMAGE_PROOF	1 = camera profile 0 = working space	Indicates whether the selected camera profile or default working color space should be used for captured images
CMM_CONVERT_VRI	Virtual image handle	Converts image using existing camera profile
CMM_INP_INTENT	0 = picture (default) 1 = proof 2 = graphics 3 = match print	Indicates the rendering intent for color correction.
CMM_ATTACH_ICC	Image VRI	Attaches the selected ICC color profile to the image. The profile is selected by previous CMM_CAMERA_PROF and CMM_USE_IMAGE_PROF commands.
CMM_CONVERT_TO_WPROF	1 = working profile 0 = destination profile	Indicates whether the selected destination profile or the default working color space should be used for converted images.
CMM_CREATE_NEW_IMAGE	1 = put results in new image 0 = use active imagee	Indicates whether a new image should be created with the next conversion operation, or if the active image should be used.
CMM_SAVE_ICC_PROF	1 = on 0 = off	Turns the ‘Save ICC profiles in TIFF files’ option on or off.
CMM_SAVE_ICC_ALWAYS	1 = on 0 = off	Turns the ‘Always save ICC profiles’ option on or off. If this option is off, the profile is saved only if it is not the working profile.
CMM_CONVERT_ACT	Ignored, should be 0	Converts the active image to a new profile. The destination profile should be already selected using CMM_CONV_TO_WPROF and CMM_DEST_PROF functions **.**

Return Value 0 if successful, a negative error code if failed. For CMM_CONVERT_ACT, the return value will be the ID of the new image, if successful, a negative error code if failed.

Example

```
'enable color management for monitor and printer
ret = IpCmmSetInt(CMM_ENABLE,1)

'use default working color space for captured images
ret = IpCmmSetInt(CMM_USE_IMAGE_PROF,0)

Dim DocId As Integer, hVri As Integer
'get Vri of the active image
ret = IpDocGet(GETACTDOC, 0, DocId)
ret = IpDocGet(GETDOCVRI, DocId, hVri)'convert image
ret = IpCmmSet(CMM_CONVERT_VRI,0,hVri)
'update image
ret = IpAppUpdateDoc(DocId)

ret = IpCMMSetInt(CMM_USE_IMAGE_PROF,1)
ret = IpCMMSetStr(CMM_CAMERA_PROF,0,"C:\ MP5_2_Green.icc")
ret = IpCMMSetInt(CMM_ATTACH_ICC,0)

'convert image to working profile
ret = IpCMMSetInt(CMM_CONV_TO_WPROF,1)
ret = IpCMMSetInt(CMM_CREATE_NEW_IMAGE,0)
ret = IpCMMSetInt(CMM_CONVERT_ACT,0)
```

See Also IpCmmGet, IpCmmSetStr

IpCmmSetStr

Syntax **IpCmmSetStr** ***(sAttribute, sParam, pValue)***

Description This function sets the string values for the color profile.

Parameters

sAttribute	**Long**	The command ID. See table below.
sParam	**Integer**	A parameter of the command. See table below.
pValue	**String**	The name of a fixed-length string.

sAttribute	sParam	pValue	Description
CMM_CAMERA_PROF	Ignored, should be 0	String containing the file name	Sets the file name for the camera color profile
CMM_WORK_PROF	Ignored, should be 0	String containing the file name	Sets the file name for the working color profile
CMM_DEST_PROF	Ignored, should be 0	String containing the file name	Sets the file name for the destination color profile in the **Convert To Profile** dialog; This profile will be used in the next IpCMMSetInt (CMM_CONVERT_ACT, 0) operation

Return Value 0 if successful, a negative error code if failed

Example

```
‘Set camera profile
ret = IpCmmSetStr(CMM_CAMERA_PROFILE,0,”C:\DCS720XDaylightsource.icm”)
```

See Also IpCmmGet, IpCmmSetInt,

IpCmmShow

Syntax **IpCmmShow** *(WindowType, Show)*

Description This function shows or hides the color management dialogs.

Parameters

bShow	**Integer**	Must be one of the following: `SHOW` = 1, show dialog `HIDE` = 0, hide dialog
WindowType		Applies to one of the following: Color Management dialog = CMM_W_MANAGER Assign Color Profile dialog = CMM_W_ASSIGN Convert to Profile dialog = CMM_W_CONVERT

Example

```
IpCmMShow (CMM_W_MANAGER)
```

Return Value 0 if successful, an error code otherwise

IpCmTransform

Syntax **IpCmTransform**(*cmOut, cmIn, bNewImage*)

Description This function transforms the active image to another color model. Equivalent to the **Color Transform** command.

Parameters

cmOut	**Integer**	An enumerated integer, which identifies the color model to which the active image is to be transformed: CM_RGB CM_HSI CM_HSV CM_YIQ See definitions under Comments, below.
cmIn	**Integer**	An enumerated integer, which identifies the color model in which the active image is currently expressed (or is to be interpreted). Must be one of the following: CM_RGB CM_HSI CM_HSV CM_YIQ See definitions under Comments, below.

bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 - Writes the transformed results to the active window. 1 - Writes the transformed results to a new image window.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpCmTransform(CM_HSI, CM_RGB, 0)
```

This statement will convert RGB image data to HSI image data.

Comments

The following table describes the values allowed in the *cmOut* and *cmIn* parameters.

cmColor	**DESCRIPTION**
CM_RGB	Red, Green and Blue (RGB) model.
CM_HSI	Hue, Saturation and Intensity (HSI) model
CM_HSV	Hue, Saturation and Value (HSV) model
CM_YIQ	Luminance, In-Phase and Quadrature (YIQ) model.

See Also

IpCmChannelExtract, IpCmChannelMerge

IpCmpAdd

Syntax

IpCmpAdd *(DocId, Hue)*

Description

This function adds a document to the active composite image.

Parameters

DocId	**Integer**	Indicates the image to add to the color composite.

Hue	**short**	Indicates a color for the source image. Hue may be any number from 0 to 360, or be one of the following predefined values:
		HUE_RED = 0
		HUE_GREEN = 120
		HUE_BLUE = 240
		HUE_YELLOW = 60
		HUE_CYAN = 180
		HUE_MAGENTA = 300
		HUE_WHITE = 361
		HUE_DEFAULT - use color specified in Hue property, if any (if no default is specified, HUE_WHITE will be used)
		HUE_QUERY - displays Hue dialog to set color interactively

Example

```
IpCmpAdd (0, HUE_QUERY) ‘Adds document 0, queries the user for
the hue.’
IpCmAdd(DOCSEL_ACTIVE,HUE_RED) Adds the active image
```

Return Value

0 if successful, an error code otherwise.

IpCmpAddEx

Syntax **IpCmpAddEx** *(DocId, Hue***)**

Description This function allows you to add images to the color composite while simultaneously defining their X and Y shift.

Parameters

DocId	**Integer**	Indicates the image to add to the color composite.

Hue	**short**	Indicates a color for the source image. Hue may be any number from 0 to 360, or be one of the following predefined values:
		HUE_RED = 0
		HUE_GREEN = 120
		HUE_BLUE = 240
		HUE_YELLOW = 60
		HUE_CYAN = 180
		HUE_MAGENTA = 300
		HUE_WHITE = 361
		HUE_DEFAULT - use color specified in Hue property, if any (if no default is specified, HUE_WHITE will be used)
		HUE_QUERY - displays Hue dialog to set color interactively

Example

```
IpCmpAddEx (0, HUE_QUERY) ‘Adds document 0, queries the user
for the hue.’
IpCmAddEx(DOCSEL_ACTIVE,HUE_RED) Adds the active image
```

Return Value 0 if successful, an error code otherwise.

IpCmpAddTint

Syntax **IpCmpAddTint** *(DocId, Tint)*

Description This function adds a new channel to the existing color composite, which must be the active image when this function is called.

Parameters

DocId	**Long**	Indicates the image to use for color compositing
Tint	**Long**	Indicates the tint requested

Return Value The document ID of the image which received the new color composite channel.

Example

```
This example assumes that you have three images
on screen with ID numbers of 0,1, and 2
respectively:

Sub SampleComposite()
Dim CompositeID As Integer
Dim Tint1 As Long, Tint2 As Long, Tint3 As Long

'You need to fill the values of Tint1, Tint2,
and Tint3
' in some way, perhaps by calling IpDyeGet
CompositeID = IpCmpNewTint(0, Tint1)
ret = IpAppSelectDoc(CompositeID)
ret = IpCmpAddTint(1, Tint2)
ret = IpAppSelectDoc(CompositeID)
ret = IpCmpAddTint(2, Tint3)

End Sub
```

IpCmpAddTintPos

Syntax **IpCmpAddTintPos** *(DocId, Tint)*

Description This function adds a document with an RGB tint and a specific X/Y shiift to the color composite.

Parameters

DocId	**Long**	Indicates the image to use for color compositing
Tint	**Long**	Indicates the tint requested
Dx	**Long**	Indicates the X position of the composite
Dy	**Long**	Indicates the Y position of the composite

Return Value 0 if successful, an error code otherwise.

IpCmpDel

Syntax **IpCmpDelete** *(DocId)*

Description This function removes a document from the active composite image

Parameters

DocId	**short**	Indicates the document ID of the image to remove from the color composite.

Example

```
IpCmpDelete(0) ‘Remove the image with a document ID of 0’
```

Return Value 0 if successful, or IPCERR_INVARG (bad docID) or IPCERR_FUNC (not a composite active) if failed

IpCmpGet

Syntax **IpCmpGet** *(Command, DocId, Value)*

Description This function gets the values for color compositing.

Parameters

Command	**short**	Must be one of the following:
		`LUT_BRIGHTNESS`
		`LUT_CONTRAST`
		`LUT_GAMMA`
		`SHIFT_X`
		`SHIFT_Y`
		`COMP_HUE`
		`COMP_BACKGROUND`
		`COMP_DISPLAY`
		`COMP_FRAME`
		`COMP_NUMFRAMES`
		`GETNUMDOC`
		`GETDOCLST`

DocId	**short**	For the LUT , FRAME, NUMFRAMES, and SHIFT commands, Doc Id is the the DocID of the source image to inquire about or `DOCSEL_ACTIVE` for the color composite itself.
Value	**long**	Value indicates the variable that will receive the selected setting's current value.

Comments

COMMAND	**DocID**	**VALUE**
LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA	DocID of the source image to inquire about, or DOCSEL_ACTIVE to inquire about the color composite preview image's setting.	Current LUT value. Gamma is scaled by a factor of 100 so that it can be integrated.
SHIFT_X SHIFT_Y	DocID of the source image to inquire about, or DOCSEL_ACTIVE to inquire about the color composite preview image's setting.	Current pixel shift
COMP_DISPLAY	DocID of the source image to inquire about.	Flag indicating if displayed or not (non-zero if displayed).

COMMAND	**DocID**	**VALUE**
COMP_FRAME	DocID of the source image to inquire about, or DOCSEL_ACTIVE to inquire about the color composite preview image's setting.	Current frame
COMP_HUE	DocID of the source image to inquire about.	Hue
COMP_BACKGROUND	none	DocID of the background, -1 if none
COMP_NUMFRAMES	DocID of the source image to inquire about, or DOCSEL_ACTIVE to inquire about the color composite preview image's setting	Number of frames in the source image or composite.
GETNUMDOC	none	Number of documents (images) in the color composite.
GETDOCLST	This parameter should indicate the size of the array provided by the Value parameter. The array should be dimensioned to the number of documents provided by the GETNUMDOC commad.	An integer array of the document Ids of all the documents in the color composite. Use the GETNUMDOC command to get the number of values that will be returned.

Example

```
dim parm1 as integer
ret = IpCmpGet (LUT_BRIGHTNESS, 0, parm1)
Print parm1
```

Return Value 0 if successful, an error code otherwise

IpCmpNew

Syntax **IpCmpNew** *(DocId, Hue)*

Description This function creates a new color composite, based on the size of the supplied image.

Parameters

DocId	**short**	Indicates the image to use for color compositing
Hue	**short**	Indicates a color for the source image. Hue may be any number from 0 to 360, or be one of the following predefined values: `HUE_RED` = 0 `HUE_GREEN` = 120 `HUE_BLUE` = 240 `HUE_YELLOW` = 60 `HUE_CYAN` = 180 `HUE_MAGENTA` = 300 `HUE_WHITE` = 361 `HUE_DEFAULT` - use color specified in Hue property, if any (if no default is specified, `HUE_WHITE` will be used) `HUE_QUERY` - displays Hue dialog to set color interactively

Example

```
IpCmpNew (0, HUE_RED)
‘Creates a new color composite and adds Document 0 to that
‘color composite, and tints its channel Red.
```

Return Value 0 if successful, an error code otherwise.

IpCmpNewTint

Syntax **IpCmpNewTint** *(DocId, Tint)*

Description This function creates a new color composite channel with a specific RGB tint.

Parameters

DocId	**Long**	Indicates the image to use for color compositing
Tint	**Long**	Indicates the tint requested

Return Value The document ID of the new color composite preview image.

IpCmpSet

Syntax **IpCmpSet** *(Command, DocId, Value)*

Description This function sets the values for color composites.

Parameters

Command	**short**	Must be one of the following:
		`LUT_BRIGHTNESS`
		`LUT_CONTRAST`
		`LUT_GAMMA`
		`SHIFT_X`
		`SHIFT_Y`
		`COMP_HUE`
		`COMP_BACKGROUND`
		`COMP_DISPLAY`
		`COMP_RESET`
		`COMP_BESTFIT`
		`COMP_FRAME`
		`COMP_MAKESEQUENCE`
		`COMP_AUTO_COMPOSITE`

DocId	**short**	For the LUT, SHIFT, RESET, BESTFIT, and FRAME commands, parameter is the DocID of the souce to adjust, or `DOCSEL_ACTIVE` for the color composite itself.
Value	**long**	New value for the specified setting. Not used with `COMP_RESET` or `COMP_BESTFIT`.

Comments For `COMP_RESET` or `COMP_BESTFIT` the value argument is ignored, and a LUT bestfit or reset is performed on the specified image. `COMP_HUE` cannot be adjusted on the color composite preview image. For `COMP_BACKGROUND` the document ID argument is ignored, and the value argument is used to specify the background document, or –1 to reset.

COMMAND	**DocID**	**VALUE**
LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA	DocID of the source image to adjust, or DOCSEL_ACTIVE to adjust the color composite preview image’s setting.	New LUT value. Gamma is set to gamma*100 to allow integration.
SHIFT_X SHIFT_Y	DocID of the source image to adjust, or DOCSEL_ACTIVE to adjust the color composite preview image’s setting.	New pixel shift
COMP_DISPLAY	DocID of the source image to inquire about.	New display value. The document is displayed in the color composite if Value is non-zero.

COMMAND	DocID	VALUE
COMP_RESET COMP_BESTFIT	DocID of the source image to adjust, or DOCSEL_ACTIVE to adjust the color composite preview image's setting.	none
COMP_FRAME	DocID of the source image to adjust, or DOCSEL_ACTIVE to adjust the color composite preview images's setting	New frame
COMP_HUE	Document ID of the source image to adjust	Hue
COMP_MAKESEQUENCE	Not used	Not used
COMP_BACKGROUND	none	DocID to use for background, -1 to reset

Example

```
IpCmpSet (LUT_BRIGHTNESS,0,87)
```

Return Value 0 if successful, an error code otherwise.

IpCmpShow

Syntax **IpCmpShow** *(flag)*

Description This function shows or hides the color composite dialog.

Parameters

flag	**short**	Must be one of the following: `COMP_SHOW` = 1, show dialog `COMP_HIDE` = 0, hide dialog

Example

```
IpCmpShow (COMP_SHOW)
```

Return Value 0 if successful, an error code otherwise

IpColCalAdd

Syntax **IpColCalAdd** *(fRGB, fLAB)*

Description This function adds a point to the color calibration.

Parameters

fRGB	**Any**	An array of RGB values, must be declared as: `Dim fRGB(3) as single`
fLAB	**Any**	An array of color values, can be LAB or XYZ, must be declared as: `Dim fLAB(3) as single`

IpColCalConvert

Syntax	**IpColCalConvert** *(ColMode)*		
Description	This function converts the color from one model to another.		
Parameters	*ColMod*	**Integer**	Indicates the color model to convert the active image into. Must be one of the following: COLM_LAB COLM_XYZ COLM_RGB COLM_YIQ COLM_CMY

IpColCalCorrect

Syntax	**IpColCalCorrect** *(InNames$, Out Name$)*		
Description	This function corrects the color.		
Parameters	*InName$*	**Long**	Indicates the name of the color calibration to correct from.
	OutName$	**Long**	Indicates the name of the color calibration to correct to.

IpColCalCreate

Syntax	**IpColCalCreate** *()*
Description	This function creates a color calibration.
Comments	Must be called after at least 3 `IpColCalAdd` calls.

IpColCalGet

Syntax	**IpColCalGet***(Command)*		
Description	This function gets the color calibration data		
Parameters	*Command*	**Long**	Data type, must be one of the following: GET_CAL_POINT GET_CAL_INFO GET_CAL_MATRIX GET_CAL_ICC
	N	**Integer**	Number of the point
	Out	**Any**	See below.

Command	**N**	**Out**	**Description**
GET_CAL_POINT	**0 to 19**	Returns the data. Out is an array of 6 singles: Out[0]- R input value of the point Out[1]- G input value of the point Out[2]- B input value of the point Out[3] - R (or L or X)output value of the point Out[4]- G (or a or Y)output value of the point Out[5]- B (or b or Z)output value of the point	Gets a point of input values of color calibration
GET_CAL_ICC	**Ignored, must be 0**	Returns a single variable to receive the data	Gets ICC profile information

Command	**N**	**Out**	**Description**
GET_CAL_INFO	Ignored, must be 0	Returns the data. Out is an array of 3 singles: Out[0] - Color mode of the calibration, can be 0=COLM_LAB, 1=COLM_XYZ, 2=COLM_RGB Out[1]- Image Class of the calibration, 0=RGB24, 1=RGB36, 2=RGB48 Out[2] - Number of points in the calibration	Gets calibration information
GET_CAL_MATRIX	Color Channel	Out- returns the matrix for the channel, Out is array of 20 singles :Out[0]..Out[19] - matrix data	Gets the calibration matrix

Comments	For COLM_RGB the function returns coefficient of color conversion polynomial, for COLM_LAB and COLM_XYZ the function returns XYZ matrix

IpColCalGetRGB

Syntax	**IpColCalGetRGB** *(X,Y, Size, outRGBval,)*		
Description	This function gets the RGB values from the x and y positions of the active image.		
Parameters	*X*	**Long**	X position
	Y	**Long**	Y position
	Size	**Long**	Size of the array in pixels
	outRGBval	**Single**	Output array of RGB values, must be declared as: `Dim outRGBval(3) as single`

IpColCalLoad

Syntax	**IpColCalLoad** *(fNames$)*		
Description	This function loads a color calibration.		
Parameters	*fNames$*	**Long**	Name of the calibration to load
Return Value			

IpColCalNew

Syntax	**IpColCalNew** *(InpMode%, ColModel%)*		
Description	This function starts a new color calibration.		
Parameters	*InpMode*	**Long**	Indicates the image class. Can be one of the following: 0 = RGB24 1 = RGB36 2 = RGB48
	ColModel	**Long**	Indicates the color model. Must be one of the following: COLM_LAB COLM_XYZ COLM_RGB COLM_YIQ COLM_CMY

IpColCalSave

Syntax	**IpColCalSave** *(fNames$)*		
Description	This function saves a color calibration.		
Parameters	*fNames$*	**Long**	Name of the calibration to save

IpColCalSet

Syntax	**IpColCalSet***(Command, N, In)*		
Description	This function sets the color calibration data		
Parameters	*Command*	**Long**	Data type, must be one of the following: SET_CAL_POINT SET_CAL_INFO SET_CAL_MATRIX SET_CAL_ICC
	N	**Integer**	Number of the point
	InData	**Any**	See below.

Command	**N**	**InData**	**Description**
SET_CAL_POINT	**0 to 19**	Returns the data. InData is an array of 6 singles: In[0]- R input value of the point In[1]- G input value of the point In[2]- B input value of the point In[3] - R (or L or X)Input value of the point In[4]- G (or a or Y)Input value of the point In[5]- B (or b or Z)Input value of the point	Sets a point of input values of color calibration
SET_CAL_ICC	Ignored, must be 0	A single value. 1 = on 0 = off	Sets the ICC profile option
SET_CAL_INFO	Ignored, must be 0	Returns the data. In is an array of 3 singles: In[0] - Color mode of the calibration, can be 0=COLM_LAB, 1=COLM_XYZ, 2=COLM_RGB In[1]- Image Class of the calibration, 0=RGB24, 1=RGB36, 2=RGB48 In[2] - Number of points in the calibration	Sets calibration information

Command	N	In	Description
SET_CAL_MATRIX	Color Channel	In- returns the matrix for the channel, In is array of 20 singles :In[0]..In[19] - matrix data	Sets the calibration matrix

Comments	For COLM_RGB the function returns the coefficient of color the conversion polynomial, for COLM_LAB and COLM_XYZ the function sets the XYZ matrix

IpColCalShow

Syntax **IpColCalShow** *(Show)*

Description This function shows or hides the color calibration dialog.

Parameters			
	Show	**Long**	1= Show the dialog 0 = Hide the dialog

IpColExtract

Syntax **IpColExtract** *(Mask, ColMod, IsSingle)*

Description This function extracts the color channels.

Parameters			
	Mask	**Long**	Indicates the mask for the channel to be extracted, should be COLM_CH1, COLM_CH2, and/or COLM_CH3
	ColMod	**Integer**	Color model, must be one of the following: COLM_LAB COLM_XYZ COLM_RGB COLM_YIQ COLM_CMY
	IsSingle	**Integer**	Indicates the type of the output image: 1 = single point image 0 = Gray8, Gray12, or Gray 16 depending on on the class of the source

IpColShow

Syntax **IpColShow** *(Show)*

Description This function shows or hides the color coordinates dialog.

Parameters			
	Show	**Long**	1= Show the dialog 0 = Hide the dialog

IpCoLocForward

Syntax **IpCoLocForward** *(SecondImage, ColorPair, Type)*

Description This function calculates the co-localization scatterplot and parameters

Parameters

SecondImage **Integer** Document ID of the image to use as the second grayscale channel (the active image is used as the first channel). The second image ID should be –1 if the first image is a color image.

ColorPair **Interger** Indicates the color that should be used:

CP_RED_GREEN	Red for first channel, green for second
CP_BLUE_RED	Blue for first, red for second
CP_GREEN_BLUE	Green for first, blue for second
CP_GREEN_RED	Green for first, red for second
CP_RED_BLUE	Red for first, blue for second
CP_BLUE_GREEN	Blue for first, green for second

Type **Integer** Indicates the type of output desired:

CLOC_FWDMASK: Creates a color composite workspace only if the input images are grayscale. It will create and return the grayscale scatterplot.

CLOC_FWDCOLOR : Creates a color composite workspace only if the input images are grayscale. It will create and return the color scatterplot.

CLOC_FWD3D: Creates a color composite workspace only if the input images are grayscale. It will also create a grayscale scatterplot that should be the active image for the surface plot. It will create and return the color scatterplot.

CLOC_FWDPARAMS: Calculates the first set of co-localization parameters and sends them to the output window.

Comments This function, IpCoLocForward, can end up creating up to 3 new workspaces (or none at all) depending on the type of image being operated on, and the co-localization option selected.

Return Value Returns the Doc ID of the co-localization scatterplot for all output types except CLOC_FWDPARAMS. A negative return value indicates an error.

IpCoLocGetDocument

Syntax **IpCoLocGetDocument** *(DocType, DocID)*

Description This function gets the document IDs of the documents created by IpCoLocForward.

Parameters	*DocType*	**Integer**	Identifies the document type to return. Must be one of the following: CLDOC_COLORCOMPOSITE – Return the document ID of the color composite or color input image. CLDOC_SCATTERPLOT - Return the document ID of the co-localization scatterplot. CLDOC_3DMASK – Return the document ID of the grayscale scatterplot used for surface plotting.
Parameters	*DocID*	**Integer**	An integer variable to recieve the document ID.

Return Value 0 if successful. A negative return value indicates an error .

Comments The document ID returned by CLDOC_COLORCOMPOSITE may be the color iput image or a new document containing a color composite created from the grayscale imput images. The document ID returned by CLDOC_SCATTERPLOT will be the same ID returned by IpCoLocForward. The document ID returned by CLDOC_3DMASK should be the active image for proper display of the co-localization surface plot.

Example ret = IpCoLocGetDocument(CLDOC_COLORCOMPOSITE, ColorImg)

See Also IpCoLocForward

IpCoLocGetForward

Syntax **IpCoLocGetForward** *(SecondImage, ColorPair, Data)*

Description This function gets the co-localization overlap parameters of the original image.

Parameters

SecondImage	**Integer**	Document ID of the image to use as the second grayscale channel (the active image is used as the first channel). The second image ID should be –1 if the first image is a color image.
ColorPair	**Interger**	Indicates the color that should be used: CP_RED_GREEN — Red for first channel, green for second CP_BLUE_RED — Blue for first, red for second CP_GREEN_BLUE — Green for first, blue for second CP_GREEN_RED — Green for first, red for second CP_RED_BLUE — Red for first, blue for second CP_BLUE_GREEN — Blue for first, green for second
Data	**Single**	Data should be an array of 10 singles, which will receive the forward parameters: Data(0) - Pearson's correlation Rr Data(1) - Overlap coefficient R Data(2) - Overlap coefficient k1 Data(3) - Overlap coefficient k2 Data(4..9) - reserved

Return Value 0 if successful, an error code otherwise.

IpCoLocGetInverse

Syntax **IpCoLocGetInverse** *(Data)*

Description This function gets the co-localization parameters.

Parameters

Data	**Single**	Data should be an array of 10 singles, which will receive the forward parameters: Data(0) - Co-localization coefficient M1 Data(1) - Co-localization coefficient M2 Data(2 - 9) - reserved

Return Value 0 if successful, an error code otherwise

IpCoLocInverse

Syntax **IpCoLocInverse** *(Type)*

Description This function calculates co-localization parameters on the basis of the active AOI on the co-localization plot.

Parameters

Type	**Integer**	CLOC_INVMASK: Creates a mask of co-localizing pixels on the base of an AOI on the image of co-localization plot CLOC_INVPARAMS: Calculates the second set of co-localization parameters and sends them to the output window.

Return Value If the input is CLOC_INVMASK, the return value is the document ID of the mask image.

If the input is CLOC_INVPARAMS, the return value is 0.

IpCoLocShow

Syntax **IpCoLocShow** *(show)*

Description This function shows or hides the co-localization dialog.

Parameters

Show	**Integer**	Must be one of the following: `COMP_SHOW` = 1, show dialog `COMP_HIDE` = 0, hide dialog

Return Value 0 if successful, an error code otherwise

IpDbAddField

Syntax **IpDbAddField***(FieldName, FieldType, FieldLength)*

Description This function adds a custom field to the image record.

Parameters

FieldName	**String**	Identifies the name of the field to be added.
FieldType	**Integer**	An enumarated value that specifies the type of field. Must be one of the following: DB_INT: a 2-byte integer DB_LONG: a 4-byte integer DB_MEMO: a long string, limited only by your database engine DB_STRING: 1 - 255 byte string
FieldLength	**Integer**	A number between 1 and 255 indicating the number of characters in the *string* field (used by DB_STRING, ignored by the others).

Example

```
ret = IpDbAddField(“MyTextField”, DB_STRING, 40)
```

IpDbFind

Syntax

IpDbFind*(FieldName, FieldType, Operator, Field Value)*

Description

This function searches in the current view according to the specified criteria and selects (highlights) the next record (thumbnail) that matches.

Parameters

FieldName	**String**	The name of the field. The name can be selected from the list of available fields in the Single Image Layout Preferences dialog.
FieldType	**Integer**	An enumarated value that specifies the type of field. Must be one of the following: DB_INT DB_LONG DB_STRING All data fields are of the type STRING, with the exception of the following fields, which are LONG: File Size, Resolution, Width in pixels, Height in pixels
Operator	**Integer**	An enumarated value that specifies the operator of field. Must be one of the following: OP_EQUAL (equal to) OP_LT (less than) OP_LE (less than or equal to) OP_GT (greater than) OP_GE (greater than or equal to) OP_LIKE OP_NOTLIKE Depending on the field type, only certain operations will be valid. These operators cannot be recorded.
FieldValue	*See below*	The address (name) of a variable that includes the data to be found.

Return Value

Success = **IPCERR_NONE**
Failure = in case of invalid Field Type or invalid Operator, **IPCERR_INVARG, otherwise, IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
ret = IpDbFind ("Keywords", DB_STRING, OP_LIKE,"color")
ret = IpDbFind ("Width in pixels",DB_LONG, OP_GT,"300")
```

This statement will search in the current view for records wider than 300 pixels.

IpDbGoto

Syntax **IpDbGoto***(RecordNum)*

Description This function highlights a specific record in the database.

Parameters

RecordNum	**Integer**	The sequential number of the record to be selected in the current view, or special values as follows: DB_FIRST - the first record in the view. DB_LAST - the last record in the view. DB_NEXT - the next record in the view. DB_PREV - the previous record in the view.

Return Value Success = **IPCERR_NONE**
Failure = **IPCERR_FUNC** or **IPCERR_APPINACTIVE**

Example

```
ret = IpDbGoto(5)
```

This statement will select (highlight) the sixth record (thumbnail) in the current view.

Comments The ‘Archive’ operation of *Image-Pro* Plus places the archived image as the last record in the current view.

See Also IpDbSearch()

IpDbLoadView

Syntax **IpDbLoadView***(ViewName)*

Description This function loads a saved view.

Parameters

ViewName	**String**	The name of the view.

Return Value Success = **IPCERR_NONE**
Failure = in case of invalid or null View Name, **IPCERR_INVARG, otherwise, IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
ret = IpDbLoadView(“DemoView”)
```

This statement will load the previously saved view ‘DemoView’.

IpDbNewFolder

Syntax **IpDbNewFolder***(FolderName,Description)*

Description This function creates a new folder.

Parameters

FolderName	**String**	The name of the folder.
Description	**String**	The description of the folder (optional)

Return Value

Success = **IPCERR_NONE**
Invalid folder name = **IPCERR_INVARG**
Failure = **IPCERR_FUNC**

Example

```
ret = IpDbNewFolder(“Sample”,  “Sample Images”)
```

This statement will create a new folder named‘Sample’ with the description ‘Sample Images.’

IpDbOpenFolder

Syntax **IpDbOpenFolder***(FolderName)*

Description This function opens an existing folder.

Parameters

FolderName	**String**	The name of the folder.

Return Value

Success = **IPCERR_NONE**
Invalid folder name = **IPCERR_INVARG**
Failure = **IPCERR_FUNC**

Example

```
ret = IpDbOpenFolder(“Sample”)
```

This statement will open the folder named‘Sample’.

IpDbPrint

Syntax **IpDbPrint***(Layout)*

Description This function prints the thumbnails in a database or folder.

Parameters

Layout	**Integer**	Identifies the layout to print the thumbnails. Must be one of the following: 1 = Gallery Layout 2 = Single Image Layout 3 = Gallery Layout - Tagged Images 4 = Single Image Layout - Tagged Images

Comments Thumbnails are printed from the currently open folder or “No Folder.”

Example

```
ret = IpDbPrint (1)
```

IpDbReadStr

Syntax **IpDbReadStr***(FieldName, FieldType, FieldValue, ValueLength)*

Description This function reads data from the specified field in the database.

Parameters

FieldName	**String**	The name of the field. The name can be selected from the list of available fields in the Single Image Layout Preferences dialog.
FieldType	**String**	An enumerated value that specifies the type of field. Must be one of the following: DB_ STRING, DB_STRING + DB_FILE
FieldValue	*See below*	The address (name) of a variable that receives the data from the field, or output filename if DB_FILE is used.
ValueLength	**Long**	The length of the data in bytes.

Return Value Success = **IPCERR_NONE**
Failure = in case of invalid Field Type: **IPCERR_IVARG**
otherwise, IPCERR_FUNC or IPCERR_APPINACTIVE

Example

```
Dim theSubject as String * 30
Ret = IpDbReadStr ("Subject", DB_STRING, theSubject, 30)
If ret = 0 Then
Debug.Print theSubject
Else
Debug.Print "Operator failed"
End If
```

This statement will read up to a 30 character string stored in the ‘Subject’ field of the current image (see comments) into the string variable ‘theSubject’. The information found in the ‘Subject’ field will be printed to the Output Window. If no information is found the message “Operator failed” will be displayed in the Output Window.

```
Dim FileDateTime as String * 30
Ret = IpDbReadStr ("FileDateTime", DB_STRING, FileDateTime, 30)
If ret = 0 Then
Debug.Print FileDateTime
Else
Debug.Print "Operator failed"
End If
```

This statement will read up to a 30 character string stored in the ‘FileDateTime’ field of the current image (see comments) into the string variable ‘FileDateTime’. The information found in the ‘FileDateTime’ field will be printed to the Output Window. If no information is found the message “Operator failed” will be displayed in the Output Window.

```
Ret = IpDbReadStr ("Subject", DB_STRING + DB_FILE,
“c:\sample.txt", 30)
```

This statement will read the value from the subject field of the current image into a new file called sample.txt.

Comments

The current image is the one in a Single Image Layout, or the selected (highlighted) image in a database view.

See Also

IpDbFind(); IpDbGoto()

IpDbSetAttr

Syntax **IpDbSetAttr***(Atttrib, nValue, strValue)*

Description This function sets the preferences for your database.

Parameters

Attrib	**Integer**	DB_CAPTION - set caption display fields DB_COPYCUSTOM - set flag to copy custom fields
nValue	**Integer**	0 = Don't set default values of custom fields in new records 1 = Set default values of custom fields in new records This parameter is used by DB_COPYCUSTOM
strValue	**String**	The field name that will be used as the caption (used by DB_CAPTION)

Example

```
IpDbSetAttr (DB_COPYCUSTOM, 1, "")
```

IpDbSearch

Syntax **IpDbSearch***(FieldName, FieldType, Operator, Field Value)*

Description This function searches in the current view according to the specified criteria and creates a new view containing the results of the search.

Parameters

FieldName	**String**	The name of the field. The name can be selected from the list of available fields in the Single Image Layout Preferences dialog.
FieldType	**Integer**	An enumerated value that specifies the type of field. Must be one of the following: DB_INT DB_LONG DB_STRING All data fields are of the type STRING, with the exception of the following fields, which are LONG: File Size, Resolution, Width in pixels, Height in pixels

Operator	**Integer**	An enumerated value that specifies the operator of field. Must be one of the following: OP_EQUAL (equal to) OP_LT (less than) OP_LE (less than or equal to) OP_GT (greater than) OP_GE (greater than or equal to) OP_LIKE OP_NOTLIKE Depending on the field type, only certain operations will be valid. These operators cannot be recorded.
FieldValue	*See below*	The address (name) of a variable that includes the data to search for.

Return Value

Success = **IPCERR_NONE**
Failure = in case of invalid Field Type or invalid Operator, **IPCERR_INVARG, otherwise, IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
ret = IpDbSearch("Caption", DB_STRING, OP_EQUAL, "Demo.tif")
ret = IpDbSearch("Custom5", DB_LONG, OP_LE, "50")
```

This statement will search the current view for records that have ‘Demo.tif’ in their ‘Caption’ field and create a new view containing the results of the search.

IpDbViewAll

Syntax

IpDbViewAll()

Description

This function displays the content of the entire database.

Return Value

Success = **IPCERR_NONE**
Failure = **IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
ret = IpDbViewAll()
```

This statement will display the content of the entire database.

IpDbViewFolder

Syntax

IpDbViewFolder*(FolderName)*

Description

This function takes the named folder and makes it the current folder.

Parameters

FolderName	**String**	The name of the folder.

Return Value

Success = **IPCERR_NONE**
Failure = **IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
ret = IpDbViewFolder(“Sample”)
```

This statement will display the content of the folder ‘Sample’.

IpDbWriteStr

Syntax **IpDbWriteStr**(*FieldName, FieldType, FieldValue, ValueLength)*

Description This function writes data to the specified field in the database.

Parameters

FieldName	**String**	The name of the field. The name can be selected from the list of available fields in the Single Image Layout Preferences dialog.
FieldType	**String**	Must be one of the following: DB_ STRING, DB_STRING + DB_FILE
FieldValue	*See below*	The address (name) of a variable that includes the data to be written in the field, or output filename if DB_FILE is used.
ValueLength	**Long**	Ignored

Return Value Success = **IPCERR_NONE**
Failure = in case of invalid Field Type or invalid Operator, **IPCERR_INVARG, otherwise, IPCERR_FUNC or IPCERR_APPINACTIVE**

Example

```
Dim theSubject as String * 30

theSubject = “Tissue sample”

ret = IpDbWriteStr (“Subject”, DB_STRING, theSubject, 0)

This statement will write a 30 character string stored in the
string variable ‘theSubject’ in the Subject field of the current
image (see comments).

Dim FileDateTime as String * 30

FileDateTime = “03/11/98 12:07:00”

ret = IpDbWriteStr (“FileDateTime”, DB_STRING, FileDateTime, 0)

This statement will write a 30 character string stored in the
string variable ‘FileDateTime’ in the ‘FileDateTime’ field of the
current image (see comments).

Dim Custom1 as String * 30

Custom1 = “03/11/98 12:07:00”

ret = IpDbWriteStr (“Custom1”, DB_STRING, Custom1, 0)

This statement will write a 30 character string stored in the
string variable ‘Custom1’ in the Custom1 field of the current
image (see comments).

ret = IpDbWriteStr("Subject", DB_STRING + DB_FILE,
"C:\sample.txt", 0)
This statement will read the data from Sample.txt and write it
into the field specified as "Subject".
```

Comments	The current image is the one in a Single Image Layout, or the selected (highlighted) image in a database view.
See Also	IpDbFind(); IpDbGoto()

IpDcAddCol

Syntax	**IpDcAddCol***(ColumnName)*		
Description	This function adds columns to the Data Collector.		
Parameters	*ColumnName*	**String**	Indicates the name that will be displayed in the column header to identify the data.
Return Value	A positive column ID if successful, a negative error code if failed.		

Comments

This function adds a new column to the data collector layout. This will clear any data that's already collected (just as adding an item to the layout does in the Data Collector Layout page). Any columns that are added using this function will be visible in the Layout page, but they cannot be added or be selected to be removed from that page. They can only be removed from a script, using IpDcDeleteCol. Columns added from a macro function will be displayed in the layout using the name of macro that inserted the column. Columns added by an external program will be displayed using "External Program".

The ColumnName that is supplied is used as the column header in the data table.

The function returns a column ID. This column ID must be used in any future operations that affect the column, e.g. adding data to the column or deleting the column. This will usually mean that the column ID should be saved to a global variable for use in other macros in the same script.

Example

```
‘ This macro creates two columns and adds data to them
Dim ColN1 As Long  ‘ variables to hold
Dim ColN2 As Long  ‘ the column IDs
Dim nArray(3) As Single     ‘ array variable to hold the data
‘ Note that the columns should only be created
‘ ONCE per session of data collection
ColN1 = IpDcAddCol("Single1")‘ this is just a name, not a type
ColN2 = IpDcAddCol("String1")
‘ We can repeatedly do the following
nArray(0) = 30‘ sample data
nArray(1) = 31
nArray(2) = 32
‘ Add all the single data
‘ We’ve set the NewBlock parameter to 1 to create a new block
‘ with just our data. If we are adding our data to an existing
‘ block of data (e.g. already collected from Count/Size or
‘ another data source), we should set NewBlock to zero.
IpDcAddSng(ColN1, 1, 3, nArray(0))
‘ Add the string data a row at a time
‘ Note that the NewBlock parameter must be zero here,
‘ or we’ll add a new block instead of adding to the current
‘ block
IpDcAddStr(ColN2, 0, 0, "First String")
IpDcAddStr(ColN2, 0, 1, "Second String")
IpDcAddStr(ColN2, 0, 2, "Third String")
```

See Also IpDcDeleteCol, IpDcAddSng, IpDcAddStr

IpDcAddSng

Syntax **IpDcAddSng***(ColumnId, NewBlock, NumRows, Data)*

Description This function adds one or more rows of single data to specified column of the Data Collector.

Parameters

ColumnID	**Long**	Indicates the column where the data should be added. The Column ID must have been returned from IpDcAddCol.
NewBlock	**Integer**	Determines if the data should be added to a new block (if non-zero) or replace the data in the current block (if zero).
NumRows	**Integer**	Indicates the number of rows in the data.
Data	**Single**	Contains the array of single data to be added.

Return Value 0 if successful, a negative error code if failed.

Comments This function can add multiple rows of single-precision single point data to the specified column. The array provided should be a 1-dimensional array of the column data. The data will be added to the first row of a new block when NewBlock is non-zero. When NewBlock is zero, the data will replace the data in the current block (if any).

You cannot add single point data to a column that contains strings and vice-versa. You should instead create separate columns

See Also IpDcAddCol

IpDcAddStr

Syntax **IpDcAddStr***(ColID, NewBlock, Row, Data)*

Description This function adds a string of data to the Data Collector.

Parameters

ColumnID	**Long**	Indicates the column where the data should be added. The Column ID must have been returned from IpDcAddCol.
NewBlock	**Integer**	Determines if the data should be added to a new block (if non-zero) or replace the data in the current block (if zero).
Row	**Integer**	Indicates the row where the string should be inserted.
Data	**String**	Contains the string to be added.

Return Value 0 if successful, a negative error code if failed.

Comments This function adds single string to the collected data. The data will be added to the first row and column of a new block when *NewBlock* is non-zero. When *NewBlock* is zero, the data will replace the current data in the block.

The Row parameter is used to specify the insertion point of the string in the current or new block.

You cannot add single point data to a colum that contains singles, or vice-versa. Instead, you should create additional columns.

See Also IpDcAddCol

IpDcDeleteCol

Syntax **IpDcDeleteCol***(ColumnName)*

Description This function removes a column from the Data Collector.

Parameters

ColumnName	**Long**	Indicates the ID of the column to be deleted. The Column ID must have been returned from **`IpDcAddCol`**

Return Value 0 if successful, a negative error code if failed.

Comments This function deletes an exsiting column from the data collector layout. This will clear any data that's already collected (just as adding an item to the layout does in the Data Collector Layout page).

Example

```
ColN1 = IpDcAddCol("Example")
...
IpDcDeleteCol(ColN1)' delete this column
```

See Also IpDcAddCol

IpDcGet

Syntax **IpDcGet** *(sCmd, sParam, lpParam)*

Description This functions gets data from the data collector.

Parameters

sCmd	**Integer**	The command ID. See table in the Comments section.
sParam	**Integer**	A parameter of the command. See table below.
lpParam	**Reference**	A variable or array name.

Return Value DC_TYPE: returns 0 = empty, 5 = text, other = numerical value
DC_STATS:returns number of values in lpParam. 0 for text columns.
DC_DATA: returns number of values in lpParam. 0 for text columns.

Comments

(1) The current column and the current row can be set via IpDcSet(DC_COL/DC_ROW...). The current column can also be set via IpDcGet(DC_TYPE...).
(2) DC_NUMCOL and DC_TYPE will fail if the data list is empty since information about collected data items is not known yet.
(3) DC_STATS and DC_DATA will return 0 (failed) if current column contains text instead of numerical values.
(4) You can call DC_NUMVAL to determine how large of an array to pass to DC_DATA.

sCmd	sParam	lpParam	Description
DC_BLOCKROW1	block number , 0 = first block	Long variable receving the result	Gets the starting row of a given block in the data list.
DC_CUSTCOLID	The index of the custom column, from 0 to the number of custom columns -1.	Long variable receving the result	Gets the ID of the specified column that was added using IpDcAddColumn.
DC_DATA	Number of values to get.	An array of at least (sParam) singles.	Gets numerical values for the current column in the data list, starting at current row. Empty cells are skipped. For numerical columns only.
DC_NUMVAL	-1 = number of values from current row to end block number - number of values in block, 0 = first block	Long variable receving the result	Gets the number of non-empty cells in the current column of the data list.
DC_NUMROW	-1 = whole list block number, 0 = first block	Long variable receving the result	Gets the number of rows in the whole data list or a given block.
DC_NUMCOL	not used, must be 0	Long variable receving the result	Gets the number of rows in the data list or statistics table.
DC_NUMCUSTCOL	not used, must be 0	Long variable receving the result	Gets the number of custom columns that were added using IpDcAddColumn.
DC_NUMBLOCK	not used, must be 0	Long variable receving the result	Gets the number of blocks collected.

DC_STATS	not used, must be 0	An array of at least 7 singles receiving Min, Max, Mean, SD, Sum, number of samples and number of blocks in that order.	Gets the statistics for the current column.
DC_TYPE	column number , 0= first column	Long variable receving the result 0 = empty 5 = text other = numerical value	Gets the type of data contained in the given column; sets the current column.

Example

```
Dim lVal&, lBlocks&, lColumns&
Dim i%, j%
Dim fStats(10) As Single

'get number of rows in data list
ret = IpDcGet(DC_NUMROW, -1, lVal)
'get number of rows in first block
ret = IpDcGet(DC_NUMROW, 0, lVal)
'get number of columns in data list
ret = IpDcGet(DC_NUMCOL, 0, lColumns)
'get number of blocks in data list
ret = IpDcGet(DC_NUMBLOCK, 0, lBlocks)

'Set current column to 2nd column,
'and get type of data it contains
ret = IpDcGet(DC_TYPE, 1, lVal)

'get number of values in first block
ret = IpDcGet(DC_NUMVAL, 0, lVal)

'get statistics for first column
ret = IpDcSet(DC_COL, 1)
ret = IpDcGet(DC_STATS, 0, fStats(0))

'get 10 values from second column,
'starting at fifth row
ret = IpDcSet(DC_COL, 1)
ret = IpDcSet(DC_ROW, 4)
ReDim fData(10) As Single
ret = IpDcGet(DC_DATA, 10, fData(0))

'get entire column
ret = IpDcSet(DC_ROW, 0)
ret = IpDcGet(DC_NUMVAL, -1, lVal)
ReDim fData(lVal) As Single
ret = IpDcGet(DC_DATA, lVal, fData(0))
```

See Also IpDcSet, IpDcGetStr

IpDcGetStr

Syntax IpDcGetStr ***(sCmd, sParam, retString)***

Description This functions gets text from the data collector.

Parameters

sCmd	**Integer**	The command ID. See table below.

sParam	**Integer**	A parameter of the command. See table below.
retString	**String**	The name of a fixed-length string.

sCmd	sParam	retString	Description
DC_CELL	the maximum length of **retString.**	A fixed-length string receiving the contents of the cell. (at least <sParam> characters)	Gets the text contents of the cell at the current row/column.

Return Value The number of characters returned.

Example

```
Dim dataStr As String * 255
' read at most 100 characters from
' cell at 2nd column, 4th row
ret = IpDcSet(DC_COL, 1)
ret = IpDcSet(DC_ROW, 3)
ret = IpDcGetStr(DC_CELL, 100, dataStr)
```

Comments 1) The current column and the current row can be set via IpDcSet(DC_COL/DC_ROW...). The current column can also be set via IpDcGet(DC_TYPE...).
(2) DC_CELL works with empty and numerical cells as well.

See Also IpDcSet, IpDcGet

IpDcSaveData

Syntax **IpDcSaveData***(FileName, sParam)*

Description This function saves or exports collected data.

Parameters

FileName	**String**	The name/path of the file where the data will be saved. An empty string ("") if not saving to a file.
sParam	**Integer**	What to save and where to save it: S_STATS Export statistics, otherwise export data list. S_X_AXIS Include row headers S_Y_AXIS Include column headers S_DDE Send to Excel via DDE S_PRINTER Print S_CLIPBOARD Copy to clipboard S_APPEND Append to existing file

Example

```
'Save to file collect1.txt with column and row headers
ret = IpDcSaveData("c:\IPWIN7\collect1.txt", S_X_AXIS +
S_Y_AXIS)
'Copy statistics to clipboard (no headers)
ret = IpDcSaveData("", S_CLIPBOARD + S_STATS)
'Debug.print the data (no headers)
ret = IpDcSaveData("", S_DEBUG.PRINTER)
```

IpDcSelect

Syntax **IpDcSelect***(SourceName, ItemName, sParam)*

Description This function selects data items for collection.

Parameters

SourceName	**String**	The name of the data source.
ItemName	**String**	The name of the data item.
sParam	**Integer**	The representation number (if multiple representations).

Example

```
  'collect total number of objects found
  ret = IpDcSelect("Count_Size","Count",0)
  'collect all object area values from Count/Size
  ret = IpDcSelect("Count_Size","BLBM_AREA",0)
  'collect object average area value
  ret = IpDcSelect("Count_Size","BLBM_AREA",3)
```

Comments SouceName and ItemName should be spelled as they appear in Data Collector's lists, on the left hand side of the Layout page.

Names are not case sensitive.

This function can only succeed when the Data List page is empty. It can be called when the Layout page is empty (i.e. before data sources are invoked).

See Also IpDcUnSelect

IpDcSet

Syntax **IpDcSet***(sAttribute, lValue)*

Description This function sets an option or parameter in the Data Collector.

Parameters

sAttribute	**Integer**	Indicates the new option or parameter to set.
lValue	**Long**	The new value of the option/parameter: DC_AUTO Auto collection off (0), on(1), conditional(2) DC_AUTOMODE Auto collection options DC_BREAK Insert empty line (1), do not insert (0) DC_TOPLINE Add module name to column headers (1), do not add (0) DC_LEFTCOL Row headers options DC_COLWIDTH Column width in characters (8 - 50) DC_SIGNIF Number of significant digits (5 - 20) DC_COL set the current column (0 = first column) DC_ROW set the current row (0 = first row)

Example

```
' Conditional auto-collection
ret = IpDcSet(DC_AUTO, 2)
' All conditional options on. Collect from single image
ret = IpDcSet(DC_AUTOMODE, 7)
' All row header options on
ret = IpDcSet(DC_LEFTCOL, 7)
' Insert empty line between blocks
ret = IpDcSet(DC_BREAK, 1)
' make tables columns 15 char. Wide
ret = IpDcSet(DC_COLWIDTH, 15)
' show 8 significant digits
ret = IpDcSet(DC_SIGNIF, 8)
```

Comments For more details on legal values for DC_AUTOMODE and DC_LEFTCOL, please record setting these options via the Options page of Data Collector.

IpDcShow

Syntax **IpDcShow***(bShow)*

Description This function shows or hides the data collector tool.

Parameters

bShow	**Integer**	A value of 0 or 1-5, indicating whether to show or hide the data collector tool tabbed dialog: 0 - hides the dialog 1 - 5 - shows the selected tab in the dialog

See Also IpDcSelect, IpDcUnSelect, IpDcSet, IpDcSaveData, IpDcSelect

IpDcUnSelect

Syntax **IpDcUnSelec**t*(SourceName, ItemName, sParam)*

Description This function de-selects data items from the selected list on the Layout page of the Data Collector.

Parameters

SourceName	**String**	The name of the data source or <all>.
ItemName	**String**	The name of the data item.
sParam	**Integer**	The representation number (if multiple representations).

Example

```
'stop collecting total number of objects found
ret = IpDcSelect("Count_Size","Object Count",0)
'de-select all data items
ret = IpDcUnSelect("<all>","",0)
```

Comments SouceName and ItemName should be spelled as they appear in Data Collector's lists, on the left hand side of the Layout page.

Names are not case sensitive.

This function can only succeed when the Data List page is empty. It can be called when the Layout page is empty (i.e. before data sources are invoked).

See Also IpDcSelect

IpDcUpdate

Syntax **IpDcUpdate***(sUpdate)*

Description This function collects or deletes data.

Parameters

sUpdate	**Integer**	DC_FETCH = Collect Now
		DC_RESET = Delete All
		DC_RESETLAST = Delete last

Comments These commands are equivalent to pressing one of the buttons on the main page.

See Also IpDcSelect, IpDcUnSelect, IpDcShow

IpDCnvCalculateSA

Syntax **IpDCnvCalculateSA***()*

Description This function calculates the spherical abberation values for the active image baed on the current deconvolution settings.

Return Value Zero if successful, a negative error code if failed.

Comments This function can be used to calculate an empirical spherical aberration correction from the active image and the current deconvolution settings. After completion, the spherical aberration correction is updated and the new value will be applied to any subsequent deconvolutions, or can be inquired using the `DCNV_SPHERICALABERRATION` command to the `IpDCnvGet` function.

IpDCnvDeconvolve

Syntax **IpDCnvDeconvolve**

Description This function deconvolves the active image with the current settings.

Return Value The document ID of the workspace containing the deconvolved image sequence if successful, a negative error code if failed.

See Also IpDCnvSet

IpDCnvGet

Syntax **IpDCnvGet** *(Attribute, Value)*

Description This function gets the current values of the deconvolution attributes.

Parameters

Attribute	**Integer**	Indicates the attribute to be examined. See list below and Comments.
Value	**any**	Value is the variable to receive the attribute's value. See Comments.

Return Value 0 if successful, a negative error code if failed.

Comments The *Attribute* parameter determines the type of data returned to the variable, and can be one of the following:

Attribute	Value	Description
DCNV_TYPE	Integer	Type of deconvolution selected. Should be one of the following: 0 = DCTYPE_NONEIGHBOR 1 = DCTYPE_NEAREST 2 = DCTYPE_INVERSE 3 = DCTYPE _BLIND_2D 4 = DCTYOE_BLIND_3D

Attribute	Value	Description
DCNV_NA	Single	Numerical aperture
DCNV_RI	Single	Refractive index
DCNV_WL	Single	Emission wavelength
DCNV_XSPACING	Single	X spacing between pixels, returned from the spatial calibration if the image is calibrated.
DCNV_YSPACING	Single	Y spacing between pixels.
DCNV_ZSPACING	Single	Z spacing between frames or images.
DCNV_BRIGHTFIELD	Integer	Is this set for brightfield processing?
DCNV_PHASEOBJECTS	Integer	Is this set for phase object processing?
DCNV_HAZEREMOVAL	Integer	Percentage of haze removal required.

Attribute	Value	Description
DCNV_SANOISE	Integer	Gets the SA noise level. Should be one of the following: 0 = Auto 1 = Low 2 = Medium 3 = High
DCNV_PROCESSMONTAGE	Integer	Returns the montage overlap value in pixels.
DCNV_USEACTIVEPORTION	Integer	Is this set to ignore set membership and process the active portion of the sequence instead?
DCNV_CONVERTTOFLOAT	Integer	Is this set to retain floating-point results?
DCNV_MONTAGEOVERLAP	Integer	Is this set for montage overlap?
DCNV_NEIGHBORSPACING	Integer	Is the nearest neighbor spacing set?
DCNV_SPHERICALABERRATION	Single	Returns the SA correction value.

See Also IpDCnvSet, IpDCnvSetSng

For 2D and 3D Blind deconvolution, the following constants may be used:

Attribute	**Value**	**Description**
DCNV_MODALITY	Integer	Microscope modalities. Should be one of the following: 0 - Widefield Fluoresence 1 - Transmitted light Brightfield
DCNV_TOTAL_ITERATIONS	Integer	Number of total iterations for blind deconvolution
DCNV_BSAVE_ITERATIONS	Integer	Allows you to save intermediate results, toggles it on or off
DCNV_ SAVE_ITERATIONS	Integer	Indicates the interval for saving intermediate iterations. Must be a factor of the total number of iterations.
DCNV_RESULTS_ITER	Integer	Sets the iteration number on the resulting deconvolution image
DCNV_IMAGEGUESS	Integer	Initial image guess calcuation method for 3-D Blind deconvolution. Must be one of the following: 0 = constant-value data 1 = original image input data
DCNV_GUARDBAND	Integer	Indicates the size in pixels of the padding to add to the XY image border
DCNV_ GUARDBANDZ	Integer	Indicates the size in pixels of the padding to add to the Z image border
DCNV_MONTAGEZ	Integer	Toggles subvolume deconvolution in the Z dimension on or off
DCNV_ENABLEPSFCONS	Integer	Toggles the use of theoretical constraints on PSF on or off

For **2D Blind** deconvolution, the following constants may be used:

Attribute	**Value**	**Description**
DCNV_BUSEACCELERATION	Integer	Use acceleartion scheme for 2D-blind deconvolution
DCNV_B1DDEBLUR	Integer	Deblur only in the horizontal direction
DCNV_BOBJSMOOTHING	Integer	Smooth initial object estimate flag
DCNV_BPIXELSATURATION	Integer	Image contains saturated pixels
DCNV_BREMOVESCANLINES	Integer	Remove the scan lines artifact
DCNV_BSUPPRESSNOISE	Integer	Toggles noise compensation on or off
DCNV_BSYMMETRICPSF	Integer	Forces PSF to be symmetric when rotated 90 degrees
DCNV_IMAGEGUESS2D	Integer	Initial image guess calcuation method for 2-D Blind deconvolution. Must be one of the following: 0 = constant-value data 1 = original image input data
DCNV_NINTERNALPSFITERATIONS	Integer	Number of PSF iterations per cycle
DCNV_SHGUARDBAND2D	Integer	Indicates the size in pixels of the padding to add to the Z image border for 2-D blind deconvolution
DCNV_BBACKGROUNDCORRECTION	Integer	Correct background subtraction minimum intensity value
DCNV_BLIVE2D	Integer	Toggles the live deconvolution preview on or off
DCNV_BEDFAULTTMPPATH	Integer	Sets the temporary folder to the Windows default. 0 = Off 1 = On If this option is Off, the program uses the folder defined by DCNV_STMPPATH

IpDCnvGetStr

Syntax	**IpDCnvGetStr***(Attribute, Value)*		
Description	This function gets the current values of the deconvolution attributes.		
Parameters	*Attribute*	**Integer**	DCNV_STMPPATH sets the folder for temporary files of deconvolution. This path is used for saving the images when DCNV_BDEFAULTTMPPATH option is 0
	Value	**String**	Value is the variable to receive the attribute's value. See Comments.
Return Value	0 if successful, a negative error code if failed.		
Comments	This function is reserved for future expansion.		
See Also	IpDCnvSet, IpDCnvSetSng		

IpDCnvSet

Syntax	**IpDCnvSet** *(Attribute, New Value)*		
Description	This function sets the attribute to new values.		
Parameters	*Attribute*	**Integer**	Indicates the attribute to set. See list below and Comments.
	New Value	**Integer**	New value for integer settings.
Return Value	0 if successful, a negative error code if failed.		
Comments	The *Attribute* parameter determines the attribute to set. This function is used only for Integer attributes.		

Attribute	Parameter Type
DCNV_TYPE	Integer, must be one of the following: 0 = DCTYPE_NONEIGHBORS 1 = DCTYPE_NEAREST 2 = DCTYPE_INVERSE 3 = DCTYPE_BLIND_2D 4 = DCTYPE_BLIND_3D
DCNV_BRIGHTFIELD	Integer. If NewValue is non-zero, will be set for brightfield processing. If NewValue is zero, fluorescence is assumed.
DCNV_PHASEOBJECTS	Integer. If NewValue is non-zero, will be set for phase object processing.
DCNV_HAZEREMOVAL	Integer. NewValue should be from 1-100 to set the haze removal percentage. Not valid for DCTYPE_INVERSE
DCNV_PROCESSMONTAGE	Integer.If NewValue is non-zero, will be set for montage processing. Valid only for DCTYPE_INVERSE.
DCNV_USEACTIVEPORTION	Integer. If NewValue is non-zero, will be set to process active portion of image (override set and Z stack information).
DCNV_MONTAGEOVERLAP	Integer. Sets the montage overlap
DCNV_NEIGHBORSPACING	Sets the nearest neighbor spacing.
DCNV_SANOISE	Integer. Sets the SA noise level. Should be one of the following: 0 = Auto 1 = Low 2 = Medium 3 = High 4 = Custom
DCNV_CONVERTTOFLOAT	Integer. If NewValue is non-zero, the intermediate floating-point results of the deconvolution will be retained

See Also IpDCnvGet, IpDCnvSetSng

For **2D and 3D Blind** deconvolution, the following constants may be used:

Attribute	**Value**	**Description**
DCNV_MODALITY	Integer	Microscope modalities. Should be one of the following: 0 – Widefield Fluoresence 1 –Transmitted light Brightfield
DCNV_TOTAL_ITERATIONS	Integer	Number of total iterations for blind deconvolution
DCNV_BSAVE_ITERATIONS	Integer	Allows you to save intermediate results, toggles it on or off
DCNV_ SAVE_ITERATIONS	Integer	Indicates the interval for saving intermediate iterations. Must be a factor of the total number of iterations.
DCNV_SUBPIXEL_XY	Integer	Sets the super-resolution value
DCNV_RESULTS_ITER	Integer	Sets the iteration number on the resulting deconvolution image
DCNV_IMAGEGUESS	Integer	Initial image guess calcuation method for 3-D Blind deconvolution. Must be one of the following: 0 = constant-value data 1 = original image input data
DCNV_GUARDBAND	Integer	Indicates the size in pixels of the padding to add to the XY image border
DCNV_ GUARDBANDZ	Integer	Indicates the size in pixels of the padding to add to the Z image border
DCNV_MONTAGEZ	Integer	Toggles subvolume deconvolution in the Z dimension on or off
DCNV_ENABLEPSFCONS	Integer	Toggles the use of theoretical constraints on PSF on or off

Example

```
ret=IpDCnvSet(DCNV_SUBPIXEL_XY, 1)
```

For 2D Blind deconvolution, the following constants may be used:

Attribute	**Value**	**Description**
DCNV_BUSEACCELERATION	Integer	Use acceleartion scheme for 2D-blind deconvolution
DCNV_B1DDEBLUR	Integer	Deblur only in the horizontal direction
DCNV_BOBJSMOOTHING	Integer	Smooth initial object estimate flag
DCNV_BPIXELSATURATION	Integer	Image contains saturated pixels
DCNV_BREMOVESCANLINES	Integer	Remove the scan lines artifact
DCNV_BSUPPRESSNOISE	Integer	Toggles noise compensation on or off
DCNV_BSYMMETRICPSF	Integer	Forces PSF to be symmetric when rotated 90 degrees
DCNV_IMAGEGUESS2D	Integer	Initial image guess calcuation method for 2-D Blind deconvolution. Must be one of the following: 0 = constant-value data 1 = original image input data
DCNV_NINTERNALPSFITERATIONS	Integer	Number of PSF iterations per cycle
DCNV_SHGUARDBAND2D	Integer	Indicates the size in pixels of the padding to add to the Z image border for 2-D blind deconvolution
DCNV_BBACKGROUNDCORRECTION	Integer	Correct background subtraction minimum intensity value
DCNV_BLIVE2D	Integer	Toggles the live deconvolution preview on or off
DCNV_BEDFAULTTMPPATH	Integer	Sets the temporary folder to the Windows default. 0 = Off 1 = On If this option is Off, the program uses the folder defined by DCNV_STMPPATH

IpDCnvSettings

Syntax **IpDCnvSettings***(szSettings, bSave)*

Description This function loads or saves a set of deconvolution settings

Parameters

szSettings	**String**	Indicates the settings file
bSave	**Long**	Indicates whether to load or save the file: 0 = load file 1 = save file

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpDCnvSettings (“sampleset.dcs”,0)
```

IpDCnvSetSng

Syntax **IpDCnvSetSng (**A*ttribute, New Value)*

Description This function sets the deconvolution attributes to new values.

Parameters

Attribute	**Integer**	Indicates the attribute to set. See list below and Comments.
New Value	**Single**	New value for single settings.

Return Value 0 if successful, a negative error code if failed.

Comments The *Attribute* parameter determines the attribute to set. This function is used only for string attributes.

Attribute	Parameter Type
DCNV_CUSTOMNOISE	Sets the custom noise level. Note that DCNV_SANOISE must be set to 4 before this value can be set.
DCNV_NA	Value should be a Single containing the new numerical aperture.
DCNV_RI	Refractive index.
DCNV_WL	Emission wavelength
DCNV_XSPACING	X spacing. Cannot be set if the image is calibrated.
DCNV_YSPACING	Y spacing. Cannot be set if the image is calibrated.
DCNV_ZSPACING	Z spacing.
DCNV_SPHERICAL ABERRATION	Sets the spherical aberration.

Example

```
ret = IpDCnvSet(DCNV_SANOISE,4)’custom level
ret = IpDCnvSetSng(DNCV_CUSTOMNOISE, gNoiseLevel)
```

See Also IpDCnvGetStr

For **3D Blind** deconvolution, the following constants may be used:

Attribute	Parameter Type
DCNV_PSFSTREETCHFACTOR	Stretch factor to apply to the calculated PSF
DCNV_PSFCENTRALRADIUS	Radius in pixels of the initial PSF hourglass “waist”

For **2D Blind** deconvolution, the following constants may be used:

Attribute	Parameter Type
DCNV_FPERCENTSATURATION	Percentage of the max intensity for pixels to be considered saturated

IpDCnvSetStr

Syntax	**IpDCnvSetStr** *(Attribute, New Value)*		
Description	This function sets the attribute to new values.		
Parameters	*Attribute*	**Integer**	DCNV_STMPPATH sets the folder for temporary files of deconvolution. This path is used for saving the images when DCNV_BDEFAULTTMPPATH option is 0
	New Value	**String**	New value for integer settings.
Return Value	0 if successful, a negative error code if failed.		
Comments	This function is reserved for future expansion.		
See Also	IpDCnvGet, IpDCnvSetSng		

IpDCnvShow

Syntax	**IpDConvShow***(Show)*		
Description	This function shows or hides the deconvolution dialog.		
Parameters	*Show*	**Integer**	Shows or hides the deconvolution dialog: DCNV_HIDE Hides the dialog DCNV_SHOW Shows the dialog
Return Value	0 if successful, a negative error code if failed.		

IpDCnvResultsShow

Syntax	**IpDCnvResultsShow***(Show)*		
Description	This function shows or hides the deconvolution results dialog.		
Parameters	*Show*	**Integer**	Shows or hides the deconvolution results dialog: DCNV_HIDE Hides the dialog DCNV_SHOW Shows the dialog
Return Value	0 if successful, a negative error code if failed.		

IpDde

Syntax **IpDde**(*Cmd*, *String1*, *String2*)

Description This function gives access to the Dynamic Data Exchange protocol, used by many popular Windows programs to exchange data. It complements the data export via DDE function found in the Image-Pro data generating tools.

Parameters

Cmd	**Integer**	Command ID.
String1	**LPSTR(C),** **String(Basic)**	First parameter of the command.
String2	**LPSTR(C),** **String(Basic)**	Second parameter of the command.

Comments The commands used with this function are listed in the table below.

The commands and formats shown with the examples of DDE_EXEC are specific to the English-language version of Excel. To determine which commands and formats are supported by a given program under DDE, consult the documentation for that product. For non-English versions of Excel, record the command in an Excel macro and observe what kind of string it generates. Any macro command can be sent to Excel using DDE if the command is enclosed in brackets [ ].

Note that in the examples above, whenever a BASIC string containing quotes has to be generated, that string must be split into its component parts. For instance, the string

```
[SELECT("R1C9")]
```

is generated by adding together five strings:

```
"[SELECT("     chr$(34)     "R1C9"  chr$(34)  and     ")]" .
```

If the program called by DDE_OPEN resides in a directory in the system Path, *Image-Pro* will attempt to start that program if it is not already running.

Example

```
q$ = chr$(34) ' ASCII code for quote.

' Open communication with sheet1 of Excel
ret = IpDde(DDE_OPEN, "excel", "sheet1")

' Put value 1.234 into cell on 2nd row and 3rd column.
ret = IpDde(DDE_PUT, "R2C3", "1.234")

'Get value back from Excel
Dim tmp$ as string * 100
Dim retval as single
ret = IpDde(DDE_GET, "R2C3", tmp$)
retval = val(tmp$)

' Execute commands in Excel:

' Open communication with Excel itself
ret = IpDde(DDE_OPEN, "excel", "system")

' Select sheet2
ret= IpDde(DDE_EXEC, "[ACTIVATE(" = q$ +"sheet2" + q$ + ")]", "")

Select cell in first row and 9th column
ret = IpDde(DDE_EXEC, "[SELECT(" + q$ + R1C9" + q$ + ")]", "")

'Paste contents of clipboard
ret = IpDde (DDE_EXEC, "[PASTE()]","")

' End communication
ret = IpDde (DDE_CLOSE, "", "")
```

IpDde commands are as follows:

Command	**String1**	**String2**	**Return Value**	**Description**
DDE_OPEN	DDE server name, usually the name of the executable file (e.g. Excel)	Topic name, depending on the program (e.g." Sheet2" in Excel)	0 if successful, negative number if failed.	Initiates communication with the DDE server program.
DDE_CLOSE	Not used.	Not used.	None.	Ends communication with the DDE server.
DDE_PUT	Item name. In Excel, the coordinates of a cell.	A string containing the data to be sent.	0 if successful, negative number if failed.	Sends a data item to the DDE server.
DDE_GET	Item name. In Excel, the coordinates of a cell.	A string receivng the data sent by the DDE server.	0 if successful, negative number if failed.	Requests a data item from the DDE server.

Command	**String1**	**String2**	**Return Value**	**Description**
DDE_SET	Item name. In Excel, the coordinates of a cell	Must be one of the following: Row Col Row_Inc Col_Inc Topic	0 if successful, negative number if failed.	Sends a data item to the DDE server.
DDE_EXEC	Command to be executed by the DDE server.	Not used.	0 if successful, negative number if failed.	Sends a command to be executed by the DDE server.

IpDemoGetStr

Syntax **IpDemoGetStr**(*Cmd, Param, OutVal*)

Description Use this command to find the name of an IPP Demo Macro.

Parameters

Cmd	**String**	See below
Param	**Integer**	An integer specifying data with which *Cmd* will operate.
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Cmd **VALUE**	**DESCRIPTION**	***Param*** **VALUE**	***OutVal*** **TYPE**
DEMO_ATTR_ LISTPATH	Use this command to determine the name and location of the folder holding one or more .MPL files that define the list of macrosd disaplayed in the macro editor.	The index of the macro of interest, from 0 to the number of demo macros, -1.	**STRING**

Return Value The name of the available macro

IpDemoSetStr

Syntax **IpDemoSetStr**(*Cmd, Param, OutVal*)

Description Use this command toset the name of an IPP Demo Macro.

Parameters

Cmd	**String**	See below
Param	**Integer**	An integer specifying data with which *Cmd* will operate.

OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

***Cmd* VALUE**	**DESCRIPTION**	***Param* VALUE**	***OutVal* TYPE**
DEMO_ATTR_ LISTPATH	Use this command to set the name and location of the folder holding one or more .MPL files that define the list of macrosd disaplayed in the macro editor.	The index of the macro of interest, from 0 to the number of demo macros, -1.	**STRING**

Return Value The name of the available macro

IpDemoShow

Syntax **IpDemoShow***(Show)*

Description This function shows or hides the maro player.

Parameters	Show	**Integer**	If non-zero, show the macro player. If zero, hide the macro player

IpDocClick

Syntax **IpDocClick**(*Message, CurPos*)

Description This function prompts the user to point to an image and press the left mouse button. It will write the position of the cursor to a variable that you specify.

Parameters	*Message*	**String**	A string of text that is to be displayed in the message box.
	CurPos	**POINTAPI**	The address (name) of the point-structure variable (of IPBasic type, POINTAPI) that will receive the position of the cursor when the user presses the left mouse button in the image.

Return Value This function returns the Document ID of the image that was clicked, or IPCERR_NODOC if you clicked outside of an image workspace. It will return IPCERR_CANCELLED if you clicked the **Continue** button on the prompt dialog.

Example The following example asks the user to select two points in an image and then measures a profile between those points.

```
dim mypt1 as pointapi, mypt2 as pointapi
dim docid1 as integer, docid2 as integer
docid1 = IpDocClick("Select the 1st point", mypt1)
if docid1 >= 0 then
    docid2 = IpDocClick("Select the 2nd point", mypt2)
    if docid2 = docid1 then
        ret = IpProfCreate()
        ret = IpProfLineMove(mypt1.x, mypt1.y, mypt2.x, ypt2.y)
    end if
end if
```

Comments

The coordinates returned in *CurPos* are actual image coordinates. They are not affected by zoom and pan settings.

If -1 is returned, the contents of *CurPos* is not set and, therefore, might not be valid.

See Also

IpBlbGet(GETHIT), IpDocGet

IpDocClose

Syntax

IpDocClose( )

Description

This function closes the active image window.

See Also

IpAppCloseAll

IpDocCloseEx

Syntax

IpDocCloseEx*(docID)*

Description

This function closes the document by document ID.

Parameters

docID	**Integer**	Identifies the document to be closed.

Comments

The workspace identified by the document ID does not have to be active.

See Also

IpDocGet, IpDocClose, IpDocFind, IpDocMove, IpDocSize

IpDocCloseVri

Syntax **IpDocCloseVri**(*docInst*)

Description This function closes a document instance.

Note - if you are an Image-Pro Software Development Kit (SDK) programmer, this function is very similar to the HilImClose function found in your HIL library.

Parameters

docInst	**Integer**	The handle (type integer in C) to the document instance as returned by `IpDocOpenVri` or `IpDocOpenAoi`.

Example The following example opens and then closes a document instance.

```
Dim docInst as integer
Dim aArea as RECT
docInst=IpDocOpenVri(DOCSEL_ACTIVE, IMA_RD, aArea)
  .
  .
  .
ret=IpDocCloseVri(docInst)
```

See Also IpDocOpenVri, IpDocOpenAoi, IpDocGetLine, IpDocPutLine

IpDocFind

Syntax **IpDocFind***(document name)*

Description This function finds a document by name

Parameters

document name	**String**	Identifies the document to be found.

Return Value Returns the Document ID

See Also IpDocGet, IpDocClose, IpDocCloseEx, IpDocMove, IpDocSize

IpDocGet

Syntax **IpDocGet**(*Cmd, Param, OutVal*)

Description Use this function to get information relating to the current or specified image (document).

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. See table below.
Param	**Integer**	Parameter of the command. See table below.
OutVal	*See below*	The name of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Example The following examples get information about the active document.

```
Dim DocId as integer, hVri as integer
```

1. The following statement gets the active document ID.

```
ret = IpDocGet(GETACTDOC, 0, DocId)
```

2. The following statement gets the window handle of the active document, where `DocId` was obtained as shown in the first example, above.

```
dim  WndHandle as long
ret = IpDocGet(GETDOCWND, DocId, WndHandle)
'or:
ret = IpDocGet(GETDOCWND, DOCSEL_ACTIVE, WndHandle)
```

3. The following example gets the Vri of the active document , where `DocId` was obtained as shown in the first example, above.

```
ret = IpDocGet(GETDOCVRI, DocId, hVri)
'or:
ret = IpDocGet(GETDOCWND, DOCSEL_ACTIVE, hvri)
```

4. The following example gets the list of documents displayed.

```
DocList(30) as integer
Dim numdocs as integer
numdocs = IpDocGet(GETDOCLST, 30, DocList(0))
```

5. The following example gets information about the active document.

```
Dim dInfo as IPDOCINFO
ret = IpDocGet(GETDOCINFO, DOCSEL_ACTIVE, dInfo)
```

6. The following example gets information about the instance associated with the active document.

```
Dim iInfo as IPDOCINFO
Dim docInst as long
docInst = IpDocOpenAoi(DOCSEL_ACTIVE, IMA_RD)
ret = IpDocGet(GETINSTINFO, DOCSEL_ACTIVE, imInfo)
```

Comments

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (See GETDOCLST statement in example, above).

In the following table, everywhere a Document ID is passed in *Param*, DOCSEL_ACTIVE can be passed instead, to designate the active document.
DOC_POS_X and DOC_POS_Y are the same kinds of coordinates that can be used with the IpDocMove function to position a workspace with the larger *Image-Pro* work area.

Command	**Description**	**PARAM (type)**	**OutVal (type)**	**Return Value**
GETACTDOC	This command gets the active Document ID. The ID number is written to *OutVal*.	Not used by GETACTDOC. Must be set to 0.	Address of the integer receving the doc ID. **(Integer)**	None.
GETDOCVRI	This command gets the image bitmap handle of the document specified in *Param*. The VRI handle is written to *OutVal.*	Document ID, or DOCSEL_ACTIVE to designate the active image. (integer)	Address of the integer variable receving the VRI handle. (**Integer)**	None.
GETDOCWND	This command gets the window handle of the document. The window handle is written to *OutVal.*	Document ID, or DOCSEL_ACTIVE to designate the active image. (integer)	Address of a window handle **(Long)**	None.
GETDOCLST	This command gets the list of open documents. The Document IDs are written to *OutVal( ).*	The maximum number of Ids allocated in *OutVal* (i.e., the size of the array).	An array of intergers receiving the list of documents (**Integer)**	Number of doc Ids returned.
GETNUMDOC	This command gets the number of open documents. This number is written to *OutVal*.	Not used by GETNUMDOC. Must be set to 0.	Address of interger (**Integer)**	None.
GETDOCINFO	This command gets document size and class information. The requested information is written to *OutVal*.	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of IPDOCINFO structure.	0 if successful
GETINSTINFO	This command gets instance size and class information. The requested information is written to *OutVal*.	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of IPDOCINFO structure.	0 if successful
INF_DPIX	Get document horizontal DPI	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of Long	0 if successful

Command	Description	PARAM (type)	OutVal (type)	Return Value
INF_DPIY	Get document vertical DPI	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of Long	0 if successful
INF_DATE	Get document date	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of Long	0 if successful
INF_IS_MODIFIED	Indicates if the specified image has been modified	Document ID, or DOCSEL_ACTIVE to designate the active image.	Address of Long	0 if successful
INF_RANGE	This command gets the single-point range of the specified image workspace. It is returned for all image types, and can be useful in determining the dynamic range (range of pixel values) of the specified image.	Document ID, or DOCSEL_ACTIVE to designate the active image.	An array of 2 singles, the first being the minimum intensity value, and the second being the maximum.	0 if successful
INF_XPOSITION INF_YPOSITION INF_ZPOSITION	These commands get the image's absolute position when captured, if known. The IPDOCPOS structure indicates whether the position is known.	Document ID, or DOCSEL_ACTIVE to designate the active image.	IPDOCPOS structure to receive the position information.	0 if successful
INF_XSCROLL	This command gets the current horizontal scroll position.	Document ID, or DOCSEL_ACTIVE to designate the active image.	A Long to receive the position.	0 if successful
INF_YSCROLL	This command gets the current vertical scroll position.	Document ID, or DOCSEL_ACTIVE to designate the active image.	A Long to receive the position.	0 if successful
INF_ZOOMFACTOR	This command gets the current Zoom factor. Zoom factors are (10), (25), (50), 100 (200), (400), (800) and (1600).	Document ID, or DOCSEL_ACTIVE to designate the active image.	A Long to receive the Zoom factor	0 if successful

DOC_POS_X	Gets the X position of the specified image in the workspace on your screen	Document ID, or DOCSEL_ACTIVE to designate the active image	Address of Integer	0 if successful
DOC_POS_Y	Gets the Y position of the specified image in the workspace on your screen	Document ID, or DOCSEL_ACTIVE to designate the active image	Address of Integer	0 if successful

The following table describes the **IPDOCINFO** structure:

C DEFINITION	BASIC DEFINITION	DESCRIPTION
`short Width;`	`Width As Integer`	Width of document (or document instance)
`short Height;`	`Height As Integer`	Height of document (or document instance)
`short iClass;`	`iClass As Integer`	Class of document, as follows IMC_BILEVEL - 1bpp (not supported) IMC_GRAY - 8bpp IMC_GRAY12 - 12bpp IMC_GRAY16 - 16bpp IMC_PALETTE - 8bpp IMC_RGB - 24bpp IMC_RGB36 - 36 bpp IMC_RGB48 - 48bpp IMC_SINGLE - 32bpp
`short Bpp;`	`Bpp As Integer`	Bits per pixel of document (bpp). See above.
`RECT Extent;`	`Extent As RECT`	For a document the left and top values are always 0. The right and bottom values are *Width-1* and *Height-1*. For an instance, RECT will be the extent of the area that was opened for read/write (see `IpDocOpenVri`).

See Also IpDocOpenAoi, IpDocOpenVri, IpDocGetStr, IpDocGetPosition

IpDocGetArea

Syntax **IpDocGetArea**(*DocID, rArea, ImageBuffer, gMode*)

Description

This function reads a rectangular area from an *Image-Pro* image bitmap into a user-defined array. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Currently, this function cannot be used with *Bilevel* images. If you want to obtain, and manipulate a block of data from a *Bilevel* image, convert it first to *Gray Scale*.

Note - Because of array size limitation in IPBasic (64K), this function is intended to be used with a Visual Basic program.

Parameters

DocID	**Integer**	An integer representing the document's ID, or DOCSEL_ACTIVE to designate the active image.
rArea	**RECT**	A rectangle specifying the area of the document to be read.
ImageBuffer	*See below*	The address (name) of the array variable that will receive the requested data. The type and size of this array is dependent upon the source image's class. See *ImageBuffer* table under Comments, below.
gMode	**Integer**	A value of 0 or CPROG specifying the manner in which the image data are to be written to the *ImageBuffer*. Where: 0 - writes the data in BASIC mode CPROG - writes the data in C mode See Comments, below, for more about *gMode.*

Return Value This function returns a 0 if successful.

Example

The following example obtains a block of 8-bit *Gray Scale* image data and inverts its pixel values.

```
Dim i as integer
Dim j as integer
Dim Reg as RECT
Reg.left = 100
Reg.top = 100
Reg.right = 200

Reg.bottom= 150

Redim ImBuf(Reg.left to Reg.right,Reg.top to Reg.bottom) as
integer
ret=IpDocGetArea(DOCSEL_ACTIVE,Reg,ImBuf(Reg.left,Reg.top),0)
for j=Reg.top to Reg.bottom
Debug.print j
for i=Reg.left to Reg.right
   ImBuf(i,j)=255-ImBuf(i,j)
next i

next j

ret = IpDocPutArea(DOCSEL_ACTIVE, Reg,
ImBuf(Reg.left,Reg.top), 0)
```

```
The following example reads an entire 8-bit Gray Scale image.
Dim iInfo as IPDOCINFO
ret=IpDocGet(GETDOCINFO, DOCSEL_ACTIVE, iInfo)
Redim ImBuf(1 to iInfo.Width,1 to iInfo.Height) as integer
ret=IpDocGetArea(DOCSEL_ACTIVE,iInfo.Extent,ImBuf(1,1),0)
' refresh the display of the active document.
ret=IpAppUpdateDoc(DOCSEL_ACTIVE)
```

Comments

The *gMode* parameter determines how IMC_GRAY, IMC_PALETTE and IMC_RGB data are written to your array. These image classes use 8 bits to represent each pixel (or color channel). BASIC, however, does not have an 8-bit data type (the 16-bit integer type is the smallest numeric data unit). So, when these image data are written in BASIC mode (i.e., *gMode* = 0), each pixel (or color channel) is converted to 16-bits. Pixel values do not change (0 to 255), but the storage requirement is twice that of the source image data. If you are going to manipulate the image data with a BASIC program, you must set *gMode* to 0.

In a C program, 8-bit pixels can be directly manipulated in an array of the **BYTE** (8-bit) data type. Therefore, if you are extracting data to an array that will be manipulated by C, set *gMode* to CPROG so that the data are written without the 8- to 16-bit conversion. This will result in faster processing times and greatly reduced storage requirements.

The *ImageBuffer* table, below, describes the data types and storage requirements of each mode.

If the Image Class is...	***ImageBuffer* size must be**	**If gMode is...**	***ImageBuffer* Data Type must be**
IMC_GRAY	(*rArea* width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_PALETTE	(*rArea* width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_RGB	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_RGB36	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_RGB48	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_GRAY12	(*rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_GRAY16	(*rArea* width, *rArea* height)	0	Integer
		CPROG	short
IMC_SINGLE	(*rArea* width, *rArea* height)	0	Single
		CPROG	single
IMC_BILEVEL	This class is not supported by IPP 4.0 OR HIGHER. Bilevel image files are converted to grayscale automatically.		

Remember, a *True Color* image (i.e., IMC_RGB) will require 3 times as many elements per line as a *Gray Scale* (IMC_GRAY) image does, because each pixel is comprised of a 3-byte "chunk" of Red, Green and Blue values.

Also, BASIC arrays are different from the C arrays used in *Image-Pro* in that they include a header containing information about the array itself. To emulate a C array when calling an *Auto-Pro* function, a BASIC program should pass the address of the first element of the array (i.e. pass the first element "by reference"). See the call to `IpDocGetArea` in the example, above.

See Also IpDocPutArea, IpDocGetLine, IpDocPutLine, IpDocOpenVri, IpDocClose, IpAoiGet

IpDocGetAreaSize

Syntax **IpDocGetAreaSize**(*DocID, Area, Mode, Size*)

Description This function returns the size required to get the specified area.

Parameters

DocID	**Integer**	An integer representing the document's ID, or DOCSEL_ACTIVE to designate the active image.
Area	**RECT**	A rectangle specifying the area of the document to be read. To get the size of a line, set Area, top equal to Area, bottom.
Mode	**Integer**	A value of 0 or CPROG specifying the manner in which the image data are to be written to the *ImageBuffer*. Where: 0 - writes the data in BASIC mode CPROG - writes the data in C mode See Comments, below, for more about *gMode.*
Size	**Long**	A long variable to receive the size required.

Return Value This function returns a 0 if successful, an error code if failed.

See Also IpDocGetArea

IpDocGetLine

Syntax

IpDocGetLine(*docInst, LineNum, LineBuffer*)

Description

This function reads a line from a document bitmap into a user-defined buffer. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Before calling `IpDocGetLine`, you must open the document for read and/or write access using `IpDocOpenVri` or `IpDocOpenAoi`.

Parameters

docInst	**Integer**	The handle (type short in C) to the document instance as returned by `IpDocOpenVri` or `IpDocOpenAoi`.
LineNum	**Integer**	The number of the line (in the instance) that is to be read, where first line (i.e., the uppermost line) in the instance is line 0, the next line is line 1, and so forth.
LineBuffer	*See below*	The address (name) of a one-dimensional array variable that will receive the requested data. The type and size of this array is dependent upon the source image's class. See *LineBuffer* table under Comments, below.

Return Value

0 if successful. Non-0, otherwise.

Example

The following example inverts the red channel in the AOI of the active RGB image.

```
Dim i as integer
Dim j as integer
Dim imInfo as IPDOCINFO
Dim docInst as long

docInst=IpDocOpenAoi(DOCSEL_ACTIVE,IMA_RDWR)
if docInst=0 then GoTo erroropen

ret=IpDocGet(GETINSTINFO,docInst,imInfo)
Redim LineBuf(1 to imInfo.Width * 3) as integer

for j=1 to imInfo.Height
   ret=IpDocGetLine(docInst,j-1,LineBuf(1))

      for i=1 to imInfo.Width * 3 step 3
      LineBuf(i) = 255-LineBuf(i)
      next i

   ret=IpDocPutLine(docInst,j-1,LineBuf(1),1)
next j

' close the instance.
ret=IpDocCloseVri(docInst)

' refresh the display of the active document.
ret=IpAppUpdateDoc(DOCSEL_ACTIVE)
```

Comments

The table, below, describes the data type and storage requirements of *LineBuffer,* for each image class.

If the Image Class is...	*LineBuffer* **size must be...**	**If your program is...**	*LineBuffer* **data type must be**
IMC_GRAY	Instance width	BASIC	Integer
		C	BYTE
IMC_PALETTE	Instance width	BASIC	Integer
		C	BYTE
IMC_RGB	3 * Instance width	BASIC	Integer
		C	BYTE
IMC_RGB36	3 * Instance width	BASIC	Integer
		C	short
IMC_RBG48	3 * Instance width	BASIC	Integer
		C	short
IMC_GRAY12	Instance width	BASIC	Integer
		C	short
IMC_GRAY16	Instance width	BASIC	Integer
		C	short
IMC_SINGLE	Instance width	BASIC	Single
		C	single
IMC_BILEVEL	Instance width Not supported in IPP 4.0 OR HIGHER	BASIC	Integer
		C	BYTE

Remember, a *True Color* image (i.e., IMC_RGB) will require 3 times as many elements per line as a *Gray Scale* (IMC_GRAY) image does, because each pixel is comprised of a 3-byte “chunk” of Red, Green and Blue values.

Also, BASIC arrays are different from the C arrays used in *Image-Pro* in that they include a header containing information about the array itself. To emulate a C array when calling an *Auto-Pro* function, a BASIC program should pass the address of the first element of the array (i.e. pass the first element “by reference”). See the call to `IpDocGetLine` in the example above.

See Also

IpDocOpenVri, IpDocOpenAoi, IpDocPutLine, IpDocGetArea

IpDocGetPropDate

Syntax **IpDocGetPropDate***(DocID, PropertyID, Frame, DocProperty)*

Description This function gets the current value of a property. Used for properties represented a date.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.

PropertyID	**Integer**	The ID of the property to get, must be one of the following:
		DOCPROP_TIME = Capture time
		DOCPROP_TIMEPOINT = Time point

Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame. For DOCPROP_TIME only, the DOC_ENTIREIMAGE property can be used to get the image time as a Date (see also the INF_DATE command to IpDocGet, which returns the image time as a string).
DocProperty	**Date**	A date variable to receive the current value of the specified property.

See Also IpDocSetPropDate

IpDocGetPropDbl

Syntax **IpDocGetPropDbl***(DocID, PropertyID, Frame, DocProperty)*

Description This function gets the current value of a property. Used for properties represented by double-precision single-point values.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
PropertyID	**Integer**	The ID of the property to get, must be one of the following: DOCPROP_XPOSITION = Position of the image along the X axis, in the current calibration units. DOCPROP_YPOSITION = Position of the image along the X axis, in the current calibration units. DOCPROP_ZPOSITION = Position of the image along the Z axis, in the microns. DOCPROP_EMWAVELENGTH = The emissions wavelength in nm. DOCPROP_EXWAVELENGTH = the excitation wavelength in nm. DOCPROP_REFINDEX = Refractive index. DOCPROP_NUMAPERTURE = Numeric aperture. DOCPROP_MAGNIFICATION = Magnification of the object in use when the image was captured. DOCPROP_EXPOSURE = Exposure time in seconds used when the image was captured. DOCPROP_GAIN = Digital gain setting used when the image was captured. DOCPROP_GAMMA = Digital gamma setting used when the image was captured. DOCPROP_OFFSET = Digital offset setting used when the image was captured.
Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame.
DocProperty	**Double**	A double variable to receive the current value of the specified property.

See Also IpDocSetPropDbl

IpDocGetPropLong

Syntax **IpDocGetPropLong***(DocID, PropertyID, Frame, DocProperty)*

Description This function gets the current value of a property. Used for properties represented by double-precision single-point values.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
PropertyID	**Long**	The ID of the property to get, must be one of the following: DOCPROP_BIN_X = The digital binning used along the horizontal axis when the image was captured. DOCPROP_BIN_Y = The digital binning used along the vertical axis when the image was captured. DOCPROP_CAPTRECT_L = The left coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_R = The right coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_T = The top coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_B = The bottom coordinate of the capture rectangle used when the image was captured. DOCPROP_CHIPCOORD_L = The left coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_R = The right coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_T = The top coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_B = The bottom coordinate of the camera sensor area used when the image was captured. DOCPROP_NATIVE_BITDEPTH = The native bit depth of the capture device used if the image has been captured in Image-Pro; typically 8, 1, 12, 14, or 16. DOCPROP_DISPLAY_TINT = Turns the pseudocolor or tint display off or on, sets that option, and redisplays the image.
Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame.
DocProperty	**Long**	A double variable to receive the current value of the specified property.

Comments	The DOCPROP_CHIPCOORD properties will only be present when the image was captured by a digital camera that uses a combination of binning and different sensor areas to support different capture resolutions. The coordinates are reported in relation to the sensor size at the current binning.
See Also	IpDocSetPropLong

IpDocGetPropStr

Syntax **IpDocGetPropStr***(DocID, PropertyID, Frame, DocProperty)*

Description This function gets the current value of a property. Used for properties represented by a string.

Parameters	*DocId*	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
	PropertyID	**Integer**	The ID of the property to get, must be one of the following: DOCPROP_CHANNELNAME = Channel name. DOCPROP_SITELABEL = Site label (i.e. Well Position or user-defined position). DOCPROP_CAPTDRIVERNAME = Name of the capture driver used in acquisition DOCPROP_CAPTCAMERANAME = Name of the camera used in acquisition DOCPROP_CAPTCAMERAID = Camera ID of the camera used in acquisition DOCPROP_CAPTDRIVERFEATURES = Description of camera features DOCPROP_CAPTDRIVERVERSION = Version of the capture driver used in acquisition DOCPROP_TIMEPHASELABEL = Name of the time phase in which the current time point belongs
	Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame.
	DocProperty	**String**	A fixed-length string to receive the current value of the specified property.

See Also IpDocSetPropStr

IpDocGetPosition

Syntax

IpDocGetPosition*(DocID, PositionID, Frame, DocPosition)*

Description

This function gets the position of the specified frame in the specified image.

Parameters

DocId	**Integer**	Indicates the image of interest. DOCSEL_ACTIVE can be used to inquire about the active image.
PositionId	**Integer**	Indicates the axis of interest. Must be one of the following: INF_XPOSITION Absolute position along X axis in calibrated units INF_YPOSITION Absolute position along Y axis in calibrated units INF_ZPOSITION Absolute position along Z axis in microns
Frame	**Long**	Indicates the frame of interest, which must be between 0 and the number of frames in the image or composite – 1, or the value –1 which specifies the active frame.
DocPosition	**IPDOCPOS**	DocPosition is the IPDOCPOS variable that will receive the position information.

Comments

The IsKnown element will indicate whether the desired position information is known for the image. The Position element will indicate the position value.

Note that the Z-axis position is always expresed in microns, regardless of the current spatial calibration.

The IPDOCPOS type is defined as follows. Note that IpDocGetPosition is the only function that uses IPDOCPOS. This function uses the structure because it needs to inidcate in the return value if the function is set, and if so, what it is set to.

IPDOCPOS	Gets the image position information.	Is known as **Interger**	If non-zerio, IsKnown indicats the positon is known. If zero, position is unknown
		Position as **Single**	Position along the specified axis.

Return Value

0 if successful. Non-0, otherwise.

Example

```
Dim posX As IPDOCPOS, posY As IPDOCPOS
ret = IpDocGetPosition( DOCSEL_ACTIVE, INF_XPOSITION, 0, posX)
ret = IpDocGetPosition( DOCSEL_ACTIVE, INF_YPOSITION, 0, posY)
If (posX.IsKnown = 0 Or posY.IsKnown = 0) Then
           MsgBox("X/Y position is not known.")
Else
        MsgBox("Position X , Y: " & CStr(posX.Position) & ", "
        & CStr(posY.Position))
End If
```

See Also

IpDocSetPosition, IPDOCPOS

IpDocGetStr

Syntax

IpDocGetStr(*Cmd, Param, OutVal*)

Description

Use this function to get string information relating to the current or specified image (document).

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. See table below.
Param	**Integer**	Parameter of the command. See table below.
OutVal	**String**	The name of the fixed-length string variable that will receive the requested data.

Example

The following example gets information about the active document.

The following example gets the description of the active document.

```
Dim descript as string *255
ret = IpDocGetStr(INF_DESCRIPTION, DOCSEL_ACTIVE, descript)
```

Comments

In the following table, everywhere a Document ID is passed in *Param*, DOCSEL_ACTIVE can be passed instead, to designate the active document.

When passing a string to get the document title, description, date, etc. make sure the string is defined with a fixed size long enough to contain the results.

INF_ARTIST	Get document artist name.	Document ID	Name of fixed-length string variable.	256 characters
INF_DATE	Get document date.	Document ID	Name of fixed-length string variable.	256 characters
INF_TITLE	Get document title.	Document ID	Name of fixed-length string variable.	256 characters
INF_DESCRIPTION	Get document description.	Document ID	Name of fixed-length string variable.	4096 characters
INF_FILENAME	Get entire file name	Document ID	Name of fixed-length string variable.	256 characters
INF_NAME	Get document name, or image file name and path.	Document ID	Name of fixed-length string variable.	256 characters
INF_SUBJECT	Get document subject.	Document ID	Name of fixed-length string variable.	256 characters

See Also

IpDocGet

IpDocMaximize

Syntax **IpDocMaximize**( )

Description This function maximizes (enlarges to maximum size) the active image window. Equivalent to clicking the **Maximize** button on the image window's **Control** bar.

See Also IpDocMinimize, IpDocRestore, IpAppMaximize

IpDocMinimize

Syntax **IpDocMinimize**( )

Description This function minimizes (reduces to an icon) the active image window. Equivalent to clicking the **Minimize** button on the image window's **Cont**rol bar.

See Also IpDocMaximize, IpDocRestore, IpAppMinimize

IpDocMove

Syntax **IpDocMove**(*X*, *Y*)

Description This function moves the active image window to the specified position within the *Image-Pro* imaging area. Equivalent to dragging the active image to a new position with the mouse.

Parameters

X	**Integer**	An integer specifying the x-coordinate of the pixel-position to which the upper-left corner of the image window is to be moved.
Y	**Integer**	An integer specifying the y-coordinate of the pixel-position to which the upper-left corner of the image window is to be moved.

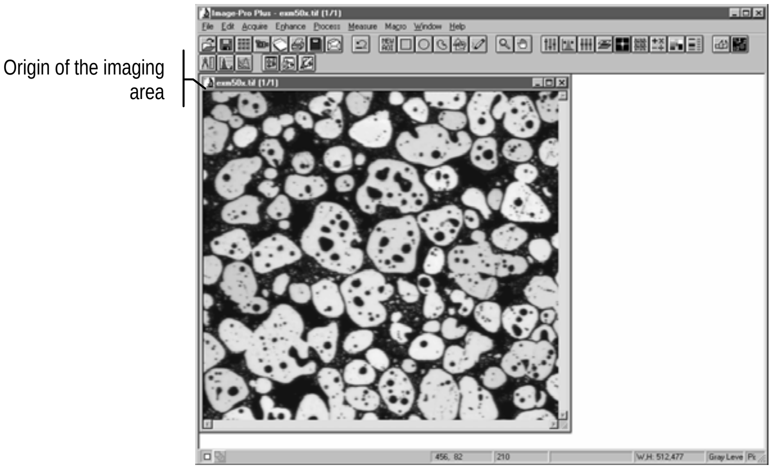
Example

```
ret = IpDocMove(0,0)
```

This statement will move the active image window such that it is positioned in the upper-left corner of the imaging area.

Comments

The origin (i.e., 0, 0) of the coordinate system referenced by the *x* and *y* parameters of this function is the pixel in the upper-left corner of the imaging area, not the upper-left corner of the screen. See diagram below.



See Also

IpDocMaximize, IpDocMinimize, IpDocRestore

IpDocOpenAoi

Syntax

IpDocOpenAoi(*docID, oMode*)

Description

This function opens an image bitmap for direct read and/or write operations (you must *Open* a document before using the `IpDocGetLine` or `IpDocPutLine` functions). If the document has an active AOI, only the rectangular area bounding the AOI will be opened. Otherwise, the entire document is opened.

Note - if you are an Image-Pro Software Development Kit (SDK) programmer, this function is very similar to the AOIImOpen function found in your HAIL library.

Parameters

docID	**Integer**	An integer representing the document's ID, or DOCSEL_ACTIVE to designate the active image.
oMode	**Integer**	An enumerated integer specifying the mode in which the instance is to be opened. Where: IMA_RD - specifies read-only mode IMA_RDWR - specifies read/write mode Additionally, the CPROG flag can be added to this expression to signify that the calling program is written in C. See Comments, below.

Return Value

An image instance (**Integer** in BASIC, **HANDLE** in C), or 0 if the open failed.

Note - if you are an Image-Pro Software Development Kit (SDK) programmer, this is the same kind of value returned by the HilImOpen function in your HIL library.

Example

The following example opens the active image (or AOI) in read-only mode.

```
Dim docInst as integer
docInst = IpDocOpenAoi(DOCSEL_ACTIVE,IMA_RD)
if docInst<>0 then
   ' Process image data w/IpDocGetLine & IpDocPutLine
     .
     .
     .
   ' Close instance
   ret = IpDocCloseVri(docInst)
end if
```

Comments

Use this function instead of `IpDocOpenVri` when the area inside an AOI must be processed. This allows you to modify the AOI with `IpDocPutLine` , even if it is non-rectangular.

If you are calling this function from a C program, be sure to add the CPROG flag to *oMode* (i.e., IMA_RD+CRPOG or IMA_RDWR+CPROG). This reduces the processing and storage requirements significantly, by retaining the 8-bit structure of the IMC_GRAY, IMC_PALETTE and IMC_RGB image types. Because BASIC does not have an 8-bit data type (the 16-bit, **Integer** type is the smallest, numeric data unit), image data must be converted to 16-bit integers in order to be accessed directly (the pixel values do not change, but the storage requirement is twice that of the source image data). In a C program, the 8-bit pixels are directly accessible via the **BYTE** (8-bit) data type. Therefore, if you are calling `IpDocOpenAoi` from a C program, add CPROG to the *oMode* expression; if you calling it from a BASIC program, leave this flag off.

The instance must be closed with `IpDocCloseVri` when it is no longer in use.

See Also

IpDocOpenVri, IpDocCloseVri, IpDocGetLine, IpDocPutLine, IpAoiGet

IpDocOpenVri

Syntax

IpDocOpenVri(*DocID, oMode, rArea*)

Description

This function opens an image bitmap for direct read and/or write operations (for example, you must open the document before using the `IpDocGetLine` or `IpDocPutLine` functions).

If you want to automatically open an instance based upon the active AOI, use `IpDocOpenAoi` instead of this function.

Note - if you are an Image-Pro Software Development Kit (SDK) programmer, this function is very similar to the HilImOpen function found in your HIL library.

Parameters

DocID	**Integer**	An integer representing the document's ID, or DOCSEL_ACTIVE to designate the active image.
oMode	**Integer**	An enumerated integer specifying the mode in which the instance is to be opened. Where: IMA_RD - specifies read-only mode IMA_RDWR - specifies read/write mode Additionally, the CPROG flag can be added to this expression to signify that the calling program is written in C. See Comments, below.
rArea	**RECT**	Image coordinates defining the area to be opened, which may be the entire image.

Return Value

An image instance (**Integer** in BASIC, **HANDLE** in C), or 0 if the open failed.

Note - if you are an Image-Pro Software Development Kit (SDK) programmer, this is the same kind of value returned by the HilImOpen function in your HIL library.

Example

The following example opens the entire active image in read-only mode.

```
Dim docInst as Long
Dim iInfo as IPDOCINFO
ret=IpDocGet(GETDOCINFO,DOCSEL_ACTIVE,iInfo)
docInst=IpDocOpenVri(DOCSEL_ACTIVE,IMA_RD,iInfo.Extent)
if docInst <> 0 then
' Process image data w/IpDocGetLine & IpDocPutLine
       .
       .
       .
' Close instance
ret=IpDocCloseVri(docInst)
end if
```

Comments

Use `IpDocOpenAoi` instead of this function when the area inside an AOI must be processed. This allows you to modify the AOI with `IpDocPutLine` , even if it is non-rectangular.

If you are calling this function from a C program, be sure to add the CPROG flag to *oMode* (i.e., IMA_RD+CRPOG or IMA_RDWR+CPROG). This reduces the processing and storage requirements significantly by retaining the 8-bit structure of the IMC_GRAY, IMC_PALETTE and IMC_RGB image types. Because BASIC does not have an 8-bit data type (the 16-bit, **Integer** type is the smallest, numeric data unit), image data must be converted to 16-bit integers in order to be accessed directly (the pixel values do not change, but the storage requirement is twice that of the source image data). In a C program, the 8-bit pixels are directly accessible via the **BYTE** (8-bit) data type. Therefore, if you are calling `IpDocOpenVri` from a C program, add CPROG to the *oMode* expression; if you calling it from a BASIC program, leave this flag off.

The instance must be closed with `IpDocCloseVri` when it is no longer in use.

See Also IpDocCloseVri, IpDocGetLine, IpDocPutLine, IpDocOpenAoi, IpAoiGet

IpDocPutArea

Syntax **IpDocPutArea**(*DocID, rArea, ImageBuffer, pMode*)

Description

This function writes a user-defined array of image data to an *Image-Pro* image. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Currently, this function cannot be used with *Bilevel* images. If you want to write to a *Bilevel* image, convert it first to *Gray Scale*.

Parameters

DocID	**Integer**	An integer representing the document's ID, or DOCSEL_ACTIVE to designate the active image.
rArea	**RECT**	A rectangle specifying the area of the document to be modified.
ImageBuffer	*See below*	The address (name) of the array variable containing the data to be written to *rArea*. The type and size of this array is dependent upon the source image's class. See *ImageBuffer* table under Comments, below.
pMode	**Integer**	A value of 0 or CPROG specifying the manner in which the image data are formatted in the *ImageBuffer*. Where: 0 - reads the data in BASIC mode CPROG - reads the data in C mode See Comments, below, for more about *pMode.*

Return Value 0 if successful.

Example

The following example inverts the pixel values in an area of an 8-bit *Gray Scale* image.

```
Dim i as integer
Dim j as integer
Dim Reg as RECT
Reg.left=100
Reg.top=100
Reg.right=200
Reg.bottom=150
Redim ImBuf(Reg.left to Reg.right,Reg.top to Reg.bottom) as integer
ret=IpDocGetArea(DOCSEL_ACTIVE,Reg,ImBuf(Reg.left,Reg.top),0)
for j=Reg.top to Reg.bottom
 for i=Reg.left to Reg.right
    ImBuf(i, j)=255-ImBuf(i,j)
 next i
next j
ret=IpDocPutArea(DOCSEL_ACTIVE,Reg,ImBuf(Reg.left,Reg.top),0)
' refresh the display of the active document.
ret = IpAppUpdateDoc(DOCSEL_ACTIVE)
```

Comments

The *pMode* parameter specifies how IMC_GRAY, IMC_PALETTE and IMC_RGB data are formatted in your *ImageBuffer*. These image classes use 8 bits to represent each pixel (or color channel). BASIC, however, does not have an 8-bit data type. The 16-bit **Integer** type is its smallest, numeric data unit. So, in a BASIC program, *ImageBuffer* contains a 16-bit value, which must be converted to 8-bits before being written to the image (note that the pixel values, 0 - 255, are not changed; the unused, high-order bits are merely stripped away). If you are writing image data from a BASIC program, you must set *pMode* to 0 ensure this conversion is performed.

In a C program, 8-bit image pixels can be represented by an array of the **BYTE** (8-bit) data type. Therefore, if you are writing data from a C program, you must set *pMode* to CPROG to ensure that the data are written without any 8- to 16-bit conversion (C programs are able to process images faster and with less memory because of this).

The *ImageBuffer* table, below, describes the data types and storage requirements of each mode.

If the Image Class is...	*ImageBuffer* **size must be**	**If pMode is...**	*ImageBuffer* **Data Type must be**
IMC_GRAY	(*rArea* width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_PALETTE	(*rArea* width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_RGB	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	BYTE
IMC_RGB36	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_RGB48	(3 * *rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_GRAY12	(*rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_GRAY16	(*rArea*.width, *rArea* height)	0	Integer
		CPROG	short
IMC_SINGLE	(*rArea* width, *rArea* height)	0	Single
		CPROG	single
IMC_BILEVEL	This class is not supported by *Image-Pro Plus v. 4.0 or higher.* Bilevel image files are converted to grayscale automatically.		

Remember, a *True Color* image (i.e., IMC_RGB) will require 3 times as many elements per line as a *Gray Scale* (IMC_GRAY) image does, because each pixel is comprised of a 3-byte “chunk” of Red, Green and Blue values.

Also, BASIC arrays are different from the C arrays used in *Image-Pro* in that they include a header containing information about the array itself. To emulate a C array when calling an *Auto-Pro* function, a BASIC program should pass the address of the first element of the array (i.e. pass the first element “by reference”). See the call to `IpDocPutArea` in the example above.

See Also IpDocGetArea, IpDocGetLine, IpDocPutLine, IpDocOpenVri, IpDocClose

IpDocPutLine

Syntax **IpDocPutLine**(*docInst, LineNum, LineBuffer, bAoi*)

Description This function writes a line of bitmap data to an image. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Before calling `IpDocGetLine`, you must open the document for read/write access using `IpDocOpenVri` or `IpDocOpenAoi`.

Parameters

docInst	**Integer**	The handle (type short in C) to the document instance as returned by `IpDocOpenVri` or `IpDocOpenAoi`.
LineNum	**Integer**	The number of the line (in the instance) to which the data are to be written, where first line (i.e., the uppermost line) in the instance is line 0, the next line is line 1, and so forth.
LineBuffer	*See below*	The address (name) of the one-dimensional array variable that contains the bitmap data. The type and size of this array is dependent upon the source image's class. See *LineBuffer* table under Comments, below.
bAoi	**Integer**	An integer value of 0 or 1 specifying whether all pixels in the instance are to be modified, or just those encompassed by the active AOI. Where: 0 - modifies all pixels 1 - modifies only AOI pixels This parameter is applied only when an instance has been opened with `IpDocOpenAoi`. It is ignored when an instance is opened with `IpDocOpenVri`. When this is the case, set *bAoi* to 0.

Return Value 0 if successful. Non-0 otherwise.

Example

The following example inverts the red channel values within the AOI of the active RGB image.

```
Dim i as integer
Dim j as integer
Dim imInfo as IPDOCINFO
Dim docInst as integer
docInst=IpDocOpenAoi(DOCSEL_ACTIVE, IMA_RDWR)
if docInst=0 then GoTo erroropen
ret=IpDocGet(GETINSTINFO, docInst, imInfo)
Redim LineBuf(1 to imInfo.Width * 3) as integer
for j=1 to imInfo.Height
   ret=IpDocGetLine(docInst,j-1,LineBuf(1))
   for i=1 to imInfo.Width * 3 step 3
      LineBuf(i)=255-LineBuf(i)
   next i
   ret=IpDocPutLine(docInst,j - 1,LineBuf(1),1)
next j
' close the instance.
ret=IpDocCloseVri(docInst)
' refresh the display of the active document.
ret=IpAppUpdateDoc(DOCSEL_ACTIVE)
```

Comments

The table, below, describes the data type and storage requirements of *LineBuffer*, for each image class.

If the Image Class is...	***LineBuffer* size must be...**	**If your program is...**	***LineBuffer* data type must be**
IMC_GRAY	Instance width	BASIC	Integer
		C	BYTE
IMC_PALETTE	Instance width	BASIC	Integer
		C	BYTE
IMC_RGB	3 * Instance width	BASIC	Integer
		C	BYTE
IMC_RGB36	3 * Instance width	BASIC	Integer
		C	short
IMC_RBG48	3 * Instance width	BASIC	Integer
		C	short
IMC_GRAY12	Instance width	BASIC	Integer
		C	short
IMC_GRAY16	Instance width	BASIC	Integer
		C	short
IMC_SINGLE	Instance width	BASIC	Single
		C	single
IMC_BILEVEL	Instance width Not supported in IPP 4.0 OR HIGHER	BASIC	Integer
		C	BYTE

Remember, a *True Color* image (i.e., IMC_RGB) will require 3 times as many elements per line as a *Gray Scale* (IMC_GRAY) image does because each pixel is comprised of a 3-byte “chunk” of Red, Green and Blue values.

Also, BASIC arrays are different from the C arrays used in *Image-Pro* in that they include a header containing information about the array itself. To emulate a C array when calling an *Auto-Pro* function, a BASIC program should pass the address of the first element of the array (i.e. pass the first element “by reference”). See the call to `IpDocPutLine` in the example above.

See Also

IpDocOpenVri, IpDocOpenAoi, IpDocPutLine, IpDocGetArea, IpAoiGet

IpDocRestore

Syntax

IpDocRestore( )

Description

This function returns the selected image window to its previous screen position and size, from a minimized or maximized state. Equivalent to clicking the Restore button on a maximized window or double-clicking the icon of a minimized window.

See Also

IpDocMaximize, IpDocMinimize, IpAppRestore

IpDocSetPropDate

Syntax **IpDocSetPropDate***(DocID, PropertyID, Frame, DocProperty)*

Description This function sets the current value of a property. Used for properties represented a date.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.

PropertyID	**Integer**	The ID of the property to set, must be one of the following:
		DOCPROP_TIME = Capture time
		DOCPROP_TIMEPOINT = Time point
		DOCPROP_MAGNIFICATION = Gets or sets the objective magnification image property.

Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame. For DOCPROP_TIME only, the DOC_ENTIREIMAGE property can be used to set the image time as a Date (see also the INF_DATE command to IpDocGet, which returns the image time as a string).
DocProperty	**Date**	A date variable to receive the current value of the specified property.

See Also IpDocGetPropDate

IpDocSetPropDbl

Syntax **IpDocSetPropDbl***(DocID, PropertyID, Frame, DocProperty)*

Description This function sets the current value of a property. Used for properties represented by double-precision single-point values.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
PropertyID	**Integer**	The ID of the property to set, must be one of the following: DOCPROP_XPOSITION = Position of the image along the X axis, in the current calibration units. DOCPROP_YPOSITION = Position of the image along the X axis, in the current calibration units. DOCPROP_ZPOSITION = Position of the image along the Z axis, in the microns. DOCPROP_EMWAVELENGTH= The emissions wavelength in nm. DOCPROP_EXWAVELENGTH = the excitation wavelength in nm. DOCPROP_REFINDEX = Refractive index. DOCPROP_NUMAPERTURE = Numeric aperture. DOCPROP_MAGNIFICATION = Magnification of the object in use when the image was captured. DOCPROP_EXPOSURE = Exposure time in seconds used when the image was captured. DOCPROP_GAIN = Digital gain setting used when the image was captured. DOCPROP_GAMMA = Digital gamma setting used when the image was captured. DOCPROP_OFFSET = Digital offset setting used when the image was captured.
Frame	**Long**	The index of the frame to edit; DOC_ACTIVEFRAME to set the property of each frame in the active portion of the image; DOC_ENTIREIMAGE to set the same property value for each frame of the entire image.
DocProperty	**Double**	The new value for the specified property.

See Also IpDocGetPropDbl

IpDocSetPropLong

Syntax **IpDocSetPropLong**(*DocID, PropertyID, Frame, DocProperty)*

Description This function sets the current value of a property. Used for properties represented by double-precision single-point values.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
PropertyID	**Long**	The ID of the property to get, must be one of the following: DOCPROP_BIN_X = The digital binning used along the horizontal axis when the image was captured. DOCPROP_BIN_Y = The digital binning used along the vertical axis when the image was captured. DOCPROP_CAPTRECT_L = The left coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_R = The right coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_T = The top coordinate of the capture rectangle used when the image was captured. DOCPROP_CAPTRECT_B = The bottom coordinate of the capture rectangle used when the image was captured. DOCPROP_CHIPCOORD_L = The left coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_R = The right coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_T = The top coordinate of the camera sensor area used when the image was captured. DOCPROP_CHIPCOORD_B = The bottom coordinate of the camera sensor area used when the image was captured. DOCPROP_DISPLAY_TINT = Turns the pseudocolor or tint display off or on, sets that option, and redisplays the image.
Frame	**Long**	The index of the frame to edit, or DOC_ACTIVEFRAME to get the property of the active (displayed) frame.
DocProperty	**Long**	The new value for the specified property.

Comments

The DOCPROP_CHIPCOORD properties will only be present when the image was captured by a digital camera that uses a combination of binning and different sensor areas to support different capture resolutions. The coordinates are reported in relation to the sensor size at the current binning.

See Also

IpDocSetPropLong

IpDocSetPropStr

Syntax

IpDocSetPropStr*(DocID, PropertyID, Frame, DocProperty)*

Description

This function sets the current value of a property. Used for properties represented by a string.

Parameters

DocId	**Integer**	The document ID of the image, or DOCSEL_ACTIVE to edit the active image.
PropertyID	**Integer**	The ID of the property to set, must be one of the following: DOCPROP_CHANNELNAME = Channel name. DOCPROP_SITELABEL = Site label (i.e. Well Position or user-defined position). DOCPROP_CAPTUREDRIVERNAME = The driver name and module name of the capture device used to capture the image, in the form "Driver name (module name)". DOCPROP_CAPTCAMERANAME = The name of the specific camera used to capture the image. DOCPROP_CAPTCAMERAID = The serial number or ID of the specific camera used to capture the image. DOCPROP_CAPTDRIVERFEATURES = A string listing the special features of the driver used to capture the image. DOCPROP_CAPTDRIVERVERSION = The version of the driver used to capture the image.
Frame	**Long**	The index of the frame to edit; DOC_ACTIVEFRAME to set the property of each frame in the active portion of the image; DOC_ENTIREIMAGE to set the same property value for each frame of the entire image.
DocProperty	**String**	A string constant or non-fixed-length string to receive the current value of the specified property.

See Also

IpDocGetPropStr

IpDocSetPosition

Syntax

IpDocSetPosition*(DocID, PositionID, Frame, Position)*

Description

This function sets the position of the specified frame in the specified image.

Parameters

DocId	**Integer**	Indicates the image of interest. DOCSEL_ACTIVE can be used to inquire about the active image.
PositionId	**Integer**	Indicates the axis of interest. Must be one of the following: INF_XPOSITION Absolute position along X axis in calibrated units INF_YPOSITION Absolute position along Y axis in calibrated units INF_ZPOSITION Absolute position along Z axis in microns
Frame	**Long**	Indicates the frame of interest, which must be between 0 and the number of frames in the image or composite – 1, or the value –1 which specifies the active frame.
Position	**Double**	This is the new position value.

Comments

Note that the Z-axis position is always expresed in microns, regardless of the current spatial calibration. IpDocSetPosition uses a Single type. This function needs only the single position value to indicate the position, after which IpDocGetPosition will return that the position has been set.

Return Value

0 if successful, a negative error code if failed.

See Also

IpDocGetPosition, IPDOCPOS

IpDocSize

Syntax **IpDocSize**(*Width*, *Height*)

Description This function changes the size of the active image window to the specified width and height.

Parameters

Width	**Integer**	An integer specifying the width, in pixels, at which you want the image window displayed.
Height	**Integer**	An integer specifying the height, in pixels, at which you want the image window displayed.

Example

```
ret = IpDocSize(200, 300)
```

This statement will resize the active image window to 200 by 300 pixels.

Comments The image window must be in the “restored” or maximized state when this function is performed. Sizing a minimized image may produce unexpected results.

See Also IpAppRestore, IpAppMove

IpDrGet

Syntax **IpDrGet** ***(sCmd, sParam, lpParam)***

Description This functions gets the values for the display range, inverse contrast, range rest, gamma, and other display range attributes.

Parameters

sCmd	**Integer**	Defines the attribute to get. See table below.
sParam	**Integer**	Depends on the value of *sCmd*. See table below.
lpParam	**Any**	Depends on the value of *sCmd*. See table below.

sCmd	**sParam**	**lpParam**	**Description**
DR_RANGE	0	Array of two longs	Gets the start and end of the range
DR_INV	0	integer variable: 1 = not inversed 0 = inverse	Gets the inverse flag
DR_GAMMA	0	single point variable	Gets the gamma value
DR_FRANGE	0	array of two singles	Gets the display range
DR_FRANGE	1	array of two singles	Gets the single point range

Comments

For details about DR_FRANGE, single point images, and single point ranges, see `IpDrSet.`

Example

```
' get display range
ret = IpDrGet(DR_RANGE, 0, ipLArray(0))
Debug.print "Display range: " + Str$(ipLarray(0)) + " to: " +
Str$(iplArray(1))

' get gamma
dim fGamma as single
ret = IpDrGet(DR_GAMMA, 0, fGamma)
Debug.print "Gamma: " + Str$(fGamma)

' get inverse status
dim sInverse as single
ret = IpDrGet(DR_INV, 0, sInverse)
If sInverse = 0 Then Debug.print "Not inversed" Else
Debug.print "Inversed"

dim fArray(2) as single

' get display range of single point image
' (alternate way)
ret = IpDrGet(DR_FRANGE, 0, fArray(0))
Debug.print "Single display range: " + Str$(fArray(0)) + " to:
" + Str$(fArray(1))

' get single point range
ret = IpDrGet(DR_FRANGE, 1, fArray(0))
Debug.print "Single point range: " + Str$(fArray(0)) + " to: "
+ Str$(fArray(1))
```

See Also

IpDrSet

IpDrSet

Syntax

IpDrSet ***(sCmd, sParam, lpParam)***

Description

This functions sets the values for the display range, inverse contrast, range reset, gamma, and other display range attributes

Parameters

sCmd	**Integer**	Defines the attribute to set. See table below.
sParam	**Integer**	Depends on the value of *sCmd*. See table below.
lpParam	**Array**	Depends on the value of *sCmd*. See table below.

sCmd	**sParam**	**lpParam**	**Description**
DR_RANGE	0	Array of two longs	Sets the start and end of the range
DR_RANGE	-1	Not used	Resets range
DR_BEST	0	Not used.	Sets optimum range

sCmd	sParam	lpParam	Description
DR_INV	0	Not used.	No inversion
DR_INV	1	Not used.	Inverse image contrast
DR_INV	2	Not used.	Toggle inversion on/off
DR_GAMMA	0	single point variable	Sets the gamma value
DR_FRANGE	0	array of two singles	Sets the start and end of the range
DR_FRANGE	-1	**Not used**	Resets range
DR_FRANGE	1	array of two singles	Sets the single point range
DR_RANGE_RESET	-1	Not used	Resets only the display range of the active image

Comments

DR_FRANGE is the same as DR_RANGE for all images except single point images (see discussion on single point images below). DR_FRANGE with *sParam=1* is only valid with a single point image and can be used to set the dynamic range of that image. DR_FRANGE with *sParam=0* can be used to set the display range of a single point image by passing real single point intensity values instead of a fixed point index as is recorded.

Single point images: 32 bit single point images don't have fixed lowest and highest intensity. Instead, they have a user-definable "single point range" that is used to set the intensity levels of pure black and pure white. This range is equivalent to the [0, 255] range of an 8 bit gray scale image or the [0, 65535] range of a 16 bit image. The single point range of a single point image is used mainly for display, but also to calculate the bounds of intensity histograms. The display range of a single point image defines a sub-set of its single point range used for display only. The single point range of a single point image can be set via DR_FRANGE with sParam = 1 or via the interface (see Image Information dialog).

Example

```
' set display range
ipLArray(0) = 51
ipLArray(1) = 200
ret = IpDrSet(DR_RANGE, 0, ipLArray(0))

' set the optimal range
ret = IpDrSet(DR_BEST, 0, IPNULL)

' inverse the contrast
ret = IpDrSet(DR_INV, 1, IPNULL)

' reset the display range and inverse flag
ret = IpDrSet(DR_RANGE, -1, IPNULL)

' set gamma
dim fGamma as single
fGamma = 0.4
ret = IpDrSet(DR_GAMMA, 0, fGamma)
```

See Also

IpDrGet

IpDrShow

Syntax	**IpDrShow(*bShow*)**		
Description	This function displays or hides the display range tool.		
Parameters	*bShow*	**Integer**	A value of 0 or 1 specifying whether the dialog is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog
See Also	IpDrGet, IpDrSet		

IpDraw

Syntax	**IpDraw***(Points, Numpoints, Attrib)*		
Description	Draws a line, polygon, or points (markers)		
Parameters	*Points*	**POINTAPI**	The name and first element of an array containing the vertices of the line.
	Numpoints	**Integer**	Number of points to be drawn
	Attrib	**Integer**	Specifies attributes of the object, or line: Valid values are: ATT_CONTROLS : For a polyline, highlights all verticies of the polyline. ATT_NOCOPY : Prevents the points of the line from being copied into Image-Pro's local memory space.
Return Value	Returns the new drawing ID		
See Also	IpAnotAttr, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus* . Use the **IpAn** *Auto-Pro* functions instead.		

IpDrawClear

Syntax	**IpDrawClear***(Objid)*		
Description	Erases the drawing.		
Parameters	*Objid*	**Integer**	Identifies the drawing to be erased.
See Also	IpDraw, IpDrawText, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotAttr,IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus* . Use the **IpAn** *Auto-Pro* functions instead.		

IpDrawClearDoc

Syntax	**IpAnotEllipse***(Cocid)*		
Description	Erases all drawings or object from the image *docid.*		
Parameters	*Docid*	**Integer**	Identifies the document containing the objects to be erased.
See Also	IpDraw, IpDrawText, IpGetLine, IpDrawClear, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotAttr,IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus* . Use the **IpAn** *Auto-Pro* functions instead.		

IpDrawGet

Syntax	**IpDrawGet***(Command, Objid, IpParam)*		
Description	Gets status, position, and other parameters for a given drawing or object.		
Parameters	*Command*	**Integer**	Identifies data to retrieve. Valid values are: GETCURPOS: Returns the cursor position at the point where the mouse button was last down. GETNUMPTS: Returns the number of points in the object GETPOINTS: Retrieves the object's points GETSTATUS: Returns a non-zero value if the object has been changed, and sets the object's status to zero. GETEDITPOINT: Returns the currently selected point of the object.
	Objid	**Integer**	Identifies the object
	IpParam	**Integer**	Results are returned in this variable.
See Also	IpDraw, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotAttr,IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus*. Use the **IpAn** *Auto-Pro* functions instead.		

IpDrawSet

Syntax	**IpDrawSet***(Command, Objid, IpParam)*		
Description	Sets status, position, and other parameters for a given drawing or object.		
Parameters	*Command*	**Integer**	Idenfies the parameter to set.
	Objid	**Integer**	Identifies the object
	IpParam	**Integer**	Idenfities other parameters for the given object.
See Also	IpDraw, IpDrawText, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpAnotLine, IpAnotBox,IpAnotAttr, IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus*. Use the **IpAn** *Auto-Pro* functions instead.		

IpDrawText

Syntax	**IpDrawText***(Text, Pos,Attrib)*		
Description	Draws text contained in *text,* at a location *pos.*		
Parameters	*Text*	**String**	Contains text to be drawn
	Pos	**POINTAPI**	Indicates point where text will be drawn.
	Attrib	**Integer**	Color of text
Return Value	Returns the new drawing ID.		
See Also	IpDraw, IpDrawClear, IpGetLine, IpDrawClearDoc, IpDrawGet, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotAttr, IpAnotEllipse		
Comments	This function is no longer supported in *Image-Pro Plus*. Use the **IpAn** *Auto-Pro* functions instead.		

IpDyeAdd

Syntax **IpDyeAdd** ***(Dye,Wavelength, ExWavelength)***

Description This function creates a new dye file which is then added to the current set of dyes.

Parameters

Dye	**String**	A string specifying the name of the new dye.
Wavelength	**Long**	Specifies the dye's emission wavelength.
ExWavelength	**Long**	Specifies the dye's excitation wavelength.

Comments `IpDyeAdd` will create a a new dye file in the current dye location (see the `DYE_PATH` command for `IpDyeGetStr` and `IpDyeSetStr`). The new file will overwrite any existing dye files with the same name. The name may include the `.IPD` extension, or if it does not the extension will be added automatically. The dye's hue is determined automatically by conversion from the emission wavelength.

IpDyeAddTint

Syntax **IpDyeAddTint** ***(Dye,Wavelength, ExWavelength, Tint)***

Description This function creates a new dye file which is then added to the current set of dyes.

Parameters

Dye	**String**	A string specifying the name of the new dye.
Wavelength	**Long**	Specifies the dye's emission wavelength.
ExWavelength	**Long**	Specifies the dye's excitation wavelength.
Tint	**Long**	RGB color specifies the dye's display color

Comments **IpDyeAddTint** will create a dye file in the current dye location (see the DYE_PATH command for **IpDyeGetStr** and **IpDyeSetStr**). The new file will overwrite any existing dye files with the same name. The name may include the ".IPD" extension, or if it does not the extension will be added automatically. The dye's display color is determined by the Tint parameter, which typically will use the RGB function to specify the red, green and blue values for the color.

IpDyeApply

Syntax **IpDyeApply *(Dye,ApplyTo, ApplyTint)***

Description This function applies the dye characteristics to the active image.

Parameters

Dye	**String**	A string specifying the name of an existing Image-Pro dye.

Apply to	**Integer**	Determines the portion of the image where the dye will be applied. Should be on eof the following:
		APPLYTO_IMAGE = Entire image
		APPLYTO_FRAME = Active frame only
		APPLYTO_PORTION = Active portion only

ApplyTint	**Integer**	If non-zero, the dye tint is applied to the image

IpDyeDelete

Syntax **IpDyeDelete *(Dye)***

Description This function removes the spcecified dye.

Parameters

Dye	**String**	A string specifying the name of an existing Image-Pro dye.

IpDyeEdit

Syntax **IpDyeEdit *(Dye, New Dye)***

Description This function displays the Edit Dye dialog, and lets the user edit a dye.

Parameters

Dye	**String**	A string specifying the name of an existing Image-Pro dye file
NewDye	**String**	A fixed-length string to which the dye file name is returned.

Return Value The name of the new dye file, or IPCEERR_EMPTY if you cancel editing the dye.

Comments The *newDye* parameter should be a fixed-length string, typically fixed at 255 characters, which will return the final name of the dye after editing (the user can change the dye name while editing). **IpDyeEdit** returns IPCERR_EMPTY if the user cancels editing the dye. Note: **IpDyeEdit** inherently requires user interaction prior to continuation of the macro script.

IpDyeGet

Syntax	IpDyeGet***(DyeFile, Command, Value)***		
Description	This function returns information about a specific dye.		
Parameters	*DyeFile*	**String**	A string specifying the full path for the selected dye.
	Command	**Integer**	Command should be one of the following: DYE_WAVELENGTH = Return the dye emission wavelength (in nm) DYE_HUE = Return the dye hue (0 Red – 240) DYE_RGB_TINT = Return the dye tint as a color reference DYE_NUMDYES = Return the number of dyes in the current location DYE_EXWAVELENGTH = Return the dye excitation wavelength (in nm)
	Value	**Long**	A long variable which will receive the specified dye parameter
See Also	IpDyeGetSng, IpDyeGetStr		

IpDyeGetStr

Syntax	**IpDyeGetStr** ***(DyeFile, Command, Index Value)***		
Description	This function gets information about the current dye management settings.		
Parameters	*DyeFile*	**String**	Not used.
	Command	**Integer**	Should be one of the following: DYE_PATH = Returns the current path for dye files DYE_LIST = return the name of the specificed Dye
	Index	**Integer**	Index of the specified dye for the DYE_LIST command.
	Value	**String**	A fixed-length string to receive the current dye file location or the specified dye name.
See Also	IpDyeGetLong, IpDyeGetSng		

IpDyeSelect

Syntax **IpDyeSelect*(DyeFile)***

Description This function displays the Edit Dye List dialog and let the user select a dye.

Parameters

DyeFile	**String**	A fixed-length string to which the name of the selected dye is returned..

Return Value `IpDyeSelect` returns `IPCERR_EMPTY` if the user cancels selecting a dye. Note: `IpDyeSelect` inherently requires user interaction prior to continuation of the macro script.

Example This function can be used in conjunction with IpPcApplyDyeTint to let the user select a dye and apply the dye's tint to the active workspace:

```
Dim strDyeFile as String * 255
ret = IpDyeSelect( strDyeFile )
if (ret <> IPCERR_EMPTY) then
    *9IpPcApplyDyeTint ( strDyeFile )
end if
```

IpDyeSetStr

Syntax **IpDyeSetStr *(DyeFile, Command,Value)***

Description This function sets the dye management settings.

Parameters

DyeFile	**String**	Not used.
Command	**Integer**	Should be the following: DYE_PATH = return the current dye location
Value	**String**	A string containing the new dye file location.

IpEDFAdd

Syntax **IpEDFAdd*(DocId)***

Description This function adds all the frames of the specified image to the current multi-plane focus stack.

Parameters	*DocId*	**Integer**	Specifies the image to add to the existing EDF stack. Note that the images must be of the same image type and size. A document ID of DOCSEL_ACTIVE can be used to add the active image. A document ID of DOCSEL_ALL can be used to add all images.

Return Value 0 if successful, a negative error code if failed.

Comments This function can be used to add the first image as well as subsequent images, however using IpEDFNew for the first image will assure that the stack does not contain any unwanted images from previous stacks.

See Also IpEDFNew

IpEDFCreate

Syntax **IpEDFCreate*(Type)***

Description This function creates the extended depth of field image

Parameters	*Type*	**Integer**	Determines the type of Extended Depth of Field image that will be created from the current stack. Must be one of the following: EDF_COMPOSITE Creates a composite image from the best-focus areas selected from multiple input frames. EDF_BEST_FOCUS Returns a new image using the single frame having the largest amount of in-focus area.

Return Value Document ID of the new image if successful, a negative error code if failed.

Comments Use `IpEDFNew` and `IpEDFAdd` to build the image list that will be used as the stack of pre-focus images. If the topographic option is selected, use the `IpEDFTopoMap` function to create the topographic map.The in-focus material is determined by the current analysis criteria.

See Also IpEDFNew, IpEDFGet

IpEDFGet

Syntax	**IpEDFGet***(Attribute, Value, Frame)*		
Description	This function gets an attribute of an Extended Depth of Field image.		
Parameters	*Attribute*	**Integer**	Attribute indicates the sequence gallery attribute to get, from the following: EDF_NORMALIZE Indicates whether the frame intensities should be normalized prior to focus analysis. EDF_CRITERIA Indicates the criteria used to analyze the frames for in-focus material. (See below for constants.) EDF_TOPO_MAP Indicates whether a topographic map image should be created. EDF_ TOPO_CALIBRATED Indicates whether the topographic map image should be given an intensity calibration that gives each pixel a value corresponding to the Z position of the plane that it was extracted from. EDF_ORDER Indicates whether the image list will be used from top to bottom (EDF_TOPDOWN) or bottom to top (EDF_BOTTOMUP). EDF_DEFAULT_FRAME Returns the default plane document ID (in *Value*) and frame number (in *Frame*). EDF_TS_MAP Determines whether to use the topographic map output (if non-zero) or the composite output (when zero) EDF_TS_GALLERY Determines whether to generate a sequence gallery output (if non-zero) EDF_SURFACE_PLOT Determines whether to generate a surface plot. Ignored if the topographic map option is not set.
	Value	**Integer**	This is an integer variable in your script that will receive the requested attribute value.
	Frame	**Long**	This is a long variable in your script that will receive the requested attribute value; used in EDF_DEFAULT_FRAME only. Can be set to IPNULL for other attributes.
Return Value	0 if successful, a negative error code if failed.		

Comments	The following constants will be used with EDF_CRITERIA attribute to indicate the type of focus analysis: EDF_MAX_LOCALCONTRAST: Pixels will be examined in a local neighborhood around the target pixel and the degree of local contrast determined for each plane. The pixel from the plane with the greatest local contrast will be selected. EDF_MAX_INTENSITY: Pixels in the same location on each plane will be examined and the pixel with the highest intensity will be selected. EDF_MIN_INTENSITY: Pixels in the same location on each plane will be examined and the pixel with the lowest intensity will be selected. EDF_MAX_DEPTHCONTRAST: Pixels in the same location on each plane will be compared to the mean intensity of all pixels at that position, and the pixel with the greatest contrast from that mean intensity will be selected. EDF_HDF_SMALL: High frequency emphasis for small edges EDF_HDF_MEDIUM: High-frequency emphasis for medium edges. EDF_HEF_LARGE:High-frequency emphasis for large edges.
See Also	IpEDFSet

IpEDFGetConf

Syntax	**IpEDFGetConf (*ByRef Value)***		
Description	This function returns the EDF confidence level for each plane.		
Parameters	*Value*	**Single**	Should be an array of Single with one element for each focus plane.
Return Value	0 if successful, a negative error code if failed.		
Comments	This function can be used after **IpEDFCreate** to inquire the confidence levels. The **EDF_NUM_PLANES** command can be used to get the number of planes for dimensioning the array.		
See Also	IpEDFCreate		

IpEDFNew

Syntax	**IpEDFNew***(DocId)*		
Description	This function starts a new Extended Depth of Field stack with frames from the specified image.		
Parameters	*DOcId*	**Integer**	Specifies the first image to add to a new EDF stack. A document ID of DOCSEL_ACTIVE can be used to add the active image. A document ID of DOCSEL_ALL can be used to add all images.
Return Value	0 if successful, a negative error code if failed.		
Comments	This function guarantees that a new stack is started (any existing stack is discarded). Note that the first image added to the stack determines the image type and size required of all subsequent images added. Note also that all frames of the image will be added to the stack .		
See Also	IpEDFAdd		

IpEDFRemove

Syntax	**IpEDFRemove***(DocId)*		
Description	This function removes the specified image from the current Extended Depth of Field stack.		
Parameters	*DocId*	**Integer**	Specifies the image to remove from the existing EDF stack. A document ID of DOCSEL_ACTIVE can be used to remove the active image. A document ID of DOCSEL_ALL can be used to remove all images.
Return Value	0 if successful, a negative error code if failed.		
See Also	IpEDFAdd		

IpEDFSet

Syntax **IpEDFSet***(Attribute, Value,Frame)*

Description This function sets the Extended Depth of Field attributes

Parameters

Attribute	**Integer**	Attribute indicates the sequence gallery attribute to set, from the following: EDF_NORMALIZE Indicates whether the frame intensities should be normalized prior to focus analysis. EDF_CRITERIA Indicates the criteria used to analyze the frames for in-focus material. (See below for constants.) EDF_TOPO_MAP Indicates whether a topographic map image should be created. EDF_ TOPO_CALIBRATED Indicates whether the topographic map image should be given an intensity calibration that gives each pixel a value corresponding to the Z position of the plane that it was extracted from. EDF_ORDER Indicates whether the image list will be used from top to bottom (EDF_TOPDOWN) or bottom to top (EDF_BOTTOMUP). EDF_DEFAULT_FRAME Sets the default plane document ID (in *Value*) and frame number (in *Frame*). EDF_TS_MAP Determines whether to use the topographic map output (if non-zero) or the composite output (when zero) EDF_TS_GALLERY Determines whether to generate a sequence gallery output (if non-zero) EDF_SURFACE_PLOT Determines whether to generate a surface plot. Ignored if the topographic map option is not set. EDF_ANALYZE_ONLY Not valid in this function, used only as an additional parameter with IpEDFCreate.
Value	**Integer**	The value that the attribute will be set to.
Frame	**Long**	This is a long value used in EDF_DEFAULT_FRAME to specify a fame number. Otherwise unused and set to 0

Return Value 0 if successful, a negative error code if failed.

Comments

The EDFTopoMap attribute will affect only the way the EDF operates from the dialog. To create a topographic map from a macro, use IpEDFTopoMap.

The following constants will be used with EDF_CRITERIA attribute to indicate the type of focus analysis:

EDF_MAX_LOCALCONTRAST: Pixels will be examined in a local neighborhood around the target pixel and the degree of local contrast determined for each plane. The pixel from the plane with the greatest local contrast will be selected.

EDF_MAX_INTENSITY: Pixels in the same location on each plane will be examined and the pixel with the highest intensity will be selected.

EDF_MIN_INTENSITY: Pixels in the same location on each plane will be examined and the pixel with the lowest intensity will be selected.

EDF_MAX_DEPTHCONTRAST: Pixels in the same location on each plane will be compared to the mean intensity of all pixels at that position, and the pixel with the greatest contrast from that mean intensity will be selected

See Also

IpEDFGet, IpEDFTopoMap

IpEDFShow

Syntax

IpEDFShow*(Show)*

Description

This function shows or hides the Extended Depth of Field dialog box.

Parameters

Show	**Integer**	An integer value of 0 or 1 indicating whether to show or hide the Extended Depth of Field dialog 0 - Hide the Extended Depth of Field dialog. 1 - Show the Extended Depth of Field dialog

Return Value

0 if successful, a negative error code if failed.

See Also

IpEDFNew,IpEDFAdd, IpEDFCreate, IpEDFTopoMap, IpEDFGet, IPEDFSet

IpEDFTestStrips

Syntax

IpEDFTestStips*()*

Description

This function generates EDF test strips using the current settings.

Return Value

DocId of the new test strip sequence if successful, a negative error code if failed.

Comments

If the EDF_TS_GALLERY option is selected, a second workspace is generated by this function. That workspace will the active workspace after the operation, so the IpDocGet function can be used to get the document ID of the sequence gallery workspace.

See Also

IpEDFAdd, IpEDFCreate, IPEDFNew

IpEDFTopoMap

Syntax **IpEDFTopoMap*()***

Description This function creates the Extended Depth of Field topographic map image.

Return Value DocId of the new image if successful, a negative error code if failed.

Comments If the topographic map option is selected, use the IpEDFTopoMap function to create the topographic map image.
A new option for the topographic map automatically shows a surface plot of the topographic map using the EDF composite image as the surface texture. For this option to work from a macro script, the IpEDFCreate function must be called first, followed by the IpEDFTopoMap function, and the new EDF_SURFACE_PLOT option must be set.

See Also IpEDFAdd, IpEDFCreate, IPEDFNew

IpFftForward

Syntax **IpFftForward**(*DisplayType*, *bFullFft*)

Description This function performs an FFT transform of the active image or AOI. Equivalent to the **FFT** command's **Forward** button and the **Forward FFT Options** dialog box.

Parameters

DisplayType	**See below**	A value which specifies the way in which the transform results will be displayed. Must be one of the following: FFT_PHASE FFT_SPECTRUM FFT_SPECTRUM32 FFT_PHASE32 FFT_SPECPHAS32 See definitions under Comments, below.
bFullFft	**Integer**	An integer value of 0 or 1 specifying whether the process will produce a full- or half-set of FFT data. Where: 0 - Generates a half-set of FFT data. 1 - Generates a full set of FFT data.

Return Value This function returns the Document ID of the FFT image, which will be an integer greater than 0. A negative return value indicates an error. If you are using `FFT_SPECPHAS32`, the return value is the image ID of the spectrum image. The phase image ID is one less than the ID of the spectrum image.

Example

```
ret = IpFftForward(FFT_SPECTRUM, 0)
```

This statement will perform an FFT transform and display the results in spectrum form. Only a half-set of data will be generated.

Comments

The following table describes the values allowed in the *DisplayType* parameter:

Display Type	Value	DESCRIPTION
FFT_PHASE	Integer	Displays the phase of the FFT.
FFT_SPECTRUM	Integer	Displays FFT data in the traditional “cloud of points” form.
FFT_SPECTRUM32	Single point	Amplitude
FFT_PHASE32	Single point	Phase
FFT_SPCPHAS32	Single point	Amplitude + phase, two images.

See Also

IpFftInverse

IpFftHiPass

Syntax

IpFftHiPass(*Type, Transition, PreserveNil*)

Description

This function filters the FFT data to allow only the frequencies outside the specified range to remain in the image. Equivalent to applying the **Hi Pass** option from the **Filter** group box in the **FFT** dialog box.

Parameters

Type	**Integer**	An enumerated integer specifying the way in which frequencies within the selected range will be treated. Must be one of the following: FFT_HANNING FFT_NOTCH See definitions under Comments, below.
Transition	**Integer**	An integer representing a percentage, from 0 to 50 (inclusive), specifying the rate at which the selected frequencies will be attenuated. The closer this value is to 0, the more closely the result will resemble the results of the FFT_NOTCH *Type.*
PreserveNil	**Integer**	An integer value of 0 or 1 specifying whether the zero frequency component is to be preserved. Where: 0 - Preserves the Zero Frequency Component 1 - Does not preserve the Zero Frequency Component

Example

```
ipRect.left = 66
ipRect.right = 189
ipRect.top = 58
ipRect.bottom = 196
ret = IpAoiCreateBox(ipRect)
ret = IpFftHiPass(FFT_HANNING, 30, 1)
```

This set of statements will attenuate all frequencies within the AOI defined by `ipRect`. A transition value of 30% will be applied during frequency attenuation. The Zero Frequency Component will not be preserved.

Comments

Before calling the IpFftHiPass function, you must define `ipRect` such that it describes an AOI encompassing the selected frequencies (see example above).

The following table describes the values allowed in the *Type* parameter:

VALUE	**DESCRIPTION**
FFT_NOTCH	Sets the selected frequencies to NULL. Equivalent to selecting the “Rectangle” option in the “Inverse/Filter” dialog box.
FFT_HANNING	Attenuates the selected frequencies at the rate specified by *Transition*. Equivalent to selecting the “Hanning” option in the “Inverse/Filter” dialog box.

The *Transition* value is ignored when the FFT_NOTCH *Type* is specified. Set it to 0.

See Also

IpFftLoPass, IpFftSpikeCut

IpFftInverse

Syntax

IpFftInverse(*DocId*, *PreserveData*)

Description

This function performs an inverse transform of the active FFT image window. Equivalent to the **FFT** command's **Inverse** button and the options in the **Inverse/Filter Options** dialog box.

Parameters

DocId	**Integer**	An integer specifying the ID of the image into which the inverse transform results are to be written, or one of the following: FFT_NEWIMAGE FFT_SOURCE FFT_NEWSINGLE Where, FFT_NEWIMAGE writes the result to a new image window, and FFT_SOURCE writes the result back to the image from which the FFT was generated. FFT_NEWSINGLE will generate a new single point image.
PreserveData	**Integer**	A value of 0 or 1 specifying whether the FFT data will be cleared from the FFT window when the inverse transform is complete. Where: 0 - Clears the data from the FFT window. 1 - Keeps the data in the FFT window.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpFftInverse(FFT_NEWIMAGE, 1)
```

This statement will perform an inverse transformation and write the results into a new image window. Data in the FFT window will be preserved so that it can be filtered again without having to do a forward FFT.

See Also

IpFftForward

IpFftLoad

Syntax

IpFftLoad(*FileName*)

Description

This function loads FFT data from a file into an image window. Equivalent to the **Load** button in the **FFT** dialog box.

Parameters

FileName	**String**	A string specifying the name of the file from which the FFT data will be read.

Return Value

This function returns the Document ID of the FFT image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpFftLoad("C:\IPWIN\DNOISE.FFT")
```

This statement will load the DNOISE.FFT file from the \IPWIN directory on drive C: .

See Also

IpFftSave

IpFftLoPass

Syntax

IpFftLoPass(*Type*, *Transition*)

Description

This function filters the FFT data to allow only the frequencies within the specified range to remain in the image. Equivalent to applying the **Lo Pass** option from the **Filter** group box in the **FFT** dialog box.

Parameters

Type	**Integer**	An enumerated integer specifying the way in which frequencies outside the selected range are to be treated. Must be one of the following: FFT_HANNING FFT_NOTCH See definitions under Comments, below.
Transition	**Integer**	An integer representing a percentage, from 0 to 50 (inclusive), specifying the rate at which the selected frequencies will be attenuated. The closer this value is to 0, the more closely the result will resemble the results of the FFT_NOTCH *Type*.

Example

```
ipRect.left = 66
ipRect.right = 189
ipRect.top = 58
ipRect.bottom = 196
ret = IpAoiCreateBox(ipRect)
ret = IpFftLoPass(FFT_HANNING, 30)
```

This set of statements will attenuate all frequencies outside of the AOI defined by `ipRect`. A transition value of 30% will be applied during frequency attenuation.

Comments

Before calling the `IpFftLoPass` function, you must define `ipRect` such that it describes an AOI encompassing the selected frequencies (see example above).

The following table describes values allowed in the *Type* parameter:

VALUE	**DESCRIPTION**
FFT_NOTCH	Sets the selected frequencies to NULL. Equivalent to selecting the **Rectangle** option in the **Inverse/Filter** dialog box.
FFT_HANNING	Attenuates the selected frequencies at the rate specified by *Transition.* Equivalent to selecting the **Hanning** option in the **Inverse/Filter** dialog box.

The *Transition* value is ignored when the FFT_NOTCH *Type* is specified. Set it to 0.

See Also

IpFftHiPass, IpFftSpikeCut

IpFftSave

Syntax

IpFftSave(*FileName*)

Description

This function saves the current FFT data to a file. Equivalent to the **Save** button in the **FFT** dialog box.

Parameters

FileName	**String**	A string specifying the name of the file to which the FFT data will be written.

Example

```
ret = IpFftSave("C:\IPWIN7\DNOISE.FFT")
```

This statement will save the FFT data to the DNOISE.FFT file in the \IPWIN directory on the C: drive.

Comments

If the specified file name already exists, it will be automatically overwritten.

See *Appendix B* in the *Image-Pro Reference Manual* for a description of the FFT file format.

See Also

IpFftLoad

IpFftShow

Syntax

IpFftShow(*bShow*)

Description

This function shows or hides the **FFT** dialog box. Equivalent to selecting the *FFT* command to open the window or clicking its close button to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the **FFT** window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Example

```
  ret = IpFftShow(1)
  ret = IpFftForward(FFT_SPECTRUM, 0)
```

This set of statements opens the **FFT** window and produces an FFT spectrum.

Comments

The **FFT** window does not have to be open during an FFT operation. Its disposition, visible or hidden, is entirely your choice. You will want to display the window if your users need to make a choice within it. But, if your objective is simply to filter a spectrum in a predefined way, you needn’t display the **FFT** window.

IpFftSpikeBoost

Syntax

IpFftSpikeBoost(*Type*, *Transition*, *Symmetrical*)

Description

This function accentuates the selected frequencies in a set of FFT data. Equivalent to applying the **Spike Boost** option from the **Filter** group box in the **FFT** dialog box.

Parameters

Type	**Integer**	An enumerated integer specifying the way in which the selected frequencies will be treated. Must be one of the following: FFT_HANNING FFT_NOTCH See definitions under Comments, below.
Transition	**Integer**	An integer representing a percentage, from 0 to 50 (inclusive), specifying the rate at which the selected frequencies will be attenuated. The closer this value is to 0, the more closely the result will resemble the results of the FFT_NOTCH *Type.*
Symmetrical	**Integer**	An integer value of 0 or 1 specifying whether both halves of the FFT data set will be affected by the frequency filter. Where: 0 - Disables Symmetrical editing. 1 - Enables Symmetrical editing.

Example

```
ipRect.left = 66
ipRect.top = 58
ipRect.right = 189
ipRect.bottom = 196
ret = IpAoiCreateBox(ipRect)
ret = IpFftSpikeBoost(FFT_HANNING, 30, 0)
```

This set of statements will accentuate all frequencies within the AOI defined by `ipRect` (i.e., 66,58 and 189,196). A transition value of 30% will be applied during frequency accentuation. Symmetrical editing is disabled.

Comments

Before calling the IpFftSpikeBoost function, you must define `ipRect` such that it describes an AOI encompassing the selected frequencies (see example above).

The following table describes the values allowed in the *Type* parameter:

VALUE	DESCRIPTION
FFT_NOTCH	Sets the selected frequencies to NULL. Equivalent to selecting the “Rectangle” option in the “Inverse/Filter” dialog box.
FFT_HANNING	Accentuates the selected frequencies at the rate specified by *Transition.* Equivalent to selecting the “Hanning” option in the “Inverse/Filter” dialog box.

The *Transition* value is ignored when the FFT_NOTCH *Type* is specified. Set it to 0.

See Also

IpFftHiPass, IpFftLoPass

IpFftSpikeCut

Syntax

IpFftSpikeCut(*Type*, *Transition*, *Symmetrical*)

Description

This function removes or attenuates the selected frequencies in a set of FFT data. Equivalent to applying the **Spike Cut** option from the **Filter** group box in the **FFT** dialog box.

Parameters

Type	**Integer**	An enumerated integer specifying the way in which the selected frequencies will be treated. Must be one of the following: FFT_HANNING FFT_NOTCH See definitions under Comments, below.
Transition	**Integer**	An integer representing a percentage, from 0 to 50 (inclusive), specifying the rate at which the selected frequencies will be attenuated. The closer this value is to 0, the more closely the result will resemble the results of the FFT_NOTCH *Type.*
Symmetrical	**Integer**	An integer value of 0 or 1 specifying whether both halves of the FFT data set will be affected by the frequency filter. Where: 0 - Disables Symmetrical editing. 1 - Enables Symmetrical editing.

Example

```
ipRect.left = 66
ipRect.top = 58
ipRect.right = 189
ipRect.bottom = 196
ret = IpAoiCreateBox(ipRect)
ret = IpFftSpikeCut(FFT_HANNING, 30, 0)
```

This set of statements will attenuate all frequencies within the AOI defined by `ipRect` (i.e., 66,58 and 189,196). A transition value of 30% will be applied during frequency attenuation. Symmetrical editing is disabled.

Comments

Before calling the `IpFftSpikeCut` function, you must define `ipRect` such that it describes an AOI encompassing the selected frequencies (see example above).

The following table describes the values allowed in the *Type* parameter:

VALUE	DESCRIPTION
FFT_NOTCH	Sets the selected frequencies to NULL. Equivalent to selecting the “Rectangle” option in the “Inverse/Filter” dialog box.
FFT_HANNING	Attenuates the selected frequencies at the rate specified by *Transition.* Equivalent to selecting the “Hanning” option in the “Inverse/Filter” dialog box.

The *Transition* value is ignored when the FFT_NOTCH *Type* is specified. Set it to 0.

See Also

IpFftHiPass, IpFftLoPass

IpFftTag

Syntax	**IpFftTag**(*DocID, Type, Source Class*)		
Description	This function specifies that the active image and another image make up a pair of spectrum and phase FFT images.		
Parameters	*Doc ID*	**Integer**	Document ID of the second image.
	Type	**Integer**	The component that the active image represents (FFT_SPECTRUM or FFT_PHASE).
	Source Class	**Integer**	The image class of the source image that generated the FFT image.
Return Value	0 if successful, an error code if failed.		

IpFlt3DApplytoBuffer

Syntax	**IpFlt3DApplytoBuffer** *(ImSizeX, ImSizeY, ImSizeZ, FltBuffer, FltParams, szKernName)*		
Description	This function applys the 3D filter to the memory buffer.		
Parameters	*ImSizeX*	**Long**	Size of the memory buffer in the X direction
	ImSizeY	**Long**	Size of the memory buffer in the Y direction
	ImSizeZ	**Long**	Size of the memory buffer in the Z direction
	p_FltBuffer	**Any**	Pointer to a floating point buffer to be filtered
	pFltParams	**Any**	Pointer to an array of doubles containing the filter parameters
	szKernName	**String**	Kernel name (path and extension not required). This parameter must be specified for CONV_3D_KERNEL and MORPH_ED_XXX filter types. For other filters, this parameter must be an empty string
Return Value	0 if successful, a negative error code if failed.		
Example	Please see Appendix A.		

IpFlt3DApplytoFrames

Syntax **IpFlt3DApplytoFrames** *(NFrames, FramesArray, pRect, FltParams, KernName)*

Description This function applys the 3D filter to the selected frames

Parameters

sNFrames	**Integer**	Number of frames to filter
FramesArray	**Any**	Pointer to the array of **long** containing the list of frames to filter. The array contains pairs of long values, the first value specifies Vri (IMHANDLE) of image and the second the frame number. The size of the array must be 2* sNFrames. Example: FramesArray(0) – Vri 1 FramesArray(1) – frame number 1 FramesArray(2) – Vri 2 FramesArray(3) – frame number 2
pRect	**RECT**	Rectangle on the image where the filter will be applied. If the value is NULL whole image is filtered.
pFltParams	**Any**	Pointer to an array of doubles containing the filter parameters. The array has the following structure: **FltParams (0) –** FilterType, can be one of the following: CONV_3D_LOPASS CONV_3D_HIPASS CONV_3D_GAUSS CONV_3D_HIGAUSS CONV_3D_EDGEPL CONV_3D_EDGEMN CONV_3D_MEDIAN CONV_3D_RANK CONV_3D_KERNEL MORPH_3D_ERODE MORPH_3D_DILATE MORPH_3D_OPEN MORPH_3D_CLOSE MORPH_3D_DISTMAP MORPH_3D_WATERSHED MORPH_3D_THINNING MORPH_3D_PRUNING MORPH_3D_BRANCH MORPH_3D_REDUCE MORPH_3D_VECTORIZE

Parameters	*pFltParams, con't*	**Any**	FltParams (1) – number of passes FltParams (2) – SizeX FltParams (3) – SizeY FltParams (4) – SizeZ FltParams (5) – Strength FltParams (6) – Rank (used only for CONV_3D_RANK filter) FltParams (7) – Filter Color Images in HSI space, 1= on, 0 = off FltParams (8) – use Morphological Kernel (used only with MORPH_3D_XXXX types), 1= on, 0 = off FltParams (9) – threshold absolute value (not percents) used with thinning, watershed, etc. FltParams (10) – the Stop After options. Used in Thinning, Watershed, Pruning filters (1-On, 0-Off). FltParams (11) – Iterations number, Used in Thinning, Watershed, Pruning filters. With Gray watershed the parameter defines Pre-flooding level. FltParams (12) – Gray Watershed option. Used only with Watershed (1-On, 0-Off). FltParams (13) – BranchEnd flags, can be a combination (sum) of the following constants: BR_SINGLE_POINT BR_END_POINT BR_SKELETON BR_TRIPLE_BR BR_4_PLUS BR_ALL – is the sum of All flags For MORPH_3D_VECTORIZE the parameter contains vectorization mode flags. See **IpFlt3DVectorize** for details. FltParams (14) **–** preserve long branches option. Used only with Pruning (1-On, 0-Off).
	szKernName	**String**	Kernel name (path and extension not required). This parameter must be specified for CONV_3D_KERNEL and MORPH_ED_XXX filter types. For other filters, this parameter must be an empty string
Return Value	0 if successful, a negative error code if failed.		
Example	Please see Appendix A.		

IpFlt3DBranchEnd

Syntax

IpFlt3DBranchEnd *(Threshold, ElemType)*

Description

This function applies the 3D Thinning filter to the active volume, and identifies 3D morphological end-points or branches of the resulting skeleton.

Parameters

dThreshold	**Double**	Threshold value, absolute level.
sElemType	**Integer**	the types of morphological features to be extracted. Every element on the output image has different gray level. Can be a combination (sum) of the following flags:

Type	Gray level
BR_SINGLE_POINT	10
BR_END_POINT	20
BR_SKELETON	30
BR_TRIPLE_BR	40
BR_4_PLUS	50 and more

All the flags are combined in BR_ALL

Return Value

0 if successful, a negative error code if failed.

Example

```
‘extract single points, skeleton, end points, triple branches,
and 4+ branches from the current image
ret = IpFlt3DBranchEnd(153.0,
BR_SINGLE_POINT+BR_END_POINT+BR_SKELETON+BR_TRIPLE_BR+BR_4_PLUS
)
’the same operation as above
ret = IpFlt3DBranchEnd(153.0, BR_ALL)
```

IpFlt3DConv

Syntax **IpFlt3DConv** *(FilterType, SizeX, SizeY, SizeZ, Passes, Strength)*

Description This function applys the 3D filter to the active image.

Parameters

sFilterType	**Integer**	Selectes the filter type, should be one of the following: CONV_3D_LOPASS CONV_3D_HIPASS CONV_3D_GAUSS CONV_3D_HIGAUSS CONV_3D_EDGEPL CONV_3D_EDGEMN
aSizeX	**Integer**	Filter size along the X axis
aSizeY	**Integer**	Filter size along the Y axis
aSizeZ	**Integer**	Filter size along the Z axis
sPasses	**Integer**	Number of passes
sStrength	**Integer**	Strength (10 is the maxiumum)

Return Value 0 if successful, a negative error code if failed.

Example

```
'apply lopass 3D filter
ret = IpFlt3DConvApply(CONV_3D_LOPASS,5,5,5,1,10)
```

IpFlt3DData

Syntax **IpFlt3DData** *(lAttr, lOption, pData)*

Description This function sets or gets the data used with 3D filtering.

Parameters

lAttr	**Long**	See table below
lOption	**Integer**	See table below
pData	**Any**	See table below

lAttr	**lOption**	**pData**	**Description**
FLT3D_DIST_SCALE_SET	Not used, should be 0	Pointer to the array of doubles[3] with scale values. pData(0) – voxel size in X direction. pData(1) – voxel size in Y direction. pData(2) – voxel size in Z direction.	Sets the distance scale (voxel size) used for distance transform and other distance map- based filters (binary watershed, thinning, reduce)
FLT3D_DIST_SCALE_GET	Not used, should be 0	Pointer to the array of doubles[3] with scale values. pData(0) – voxel size in X direction. pData(1) – voxel size in Y direction. pData(2) – voxel size in Z direction.	Gets the distance scale (voxel size) used for distance transform

Example

```
'set voxel size for distance transform
Sub SetDist()
       Dim DistScale(3) As Double
       DistScale(0)=2
       DistScale(1)=3
       DistScale(2)=10
       ret = IpFlt3DData(FLT3D_DIST_SCALE_SET,0,DistScale(0))
End Sub

'get voxel size used for distance transform
Sub GetDist()
       Dim DistScale(3) As Double
       ret = IpFlt3DData(FLT3D_DIST_SCALE_GET,0,DistScale(0))
       Debug.Print "SizeX = " & DistScale(0)
       Debug.Print "SizeY = " & DistScale(1)
       Debug.Print "SizeZ = " & DistScale(2)

End Sub
```

IpFlt3DDistance

Syntax **IpFlt3DDistance** *(Threshold)*

Description This function creates a floating-point 3D distance map on the active volume.

Parameters

dThreshold	**Double**	Threshold value, absolute level.

Return Value ID of the new distance map if successful, a negative error code if failed.

Example

```
  ’create distance map with threshold 153
ret = IpFlt3DDistance(153.0)
```

IpFlt3DGet

Syntax **IpFlt3DGet** *(Attribute, Data)*

Description This function gets the 3D filter parameters

Parameters

sAttribute	**Integer**	Parameter attribute to get FLT3D_HSI_FILTRATION gets the ‘filter color images in HIS space’ option FLT3D_USEACTIVEPORTION sets the ‘use active portion’ option.
lpData	**Long**	Pointer to a long value that receives the value

Return Value 0 if successful, a negative error code if failed.

Example

```
‘get the HSI options
Dim lHSI as Long
ret=IpFlt3DGet(FLT3D_HSI_FILTRATION, lHSI)
```

IpFlt3DKernel

Syntax **IpFlt3DKernel** *(KernName, Passes)*

Description This function applies a convolution kernel filter to the active image.

Parameters

szKernName	**String**	Kernel name. An extension and/or path is not required.
sPasses	**Integer**	Number of passes

Return Value 0 if successful, a negative error code if failed.

Example

```
‘apply Sobel 3D filter
ret=IpFlt3DKernel (Sobel 3D,1)
```

IpFlt3DMorph

Syntax **IpFlt3DMorph** *(FilterType, SizeX, SizeY, SizeZ, Passes)*

Description This function applies the free size morphological filter to the active image.

Parameters

sFilterType	**Integer**	Selectes the filter type, should be one of the following: MORPH_3D_ERODE MORPH_3D_DILATE MORPH_3D_OPEN MORPH_3D_CLOSE
aSizeX	**Integer**	Filter size along the X axis
aSizeY	**Integer**	Filter size along the Y axis
aSizeZ	**Integer**	Filter size along the Z axis
sPasses	**Integer**	Number of passes

Return Value 0 if successful, a negative error code if failed.

Example

```
‘apply Erode filter of size 7x7x7 10 times

ret = IpFlt3DMorph (MORPH_3D_ERODE,7,7,7,10)
```

IpFlt3DMorphKernel

Syntax **IpFlt3DMorphKernel** *(FilterType, KernName, Passes)*

Description This function applies the morphological kernel filter to the active image.

Parameters

sFilterType	**Integer**	Selectes the filter type, should be one of the following: MORPH_3D_ERODE MORPH_3D_DILATE MORPH_ED_OPEN MORPH_3D_CLOSE
sKernName	**String**	Kernel name. An extension and/or path is not required
sPasses	**Integer**	Number of passes

Return Value 0 if successful, a negative error code if failed.

Example

```
‘apply Erode filter of size 7x7x7 10 times
ret = IpFlt3DMorph (MORPH_3D_ERODE,7,7,7,10)
```

IpFlt3DPrune

Syntax	**IpFlt3DPrune** *(Threshold, Iterations,RetainLongBranches)*		
Description	This function applies the 3D Thinning filter to the active volume.		
Parameters	*dThreshold*	**Double**	Threshold value, absolute level.
	sIterations	**Integer**	Branch length in pixels to be removed. -1 for unlimited pruning
	sRetainLong Branches	**Integer**	Preserve long branches option. 1 = branches longer than those specified by *sIterations* are not filtered. 0 = all branches are filtered.
Return Value	0 if successful, a negative error code if failed.		

Example

```
‘apply unlimited pruning to an image with Threshold 120
ret = IpFlt3DPrune(120.0,-1)
```

IpFlt3DRank

Syntax	**IpFlt3DRank** *(SizeX, SizeY, SizeZ, Passes, Rank)*		
Description	This function applies the 3D rank filter to the active image.		
Parameters	*sSizeX*	**Integer**	Filter size along the X axis
	sSizeY	**Integer**	Filter size along the Y axis
	sSizeZ	**Integer**	Filter size along the Z axis
	sPasses	**Integer**	Number of passes
	sRank	**Integer**	Rank percentage value
Return Value	0 if successful, a negative error code if failed.		

Example

```
‘apply median filter
ret = IpFlt3DRank (5,5,5,1,50)
‘apply dilate filter
ret = IpFlt3DRank (5,5,5,1,100)
‘apply erode filter
ret = IpFlt3DRank (5,5,5,1,0)
```

IpFlt3DReduce

Syntax **IpFlt3DReduce** *(Threshold)*

Description This function applies the 3D Reduce filter to the active volume.

Parameters

dThreshold	**Double**	Threshold value, absolute level.

Return Value 0 if successful, a negative error code if failed.

Example

```
‘apply Reduce filter
ret = IpFlt3DPrune(130.0)
```

IpFlt3DSet

Syntax **IpFlt3DSet** *(Attribute, lParam)*

Description This function sets the 3D filter parameters

Parameters

sAttribute	**Integer**	Parameter attribute to set: FLT3D_HSI_FILTRATION sets the ‘filter color images in HIS space’ option FLT3D_USEACTIVEPORTION sets the ‘use active portion’ option.
lParam	**Long**	0 = off 1 = on

Return Value 0 if successful, a negative error code if failed.

Example

```
‘set the HSI options
Dim lHSI as Long
ret=IpFlt3DSet(FLT3D_HSI_FILTRATION, lHSI)
```

IpFlt3DShow

Syntax **IpFlt3DShow** *(bShow)*

Description This function hides or shows the 3D filters dialog.

Parameters

bShow	**Integer**	0 = hide the dialog 1 = show the dialog

Return Value 0 if successful, a negative error code if failed.

Example

```
‘show dialog
IpFlt3DShow (1)
```

IpFlt3DThin

Syntax	**IpFlt3DThin** *(Threshold, Iterations)*		
Description	This function applies the 3D Thinning filter to the active volume.		
Parameters	*dThreshold*	**Double**	Threshold value, absolute level.
	sIterations	**Integer**	The number of iteration for limited thinning. -1 for unlimited thinning.
Return Value	0 if successful, a negative error code if failed.		

Example

```
'apply unlimited thinning to an image with Threshold 153
ret = IpFlt3DThin(153.0,-1)
```

IpFlt3DVectGet

Syntax	**IpFlt3DVectGet** *(lAttr, lOption)*		
Description	This function gets the vectorization values.		
Parameters	*lAttr*	**Long**	See table below.
	lOption	**Integer**	See table below.
Return Value	See table below.		
Comments	Run this function after running IpFlt3DVectorize.		

lAttr	**lOption**	**Description**
V3D_NUM_VECT	Not used, should be 0	Returns the number of branches in the skeleton. Branches are skeleton lines where any pixel does not have more that 2 neighbors in 3x3x3 26-connected neighborhood.
V3D_NUM_BRPT	Not used, should be 0	Returns the number of branch points that have 3 or more pixels in 26-connected neighborhood. The branch points usually have 3 or more branches connected to it.
V3D_NUM_SNGL	Not used, should be 0	Returns the number of single pixels that do not have any neighbors in 26-connected neighborhood. The function can be used to get coordinates of points after the Reduce filter has been applied.
V3D_VECT_LEN	VectID: the ID of the branch vector, should be between 0 and the value returned by the function with V3D_NUM_VECT attribute	Returns the number of pixels in a branch

lAttr	lOption	Description
V3D_BRPT_VOLUME	BranchPointID: the ID of the branch point, should be between 0 and the value returned by the function with the V3D_NUM_BRPT attribute.	Returns the number of pixels in a branch point. Branch point may include 1 or more pixels, especially if the skeleton is produced by limited thinning, so the branch point can be a blob.
V3D_VECT_START_BR_IND	VectID: the ID of the branch vector, should be between 0 and the value returned by the function with the V3D_NUM_VECT attribute	Returns the branch point index (BranchPointID) of the start point of the vector. The value can be used to build a connection diagram of branches. The function returns -1 if there are no branch points are connected to this end of the vector (true end-point) or -2 if the branch is a closed ring.
V3D_VECT_END_BR_IND	VectID: the ID of the branch vector, should be between 0 and the value returned by the function with the V3D_NUM_VECT attribute	Returns the branch point index (BranchPointID) of the end point of the vector. The value can be used to build a connection diagram of branches. The function returns -1 if there are no branch points are connected to this end of the vector (true end-point) or -2 if the branch is a closed ring.

See Also IpFlt3DVectorize, IpFlt3DVectGetData

IpFlt3DVectGetData

Syntax	**IpFlt3DVectGetData** *(lAttr, lOption)*		
Description	This function gets the vectorization data**.**		
Parameters	*lAttr*	**Long**	See table below.
	lOption	**Integer**	See table below.
	pData	**Any**	See table below.
Return Value	See table below.		
Comments	Run this function after running IpFlt3DVectorize.		

lAttr	**lOption**	**pData**	**Description**
V3D_VECT_POINTS	VectID: the ID of the branch vector, should be between 0 and the value returned by the function with the V3D_NUM_VECT attribute	Pointer to the array of doubles that receives the coordinates. The array size has to be big enough to accommodate all values. The number of element has to be not less than 3*NumberOfPoints returned by V3D_VECT_LEN. The coordinates are passes as triplets of X, then Y and then Z coordinates. For example: pData(0) – x coordinate of the first pixel. pData(1) – y coordinate of the first pixel. pData(2) – z coordinate of the first pixel./ pData(3) - x coordinate of the second pixel	Retrieves the coordinates of the branch poly-line points
V3D_BRPT_CENTER	BranchPointID – the ID of the branch point, should be between 0 and the value returned by the function with V3D_NUM_BRPT attribute.	Pointer to the array of 3 doubles that receives the coordinate. pData(0) – x coordinate of the center. pData(1) – y coordinate of the center. pData(2) – z coordinate of the center.	Retrieves the coordinate of the branch-point center. If the Volume of Branch-Point is more than 1 the center of mass of the branch point is returned.

lAttr	lOption	pData	Description
V3D_SNGL_CENTER	SnglPointID – the ID of the single point, should be between 0 and the value returned by the function with V3D_NUM_SNGL attribute	Pointer to the array of 3 doubles that receives the coordinate. pData(0) – x coordinate of the center. pData(1) – y coordinate of the center. pData(2) – z coordinate of the center.	Retrieves the coordinate of a single point.
V3D_BRPT_DIAMETER	BranchPointID – the ID of the branch point, should be between 0 and the value returned by the function with V3D_NUM_BRPT attribute	Pointer to a double that receives the diameter.	Retrieves the diameter of a 3+ branch point. The diameter is based on the value of the distance map image at the coordinate of the branch point. The last distance map created by thinning or distance map operation with active V3D_SAVE_DIST_MAP_SET option is used. (see also FLT3D_DIST_SCALE_SET to set calibrated voxel size).
V3D_SNGL_DIAMETER	SnglPointID – the ID of the single point, should be between 0 and the value returned by the function with V3D_NUM_SNGL attribute	Pointer to a double that receives the diameter.	Retrieves the diameter of a single point.
V3D_VECT_DIAMETER	BranchPointID – the ID of the branch point, should be between 0 and the value returned by the function with V3D_NUM_BRPT attribute	Pointer to a double that receives the diameter	Retrieves the average diameter of a vector. The branch diameter is calculated as average diameter of all points in the branch. See V3D_BRPT_DIAMETER for more info.
V3D_POINT_DIAMETER	Point address, which is calculated as X + Y*Width + Z*Width*Height, where Width and Height define image size	Pointer to a double that receives the diameter.	Tetrieves the diameter of an arbitrary point defined by its linear coordinate. See V3D_BRPT_DIAMETER for more info.

IpFlt3DVectorize

Syntax **IpFlt3DVectorize** *(lMode, dThreshold)*

Description This function vectorizes the active image.

Parameters

lMode	**Long**	Defines the type of vectorization. The following flags can be used: V3D_FIND_SKEL - extract vectors of skeleton V3D_FIND_BR_POINTS - extract triple and 4+ branch points V3D_FIND_SNGL_POINTS - extract single points The above flags can be used in combination (e.g. V3D_FIND_SKEL + V3D_FIND_BR_POINTS to extract skeleton and branch points) V3D_FIND_ALL- is the combination of the above flags. V3D_OPTIMIZE - optimize the poly-lines removing the pixels that lie on a straight line. This function can be used after running vectorization with V3D_FIND_X flags. V3D_SAVE_DIST_MAP – sets the distance map saving mode. When the flag is set, running a Thinning or Distance filter creates a distance map in the vectorization environment which will then provide information about point and vector diameters. V3D_RESET - resets the internal buffers of the module. Use this function to free up memory when vectorization data is no longer needed.
dThreshold	**Integer**	Absolute level of threshold value for V3D_FIND_X operations. For V3D_OPTIMIZE and V3D_RESET this parameter is not used and should be 0

Return Value 0 if successful, a negative error code if failed.

Comments The active image has to be a skeleton produced by an unlimited or limited thinning filter. The function converts skeleton lines into poly-lines and returns the coordinates and connectivity of 3+ branch points and single points.

See also `IpFlt3DVectorGet, IpFlt3DVectorGetData`

IpFlt3DWatershed

Syntax **IpFlt3DWatershed** *(Threshold, Iterations, GrayWatershed)*

Description This function runs the 3D watershed separation filter on the active volume.

Parameters

dThreshold	**Double**	Threshold value, absolute level. This parameter is ignored with Gray Watershed.
sIterations	**Integer**	The number of iteration for limited watershed. -1 for unlimited watershed. For Gray watershed the parameter defines the Preflooding level.

sGrayWatershed	**Integer**	Turns Gray Watershed option on or off: 1 = on 0 = off

Return Value

0 if successful, a negative error code if failed.

Example

```
'apply binary watershed to an image with Threshold 128
ret = IpFlt3DWatershed(128.0,-1,0)
'apply limiter binary watershed with 6 iterations
ret = IpFlt3DWatershed(128.0,6,0)
'apply gray watershed with preflooding level of 10
ret = IpFlt3DWatershed(128.000061,10,1)
```

IpFltBranchEnd

Syntax

IpFltBranchEnd(*Threshold,Classify)*

Description

This function applies the branch/endpoint filter with threshold and rank to the active image or AOI.

Parameters

Threshold	**Integer**	Threshold (0-100) at which to binarize the image prior to skeletonization.
Classify	**Integer**	This parameter calssifies points by determining how many separate branches extend from that point. Sum of: BR_SKEL = 16;skeletal points of connectivity = 2 BR_END = 32; end points of connectivity = 1 BR_BRANCH3 = 64; branch points of connectivity = 3 BR_BRANCHN = 128; branch points of connectivity = 4 or more

Example

```
ret = IpFltBranchEnd(22,64)
```

This statement uses a threshold of 10 while applying the trip branches option.

Comments

The resulting image may require contrast adjustment for the results to be visible.

IpFltClose

Syntax

IpFltClose(*Shape*, *Passes*)

Description

This function applies the closing filter to the active image or AOI. Equivalent to selecting the **Close** option within the **Filter** command window.

Parameters

Shape **Integer** An enumerated integer specifying the shape and size of the filtering kernel. Must be one of the following:

MORPHO_2x2SQUARE
MORPHO_3x1ROW
MORPHO_1x3COLUMN
MORPHO_3x3CROSS
MORPHO_5x5OCTAGON
MORPHO_7x7OCTAGON
MORPHO_11x11OCTAGON

See definitions under Comments, below.

Passes **Integer** An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltClose(MORPHO_2x2SQUARE, 3)
```

This statement will filter the image data using a 2 x 2 square closing filter. The filter will be applied 3 times.

Comments

The following table describes the values allowed in the *Shape* parameter: These values are equivalent to the options presented by the *Filtering* window's **Options** group box when a morphological filter is selected.

VALUE	DESCRIPTION
MORPHO_2x2SQUARE	Applies a 2 x 2 square filtering kernel.
MORPHO_3x1ROW	Applies a 3 x 1 horizontal filtering kernel.
MORPHO_1x3COLUMN	Applies a 1 x 3 vertical filtering kernel.
MORPHO_3x3CROSS	Applies a 3 x 3 cross filtering kernel.
MORPHO_5x5OCTAGON	Applies a 5 x 5 octagonal filtering kernel.
MORPHO_7x7OCTAGON	Applies a 7 x 7 octagonal filtering kernel.
MORPHO_11x11OCTAGON	Applies a 11 x 11 octagonal filtering kernel.

See Also

IpFltOpen, IpFltErode, IpFltDilate

IpFltConvolveKernel

Syntax	**IpFltConvolveKernel**(*KernelName*, *Strength*, *Passes*)		
Description	This function filters the image data using the convolution filter contained in the specified file. Equivalent to selecting the **Other** option within the **Filter** command window.		
Parameters	*KernelName*	**String**	A string specifying the file in which the kernel coefficients are contained. Must be one of the following: SCULPT.3X3 TOPHAT.3X3 TOPHAT.5X5 TOPHAT.7X7 WELL.3X3 WELL.5X5 WELL.7X7 HORZEDGE.3X3 HORZEDGE.5X5 HORZEDGE.7X7 VERTEDGE.3X3 VERTEDGE.5X5 VERTEDGE.7X7 HIGAUSS.7X7 HIGAUSS.9X9 LAPLACE.3X3 LAPLACE.5X5 LAPLACE.7X7
	Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result that is to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
	Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltConvolveKernel("VERTEDGE.7x7", 10, 1)
```

This statement will filter the image data using the kernel contained in the file VERTEDGE.7x7. This filter will be applied one time at full strength (10).

Comments

See *Appendix B* in the *Image-Pro Reference Manual* for a description of a kernel file.

IpFltDespeckle

Syntax **IpFltDespeckle**(*Size*, *Strength*, *Passes*)

Description This function applies the Despeckle filter to the active image or AOI. Equivalent to selecting the Despeckle option within the Filter command window.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation. Convolution kernels are always square, so this value specifies both length and width (e.g., 3 x 3).
Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltDespeckle (5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

IpFltDilate

Syntax **IpFltDilate**(*Shape*, *Passes*)

Description This function applies the Dilation filter to the active image or AOI. Equivalent to selecting the **Dilate** option within the **Filter** command window.

Parameters

Shape	**Integer**	An enumerated integer specifying the shape and size of the filtering kernel. Must be one of the following: MORPHO_2x2SQUARE MORPHO_3x1ROW MORPHO_1x3COLUMN MORPHO_3x3CROSS MORPHO_5x5OCTAGON MORPHO_7x7OCTAGON MORPHO_11x11OCTAGON See definitions under Comments, below.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltDilate(MORPHO_1x3COLUMN, 2)
```

This statement will filter the image data using a 1 x 3 vertical dilation filter. The filter will be applied 2 times.

Comments The following table describes the values allowed in the *Shape* parameter: These values are equivalent to the options presented within the **Filtering** window's **Options** group box when a morphological filter is selected.

VALUE	**DESCRIPTION**
MORPHO_2x2SQUARE	Applies a 2 x 2 square filtering kernel.
MORPHO_3x1ROW	Applies a 3 x 1 horizontal filtering kernel.
MORPHO_1x3COLUMN	Applies a 1 x 3 vertical filtering kernel.
MORPHO_3x3CROSS	Applies a 3 x 3 cross filtering kernel.
MORPHO_5x5OCTAGON	Applies a 5 x 5 octagonal filtering kernel.
MORPHO_7x7OCTAGON	Applies a 7 x 7 octagonal filtering kernel.
MORPHO_11x11OCTAGON	Applies a 11 x 11 octagonal filtering kernel.

See Also IpFltOpen, IpFltErode, IpFltClose

IpFltDistance

Syntax **IpFltDistance** (*Threshold, Mode)*

Description This function applies the distance filter to the active image or AOI.

Parameters

Threshold	**Integer**	An integer value between 1 and 100 inclusive that indicates at what percentage of intensity to apply the filter.
Mode	**Integer**	Indicates the type of distance mapping to perform. Must be one of the following: DISTANCE_SQUARE - 0 =current square distance DISTANCE_DIAGONAL - 1 = current diagonal distance DISTANCE_EUCLIDIAN - 2 = Euclidian distance, integer

Example

```
ret = IpFltDistance(10,0)
```

This statement uses a threshold of 10 while applying the square option.

Comments All returned images will have their distances normalized, so that a white 4-connected to black background will have a distance of 1.

IpFltErode

Syntax

IpFltErode(*Shape*, *Passes*)

Description

This function applies the Erosion filter to the active image or AOI. Equivalent to selecting the **Erode** option within the **Filter** command window.

Parameters

Shape	**Integer**	An enumerated integer specifying the shape and size of the filtering kernel. Must be one of the following: MORPHO_2x2SQUARE MORPHO_3x1ROW MORPHO_1x3COLUMN MORPHO_3x3CROSS MORPHO_5x5OCTAGON MORPHO_7x7OCTAGON MORPHO_11x11OCTAGON See definitions under Comments, below.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image data.

Example

```
ret = IpFltErode(MORPHO_3x1ROW, 2)
```

This statement will filter the image data using a 3 x 1 horizontal erosion filter. The filter will be applied 2 times.

Comments

The following table describes the values allowed in the *Shape* parameter. These values are equivalent to the options presented within the **Filtering** window's **Options** group box when a morphological filter is selected.

VALUE	DESCRIPTION
MORPHO_2x2SQUARE	Applies a 2 x 2 square filtering kernel.
MORPHO_3x1ROW	Applies a 3 x 1 horizontal filtering kernel.
MORPHO_1x3COLUMN	Applies a 1 x 3 vertical filtering kernel.
MORPHO_3x3CROSS	Applies a 3 x 3 cross filtering kernel.
MORPHO_5x5OCTAGON	Applies a 5 x 5 octagonal filtering kernel.
MORPHO_7x7OCTAGON	Applies a 7 x 7 octagonal filtering kernel.
MORPHO_11x11OCTAGON	Applies a 11 x 11 octagonal filtering kernel.

See Also

IpFltOpen, IpFltDilate, IpFltClose

IpFltExtractBkgnd

Syntax **IpFltExtractBkgnd**(*BrightOnDark*, *ObjectSize*)

Description This function extracts the background from the active image or AOI. Equivalent to selecting the **Background** option within the **Filter** command window.

Parameters

BrightOnDark	**Integer**	An integer value of 0 or 1 specifying whether the objects are dark or light. Where: 0 - Specifies dark objects on a bright background. Equivalent to the "Bright" background selection in the "Option" group box. 1 - Specifies bright objects on a dark background. Equivalent to the "Dark" background selection in the "Option" group box.
ObjectSize	**Integer**	An integer between 7 and 100 (inclusive) that describes the size of the objects in the image, in pixels.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpFltExtractBkgnd(0, 25)
```

This statement will extract the background from an image containing dark objects that are smaller than 25 pixels in diameter.

See Also IpFltFlatten

IpFltFlatten

Syntax

IpFltFlatten(*BrightOnDark*, *ObjectSize*)

Description

This function flattens the background of the active image or AOI. Equivalent to selecting the **Flatten** option within the **Filter** command window.

Parameters

BrightOnDark	**Integer**	An integer value of 0 or 1 specifying whether the objects are dark or light. Where: 0 - Specifies dark objects on a bright background. Equivalent to the "Bright" background selection in the "Option" group box. 1 - Specifies bright objects on a dark background. Equivalent to the "Dark" background selection in the "Option" group box.
ObjectSize	**Integer**	An integer between 7 and 100 (inclusive) that describes the size of the objects in the image, in pixels.

Example

```
ret = IpFltFlatten(1, 40)
```

This statement will flatten the background of an image containing bright objects that are smaller than 40 pixels in diameter.

See Also

IpFltExtractBkgnd

IpFltGauss

Syntax

IpFltGauss(*Size*, *Strength*, *Passes*)

Description

This function applies the Gauss filter to the active image or AOI. Equivalent to selecting the Gauss option within the **Filter** command window. Use this filter to soften an image by eliminating high-frequency information using a Gauss function. This has the effect of blurring sharp edges. The operation of the Gauss filter is similar to the LoPass filter, but it degrades the image less than the LoPass filter.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7, which specifies the size of the kernel to be applied during the filtering operation.
Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltGauss(5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

IpFltHiPass

Syntax

IpFltHiPass(*Size*, *Strength*, *Passes*)

Description

This function applies the HiPass filter to the active image or AOI. Equivalent to selecting the **HiPass** option within the **Filter** command window.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation. Convolution kernels are always square, so this value specifies both length and width (e.g., 3 x 3).
Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltHiPass(5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

IpFltLaplacian

Syntax

IpFltLaplacian(*Size*, *Strength*, *Passes*)

Description

This function applies the Laplacian filter to the active image or AOI. Equivalent to selecting the **Laplacian** option within the **Filter** command window.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation.
Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltLaplacian(5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

IpFltLocHistEq

Syntax

IpFltLocHistEq*(WindowSize, StepSize, EqualType, StdDev)*

Description

This function applies local histogram equalization techniques to the image and adjusts the image intensities accordingly. The effect is to bring out image details that might not be discernable using global enhancements such as Best Fit or global Histogram Equalization.

Parameters	*WindowSize*	**Integer**	The size of the window upon which to calculate the local histogram. Smaller windows will track smaller details more effectively, while larger windows will provide a smoother overall effect
	StepSize	**Integer**	The distance over which a particular histogram will be applied before recalculation. This parameter is limited to a maximum of WindowSize. Smaller values provide closer tracking of local effects, while larger values are more efficient.
	EqualType	**Integer**	The type of histogram equalization to apply. The values are as follows: LOCEQ_LINEAR - 1: See Global Histogram Equalization. LOCEQ_BELL - 2: See Global Histogram Equalization LOCEQ_LOG - 3: See Global Histogram Equalization LOCEQ_EXP - 4: See Global Histogram Equalization LOCEQ_BESTFIT - 5: See Global Histogram Equalization LOCEQ_STDDEV - 6: The image values at +/- the StdDev parameter will be stretched to the maximum and minimum intensities. This provides an effect akin to the BESTFIT method, but with much less sensitivity to outlying values
	StdDev	**single**	Only used if EQ_STDDEV is specified, this single point value specifies the number of standard deviations +/- that are stretched to maximum and minimum intensities. For a normal distribution of intensities in a random image a value of 1.0 includes 67% of the values, 2.0 includes 95%, and 3.0 includes 99%. This parameter is limited to a range of 0.1 to 5.0.

Example

```
ret = IpFltLocHistEq( 30, 5, 6, 1.5 )
```

Comments

LHE is accessed via the Filter dialog. Functionally, it belongs to the same group as Hipass and Sharpen.

IpFltLoPass

Syntax **IpFltLoPass**(*Size*, *Strength*, *Passes*)

Description

This function applies the LoPass filter to the active image or AOI. Equivalent to selecting the **LoPass** option within the **Filter** command window.

Parameters	*Size*	**Integer**	An integer value of 3, 5 or 7, which specifies the size of the kernel to be applied during the filtering operation.

Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltLoPass(5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

IpFltMedian

Syntax

IpFltMedian(*Size*, *Passes*)

Description

This function applies the Median filter to the active image or AOI. Equivalent to selecting the **Median** option within the **Filter** command window.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image data.

Example

```
ret = IpFltMedian(5, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The filter will be applied twice.

See Also

IpFltLoPass

IpFltOpen

Syntax

IpFltOpen(*Shape*, *Passes*)

Description

This function applies the Opening filter to the active image or AOI. Equivalent to selecting the *Open* option within the **Filter** command window.

Parameters

Shape	**Integer**	An enumerated integer specifying the shape and size of the filtering kernel. Must be one of the following: MORPHO_2x2SQUARE MORPHO_3x1ROW MORPHO_1x3COLUMN MORPHO_3x3CROSS MORPHO_5x5OCTAGON MORPHO_7x7OCTAGON MORPHO_11x11OCTAGON See definitions under Comments, below.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltOpen(MORPHO_3x3CROSS, 5)
```

This statement will filter the image data using a 3 x 3 cross opening filter. The filter will be applied 5 times.

Comments

The following table describes the values allowed in the *Shape* parameter: These values are equivalent to the options presented within the **Filtering** window's **Options** group box when a morphological filter is selected.

VALUE	DESCRIPTION
MORPHO_2x2SQUARE	Applies a 2 x 2 square filtering kernel.
MORPHO_3x1ROW	Applies a 3 x 1 horizontal filtering kernel.
MORPHO_1x3COLUMN	Applies a 1 x 3 vertical filtering kernel.
MORPHO_3x3CROSS	Applies a 3 x 3 cross filtering kernel.
MORPHO_5x5OCTAGON	Applies a 5 x 5 octagonal filtering kernel.
MORPHO_7x7OCTAGON	Applies a 7 x 7 octagonal filtering kernel.
MORPHO_11x11OCTAGON	Applies a 11 x 11 octagonal filtering kernel.

See Also

IpFltClose, IpFltDilate, IpFltErode

IpFltPhase

Syntax **IpFltPhase**( )

Description This function applies the Phase filter to the active image or AOI. Equivalent to selecting the **Phase** option within the **Filter** command window.

Example

```
ret = IpFltPhase()
```

IpFltPrune

Syntax **IpFltPrune**(*Threshold, Passes*)

Description This function applies the pruing filter to the active image or AOI.

Parameters

Threshold	**Integer**	An integer value between 1 and 100 inclusive that describes the intensity of the filter
Passes	**Integer**	An integer between 1 and 65535 (inclusive) that describes the number of passes. Enter -1 to disable the number of passes

Example

```
  ret = IpFltPrune ( 50,2)
```

Comments This statement applies the Prune filter with a 50% threshold. The filter is applied twice.

IpFltRank

Syntax **IpFltRank (*Size, Threshold,Rank, Passes)***

Description This function applies the rank filter with threshold and rank to the active image or AOI.

Parameters

Size	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation.
Threshold	**Single**	An integer value between 0 and 100 inclusive specifying the absolute difference in values between the center pixel and the pixel replacement. This value must be multiplied by the dynamic range of the image class to get the absolute gray value.
Rank	**Integer**	An integer value between 0 and 100 (inclusive) specifying which pixel in the sorted pixel values array will be used to replace the center pixel. A value of 0 means the lowest pixel value, and a value of 100 means the highest pixel value.
Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image data.

Example

```
ret = IpFltRank(3,70,50,1)
```

IpFltReduce

Syntax **IpFltReduce**(*Threshold, Mode,)*

Description This function applies the reducing filter to the active image or AOI.

Parameters

Threshold	**Integer**	An integer value between 1 and 100 inclusive that describes the intensity of the filter
Mode	**Integer**	Indicates the type of reduction to perform. Must be one of the following:

Basic Grid looks like this:

01 02 03 04 05

06 07 08 09 10

11 12 13 14 15

16 17 18 19 20

21 22 23 24 25

FLT_4NEIGHBOR   Use pixels 8, 12, 14, and 18 for filtering pixel 13. The distance to 13 will be the minimum of the values of these pixels plus the distance of 13 from that pixel, calculated in floating point and rounded to an integer upon return. The neighborhood is that of a small plus sign.

FLT_8NEIGHBOR   Use pixels 7, 8, 9, 12, 14, 17, 18, and 19 for filtering pixel13. The neighborhood evaluated is a small square.

REDUCE_16NEIGHBOR   Use all of the FLT_8NEIGHBOR pixels, plus pixels 2, 4,6, 10, 16, 20, 22, and 24 to filter pixel 13. This includes all adjacent pixels in a small square plus those a chess style 'knights-move' away - two pixels away and one over. This provides the most accurate processing.

IpFltRoberts

Syntax **IpFltRoberts**( )

Description This function applies the Roberts filter to the active image or AOI. Equivalent to selecting the **Roberts** option within the **Filter** command window.

Example

```
ret = IpFltRoberts()
```

IpFltRstrDilate

Syntax **IpFltRstrDilate (*DocMask, Threshold,Connect, Iterations)***

Description This function applies the restricted dilation filter with threshold in those areas allowed by the image mask.

Parameters

DocMask	**Integer**	Document ID of the mask image
Threshold	**Integer**	Number between 1 and 100 expressing the percentage theshold for the mask image. This is identical in operation to the threshold used in the Thinning filter and other morphological operations.
Connect	**Integer**	Must be one of the following: 0 = 4-connect 1 = 8-connect

	Iterations	**Integer**	Number of restricted dilation iterations.

Example

```
ret = IpFltRstrDilate(3,70,1,50)
```

This statement selects the ID number of the mask and adjusts the threshold to 70. Eight-connect is selected while the number of iterations is set at 50.

See Also IpFltRstrDilateShow

IpFltRstrDilateShow

Syntax **IpFltRstrDilateShow (*bShow*)**

Description This function displays or hides the restricted dilation filter dialog.

Parameters	*bShow*	**Integer**	A value of 0 or 1 specifying whether the filter dialog is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog

Example

```
ret = IpFltRstrDilateShow(1)
```

See Also IpFltRstrDilate

IpFltSharpen

Syntax **IpFltSharpen**(*Size*, *Strength*, *Passes*)

Description This function applies the Sharpen filter to the active image or AOI. Equivalent to selecting the **Sharpen** option within the **Filter** command window.

Parameters	*Size*	**Integer**	An integer value of 3, 5 or 7 specifying the size of the kernel to be applied during the filtering operation.
	Strength	**Integer**	An integer between 1 and 10 (inclusive) specifying the amount of the filtered result to be applied to the image. A value of 10 indicates that the full result (100%) is to be applied. Lesser values apply the result at reduced strengths.
	Passes	**Integer**	An integer between 1 and 100 (inclusive) specifying the number of times the filter is to be applied to the image.

Example

```
ret = IpFltSharpen(5, 8, 2)
```

This statement will filter the image data using the 5 x 5 kernel. The results will be applied at reduced strength (8). The filter will be applied twice.

See Also IpFltHiPass

IpFltShow

Syntax **IpFltShow**(*bShow*)

Description This function displays or hides the **Filter** dialog box. Equivalent to selecting the **Filtering** command to open the window and clicking its **Close** button to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the **Filtering** window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Example

```
ret = IpFltShow(1)
ret = IpFltOpen(MORPHO_2x2SQUARE, 1)
ret = IpFltClose(MORPHO_7x7OCTAGON, 1)
ret = IpFltShow(0)
```

This set of statements will open the **Filtering** window, filter an image using the open and closing filters, then close the **Filtering** window.

Comments The **Filtering** window does not have to be open during a filtering operation. Its disposition, visible or hidden, is entirely your choice. You will want to display the window when your users are required to make choices within it. However, if your objective is simply to filter an image in a predefined way, you need not display the **Filtering** window.

IpFltSobel

Syntax **IpFltSobel**( )

Description This function applies the Sobel filter to the active image or AOI. Equivalent to selecting the **Sobel** option within the **Filter** command window.

Example

```
ret = IpFltSobel
```

IpFltThin

Syntax **IpFltThin**(*Threshold*)

Description This function applies the Thinning filter to the active image or AOI. Equivalent to selecting the **Thinning** option within the **Filter** command window.

Parameters

Threshold	**Integer**	An integer between 1 and 100 (inclusive) specifying the gray level at which the image should be binarized before the filter is applied. This value represents a percentage of the intensity range, e.g., a value of 50 specifies the intensity level at the 50% point in the range.

Example

```
ret = IpFltThin(25)
```

This statement will apply the Thinning filter to the image data, which is first binarized at the 25% gray level.

IpFltThinEx

Syntax

IpFltThinEx(*Threshold, Passes*)

Desc ription

This function applies the Thinning filter to the active image or AOI. Equivalent to selecting the **Thinning** option within the **Filter** command window.

Parameters

Threshold	**Integer**	An integer between 1 and 100 (inclusive) specifying the gray level at which the image should be binarized before the filter is applied. This value represents a percentage of the intensity range, e.g., a value of 50 specifies the intensity level at the 50% point in the range.
Passes	**Integer**	An integer between 1 and 65535 (inclusive) that describes the number of passes. Enter -1 to disable the number of passes.

Example

```
ret = IpFltThinEx(25,2)
```

This statement will apply the Thinning filter to the image data, which is first binarized at the 25% gray level. The filter will be applied twice.

IpFltUserErode

Syntax

IpFltUserErode*(KernelName,Passes)*

Description

This function applies a morphological erosion filter to the active image or AOI with a user-defined kernel.

Parameters

KernelName	**String**	A string specifying a file name for the kernel filter.
Passes	**Integer**	An integer between 1 and 65535 (inclusive).

Example

```
ret = IpFltUserErode ("mykernel.3x3", 2)
```

Comments

This statement will apply the erosion function using the kernel file, "mykernel.3x3". The filter will be applied twice.

IpFltUserDilate

Syntax

IpFltUserDilate*(KernelName, Passes)*

Description

This function applies a morphological dilation filter with a user-defined kernel to active image or AOI with a user-defined kernel.

Parameters

KernelName	**String**	A string specifying a file name for the kernel filter.
Passes	**Integer**	An integer between 1 and 65535 (inclusive).

Example

```
ret = IpFltUserDilate ("mykernel.3x3", 2)
```

Comments

This statement will apply the dilation function using the kernel file, "mykernel.3x3". The filter will be applied twice.

IpFltVariance

Syntax

IpFltVariance(*SizeX, SizeY*)

Description

This function applies the Variance filter to the active image or AOI. Equivalent to selecting the **Variance** option within the **Filter** command window.

Parameters

SizeX	**Integer**	An integer specifying the size of the kernel in the X direction.
SizeY	**Integer**	An integer specifying the size of the kernel in the Y direction.

Example

```
ret = IpFltVariance(5, 5)
```

This statement will filter the image data using a 5 x 5 kernel.

IpFltWatershed

Syntax

IpFltWatershed(*Threshold*)

Description

This function applies the Watershed filter to the active image or AOI. Equivalent to selecting the **Watershed** option within the **Filter** command window.

Parameters

Threshold	**Integer**	An integer between 1 and 100 (inclusive) specifying the gray level at which the image should be binarized before the filter is applied. This value represents a percentage of the intensity range, e.g., a value of 50 specifies the intensity level at the 50% point in the range.

Example

```
ret = IpFltWatershed(30)
```

This statement will apply the Watershed filter to the image data, which is first binarized at the 30% gray level.

IpFltWatershedEx

Syntax

IpFltWatershedEx(*Threshold, Passes*)

Description

This function applies the Watershed filter to the active image or AOI. Equivalent to selecting the **Watershed** option within the **Filter** command window.

Parameters

Threshold	**Integer**	An integer between 1 and 100 (inclusive) specifying the gray level at which the image should be binarized before the filter is applied. This value represents a percentage of the intensity range, e.g., a value of 50 specifies the intensity level at the 50% point in the range.
Passes	**Integer**	An integer between 1 and 65535 (inclusive) that describes the number of passes. Enter -1 to disable the number of passes.

Example

```
ret = IpFltWatershedEx(30,1)
```

This statement will apply the Watershed filter to the image data, which is first binarized at the 30% gray level. The filter will be applied once.

IpFsGet

Syntax **IpFsGet** *(File,Attribute,Data)*

Description Indicates the file signature attribute that should be returned.

Parameters

File	**String**	Indicates the full path of the file name to analyze.
Attribute	**Integer**	Indicates the file signature attribute that should be returned.
Data	**Any**	Provides the user variable to receive the attribute.

Comments The Attribute parameter determines the type of data returned to the user's variable, and can be one of the following:

FS_SIGNATURE	The current file signature is returned as a 128-bit number.
FS_COMPARE	The 128-bit number provided is compared to the current signature. If they are identical, the return code will be 1, otherwise the function returns 0.

Return Value 0 if successful, a negative error code if failed. This command does not record.

See Also IpFsGetStr

IpFsGetStr

Syntax **IpFsGetStr** *(File, Attribute, Signature)*

Description Indicates the file signature attribute that should be returned.

Parameters

File	**String**	Indicates the full path of the file name to analyze.
Attribute	**Integer**	Determines the type of data to be returned. Must be one of the following: FS_SIGNATURE_STR The current file signature is returned as a string FS_COMPARE_STR The provided string is compared to the current signature.

Parameters

Signature	**String*40**	Provides the user variable to receive the attribute.

Return Value When using FS_COMPARE_STR, returns 1 for identical signatures, otherwise returns 0. Will return an error code if failed. This command does not record.

See Also IpFsGet

IpFtpOpen

Syntax **IpFtpOpen** *(Server, FileName)*

Description This function opens the named file.

Parameters

FileName	**String**	Name of the file (including server dirrectory if any)

Server	**String**	Name or IP address of the Internet file server.

See Also IpFTPSaveAsShow, IpFTPServerShow,IpFTPOpenShow, IpFTPSaveDocAs, IpFTPSaveFileAs

IpFtpSave

Syntax **IpFtpSave** *(Server, FileName)*

Description This function saves the specified document.

Parameters

FileName	**String**	Name of the file (including server dirrectory if any)
Server	**String**	Name or IP address of the Internet file server.

See Also IpFTPOpenShow, IpFTPSaveAsShow,IpFTPServerShow,IpFTPOpenFile, IpFTPSaveFileAs

IpGalAdd

Syntax **IpGalAdd**(*FileName*)

Description This function adds the specified image file to the active database. Equivalent to the **Add** command on the **Database** window's *File* menu.

Parameters

FileName	**String**	A string specifying the image files that are to be added to the database. The first element in the string must be a directory name, followed by one or more file names, separated by spaces. See example below.

Example

```
ret = IpGalNew("C\IPWIN\DATABASE\012194.MDB")
ret = IpGalAdd("C:\IMAGES\SLIDE1.TIF")
```

This pair of statements will create a database called 012194.MDB and add the TIF file called Slide1 to it.

Comments The database file into which the images will be added must be open, and selected, before invoking this function. Therefore, your macro must either open (`IpGalOpen`), create (`IpGalNew`) or select (`IpGalSetActive`) a database before calling this function.

To save Count/Size data together with the active image, use IpGalAdd with an empty string: `IpGalAdd(“”)`

The format of a file is determined by its extension.

See Also IpGalNew, IpGalOpen, IpGalSetActive

IpGalChangeDescription

Syntax **IpGalChangeDescription**(*DescriptionType*, *Description*)

Description This function writes Subject, Artist, Date and Comment information to the selected database image. Equivalent to editing the **Database Information** group box within the **Database** window's **Info** command.

Parameters

DescriptionType	**Integer**	An enumerated integer specifying the description field that is being changed. Must be one of the following: INF_ARTIST (in single-image layout only) INF_DESCRIPTION INF_SUBJECT INF_DATE See definitions under Comments, below.
Description	**String**	The string that is to be assigned to the specified field.

Example

```
ret = IpGalChangeDescription(INF_ARTIST,"Lab 1")
ret = IpGalChangeDescription(INF_DESCRIPTION,"Type 1 Camera")
ret = IpGalChangeDescription(INF_SUBJECT,"Control Cells")
ret = IpGalChangeDescription(INF_DATE,"01/01/1997 13:01:07")
ret = IpWsSave()
```

These statements will write the specified data (e.g., “Lab 1”) to the specified description fields (e.g., INF_ARTIST) and then save the changes to the image file via the `IpWsSave` function.

Comments

The following table describes the values allowed in the *DescriptionType* parameter:

DescriptionType	**DESCRIPTION**
INF_ARTIST	Indicates that the string specified in *Description* is to be written into the “Artist” field. Equivalent to the “Artist” field in the **Info** dialog box.
INF_DESCRIPTION	Indicates that the string specified in *Description* is to be written into the “Comments” field. Equivalent to the “Comments” field in the **Info** dialog box.
INF_SUBJECT	Indicate that the string specified in *Description* is to be written into the “Subject” field. Equivalent to the “Subject” field in the **Info** dialog box.
INF_DATE	Indicates that the string specified in *Description* is to be written into the “Date” field. Equivalent to the “Date” field in the **Info** dialog box.

Once the description fields have been defined with the `IpGalChangeDescription` statements, these fields must be saved to the image with the `IpWsSave` function.

See Also

IpWsSave

IpGalClose

Syntax

IpGalClose(*FileName*)

Description

This function closes an open database file. Equivalent to the **Close Database** command on the **Database** window's *File* menu.

Parameters

FileName	**String**	A string specifying the name of the database file that is to be closed

Return Value

This function returns a 0 if the database file was successfully closed. A -1 if an error occurred.

Example

```
ret = IpGalClose("C:\IPWIN\RESULTS.MDB")
```

This statement will close the database file called RESULTS.MDB in the \IPWIN directory on the C: drive.

IpGalDelete

Syntax **IpGalDelete**(*DatabaseName*)

Description This function deletes the specified database file. Equivalent to the **Delete Database** command on the **Database** window's *File* menu.

Parameters

DatabaseName	**String**	A string specifying the name of the database file that is to be deleted.

Example

```
ret = IpGalDelete("C:\IPWIN\RESULTS.MDB")
```

This statement will delete the RESULTS.MDB database file from the \IPWIN directory on the C: drive.

IpGalImageOpen

Syntax **IpGalImageOpen**(*imageId*)

Description This function opens the specified image in the active database. Equivalent to double-clicking the database image with the left mouse button.

Parameters

imageId	**Integer**	An integer specifying the position number of the image to be opened (where 0 represents the image in the first position in the database window — the one in the upper-left corner), or one of the following negative values: -1 - Specifies all images. -2 - Specifies the last image. -3 - Specifies all tagged images.

Return Value This function returns a 0 if the image file was successfully opened. A -2 if an error occurred.

Example

```
ret = IpGalImageOpen(-1)
```

The statement above will open all images in the active database.

```
ret = IpGalImageOpen(0)
```

The statement above will open the first image displayed in the database.

```
ret = IpGalImageOpen(-2)
```

The statement above will open the last image displayed in the database.

See Also IpGalTag

IpGalNew

Syntax	**IpGalNew**(*FileName*)
Description	This function creates a new database file. Equivalent to the **New Database** command on the **Database** window's *File* menu.
Parameters	*FileName* **String** A string specifying the file name to be given to the new database file.
Example	`ret = IpGalNew("C:\IPWIN\RESULTS.MDB")` This statement will create a new database file called RESULTS.MDB in the \IPWIN directory on the C: drive.
Comments	Use the `IpGalAdd` function to add image files to the database once it has been created with `IpGalNew`.
See Also	IpGalAdd, IpGalOpen

IpGalOpen

Syntax	**IpGalOpen**(*FileName*)
Description	This function opens an existing database file. Equivalent to the **Open Database** command on the **Database** window's *File* menu.
Parameters	*FileName* **String** A string specifying the name of the database file that is to be opened.
Return Value	This function returns a 0 if the database file was successfully opened. A -1 if an error occurred.

Example	`ret = IpGalShow(1)`
	`ret = IpGalOpen("C:\IPWIN\RESULTS.MDB")`
	This pair of statements will open and display the database file called RESULTS.MDB from the \IPWIN directory on the C: drive.

Comments	If you want your users to see the contents of the Database you are opening, be sure to precede this function with the `IpGalShow(1)` statement.

IpGalRemove

Syntax	**IpGalRemove**(*FromDisk*)
Description	This function deletes the tagged images from a database file. Equivalent to the **Delete Records** command on the **Database** window's *Database* menu.
Parameters	*FromDisk* **Integer** An integer value of 0 or 1 specifying whether or not to remove the image file(s) from disk in addition to removing the image(s) from the Database. Where: 0 - Does not delete the image file(s). 1 - Deletes the image file(s).

Example

```
ret = IpGalTag(-2, 1)
ret = IpGalRemove(1)
```

This pair of statements will remove the last image from the database. The file associated with this image will also be deleted from disk.

See Also IpGalTag

IpGalSetActive

Syntax **IpGalSetActive**(*GalId*)

Description This function makes the specified database the "active" database. It selects the database upon which all subsequent database functions will operate.

Parameters *GalId* **Integer**

An integer between 10000 and 10003 (inclusive) specifying which of the open galleries is to be made active. This value selects the database based upon its position on the *View* menu, where:

10000 - Specifies the first database listed in the menu.
10001 - Specifies the second database listed in the menu.
10002 - Specifies the third database listed in the menu.
10003 - Specifies the fourth (last) database listed in the menu.

Example

```
ret = IpGalSetActive(10001)
```

This statement will activate the second database listed in the *View* menu.

IpGalShow

Syntax **IpGalShow**(*bShow*)

Description This function is used to open or close the **Database** window.

Parameters *bShow* **Integer**

An integer value of 0 or 1 specifying whether the **Database** window is to be shown. Where:

0 - Closes the window if it is already open.
1 - Opens the window.

Example

```
ret = IpGalShow(1)
ret = IpGalOpen("C:\IPWIN\CELLS.MDB")
ret = IpGalAdd("C:\IMAGES\SLIDE1.TIF")
ret = IpGalShow(0)
```

This set of statements will open the **Database** window, open and add an image to the CELLS.MDB database file, then close the **Database** window.

Comments

The **Database** window does not have to be open during execution of the database functions. Its disposition, visible or hidden, is entirely your choice. You will want to display the window when your users are required to make choices within it. However, if your objective is simply to manipulate the contents of the database files, you need not display the **Database** window.

IpGalSort

Syntax

IpGalSort(*bByName*, *bAscending*)

Description

This function sorts the images in the active Database by the specified order. Equivalent to the **Sort** command in the database *Window* menu.

Parameters

bByName	**Integer**	An integer value of 0 or 1 specifying the characteristic by which the images are to be sorted. Where: 0 - Sorts by image name. 1 - Sorts by image size.
bAscending	**Integer**	An integer value of 0 or 1 specifying the order in which the images are to be sorted. Where: 0 - Sorts in ascending order. 1 - Sorts in descending order.

Example

```
ret = IpGalSort(1, 1)
```

This statement will sort the images in the active database in descending size order.

IpGalTag

Syntax

IpGalTag(*SlotNumber*, *bTag*)

Description

This function tags/untags the specified database image to select/de-select it as a candidate for subsequent processing by the `IpGalRemove` or `IpGalImageOpen` functions. Equivalent to clicking the database image with the <shift> key and the left mouse button.

Parameters

SlotNumber	**Integer**	An integer specifying the position number of the image to be tagged/untagged (where 0 represents the image in the first position in the database window — the one in the upper-left corner), or one of the following negative values: -1 = Specifies all images. -2 = Specifies the last image.

bTag	**Integer**	An integer value of 0 or 1 specifying whether the image is to be tagged or untagged. Where: 0 = Untags. 1 = Tags.

Example

```
ret = IpGalTag(-1,0)
```

The statement above will untag all images in the active database.

```
ret = IpGalTag(0,1)
```

The statement above will tag the first image displayed in the database.

```
ret = IpGalTag(-2,1)
```

The statement above will tag the last image displayed in the database.

See Also IpGalRemove, IpGalImageOpen

IpGalUpdate

Syntax **IpGalUpdate**( )

Description This function reloads the contents of the active database with the most up-to-date versions of its image files. Equivalent to the **Update Thumbnail** command on the **Database** window's *File* menu.

IpGetLine

Syntax **IpGetLine**(*Message,LinePts, Numpoints, Maxpoints, Attrib)*

Description Ask the user to click on a line or polygon. The line or polygon is returned in LinePts and numpoints; maxpoints indicates the maximum number of points that can be clicked in. The function returns the new object id. A different message can be displayed for each point by separating messages with ASCII character 10.

Parameters

Message	**String (Basic)** **LPSTR (C)**	The message relating to a point or points.
LinePts	**POINTAPI**	Defines the line.
Numpoints	**Integer**	Defines the polygon.
Maxpoints	**Integer**	Maximum number of points that can be clicked in.
Attrib	**Integer**	Other attributes of the line or polygon

Example

```
Dim lineid as integer, numpts as integer
Dim linePts(2) as POINTAPI
Dim message as string
message = "Click 1st point" + chr$(10) + "click 2nd point"
lineid = IpGetLine(message, linePts(0), numpts, 2, 0)
```

See Also

IpDraw, IpDrawText, IpDrawClear, IpDrawGet, IpDrawClearDoc, IpDrawSet, IpAnotLine, IpAnotBox, IpAnotAttr

Comments

For all drawing or overlay functions, an “object” or “drawing” is a line, text, marker/point, or polygon that can be moved.

IpGetConvertColor

Syntax

IpGetConvertColor *(RGBval, outLABval, ColMod, Class, Norm)*

Description

This function gets the color coordinates of RGB values

Parameters

RGBval	**Single**	An array of RGB values,must be declared as `Dim RGBval(3) as single`
outLABval	**Single**	An array of return values,must be declared as `Dim outLABval(3) as single`
ColMod	**Integer**	Color Model, must be one of the following: COLM_LAB COLM_XYZ COLM_RGB COLM_YIQ COLM_CMY
Class	**Integer**	Image class, mut be IMC_RGB or IMC_RGB48
Norm	**Integer**	Normalization; if Norm = 1 the output value is normalized to the class range. For example, if the class is IMC_RGB, the range is 0 to 255.

IpGridApply

Syntax

IpGridApply ***(bApply)***

Description

This function applies or removes a grid to/from the active image.

Parameters

bApply	**Integer**	1 – Apply selected grid to current image 0 – Remove selected grid from current image

Return Value

Returns IPCERR_NODOC if no grid is active.
Returns IPCERR_NODOC if no image is present.

See Also

IpGridShow, IpGridCreateMask, IpGridSelect

IpGridCreateMask

Syntax **IpGridCreateMask**

Description This function creates a new mask.

Return Value Returns IPCERR_NODOC if no grid is active.
Returns IPCERR_NODOC if no image is present.
Returns DOCID on success.

See Also IpGridApply, IpGridShow, IpGridSelect

IpGridSelect

Syntax **IpGridSelect*(lpszFileName)***

Description Selects a file of grid settings.

Parameters

lpszFileName	**String**	Indicates the name of the grid file.

See Also IpGridApply, IpGridShow, IpGridCreateMask

IpGridShow

Syntax **IpGridShow *(bShow)***

Description This function displays or hides the grid mask dialog.

Parameters

bShow	**Integer**	A value of 0 or 1 specifying whether the grid mask dialog is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog

See Also IpGridApply, IpGridCreateMask, IpGridSelect

IpHstCreate

Syntax **IpHstCreate**( )

Description This function opens the **Histogram** window for the active image. Equivalent to selecting the **Histogram** command.

Return Value This function returns the Histogram ID if successful. -1 is returned if an error occurred.

Comments An image must be open before calling this function. The newly created histogram window becomes the “active” (i.e., selected) histogram as soon as it is created.

See Also IpHstMove, IpHstDestroy, IpHstSelect

IpHstDestroy

Syntax

IpHstDestroy( )

Description

This function closes the active histogram window and clears any data associated with it. Equivalent to selecting the **Close** command in the **Histogram** window's *File* menu.

Comments

Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstDestroy`.

See Also

IpHstCreate, IpHstSelect

IpHstEqualize

Syntax

IpHstEqualize(*Method*)

Description

This function will redistribute the active image's histogram using the specified method. Equivalent to selecting an equalization method with the **Equalize** command.

Parameters

Method **Integer** An enumerated integer specifying the equalization method to use. Must be one of the following types:

EQ_BESTFIT

EQ_BELL

EQ_LINEAR

EQ_LOGARITHMIC

EQ_EXPONENTIAL

See definitions under Comments, below.

Example

```
ret = IpHstEqualize(EQ_BELL)
```

This statement will equalize the histogram using the “Bell” method.

Comments

The following table describes the values allowed in the *Method* parameter:

Method	**DESCRIPTION**
EQ_BESTFIT	Assigns bottom 3% as Shadow point, upper 3% as Highlight point and distributes the remainder evenly across the scale. (Equivalent to BestLut in the *Image* menu.)
EQ_BELL	Distributes the histogram evenly around the center of the intensity scale.
EQ_LINEAR	Distributes the histogram equally across the intensity scale.
EQ_LOGARITHMIC	Shifts the histogram to the lower-end of the intensity scale.
EQ_EXPONENTIAL	Shifts the histogram to the upper-end of the intensity scale.

IpHstGet

Syntax

IpHstGet(*Cmd, Param, OutVal*)

Description

Use this function to get information relating to the selected histogram. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETINDEX GETLNUMPTS GETNUMPTS GETVALUES GETSTATS GETRANGE See definitions under Comments, below.
Param	**Integer**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Return Value

All commands listed below return 0 if successful. A negative error, otherwise.

Example

The following example calculates the mean value in the active histogram.

```
Dim numbins As Integer
Dim hstSum As Single, totalPix as single, Mean as single
Dim i As Integer
ret=IpHstGet(GETNUMPTS,0,numbins)
Redim hstdat(numbins) As Single
ret=IpHstGet(GETVALUES,numbins,hstdat(0))
hstSum=0#
totalPix=0#
For i=0 To numbins - 1
   hstSum=hstSum + hstdat(i) * i
   totalPix=totalPix + hstdat(i)
Next i
If totalPix > 0# Then
   Mean=hstSum/totalPix
End If
  .
  .
  .
```

The following example gets the mean value directly

```
  .
  .
  .
Redim stats(10) As Single
ret = IpHstGet(GETSTATS, 0, stats(0))
```

```
Mean = stats(0)
StdDev = stats(1)
Sum = stats(2)
```

The following example illustrates the use of GETLNUMPTS:

```
Sub HstPts()
Dim NumPts As Integer
Dim LNumPts As Long
ret = IpHstGet(GETNUMPTS, 0, NumPts)
If (ret < 0) Then
   MsgBox("Have to use GETLNUMPTS")
   ret = IpHstGet(GETLNUMPTS, 0, LNumPts)
   MsgBox("Ret = " + Str$(ret) + ", LNumPts = " +
Str$(LNumPts))
Else
   MsgBox("Ret = " + Str$(ret) + ", NumPts = " + Str$(NumPts))
End If
End Sub
```

Comments

Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstGet`.

Histograms of RGB images contain 3 times as much data as an equivalent Gray Scale histogram. The data are organized Red channel first, then Green, then Blue.

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (See `IpHstGet(GETSTATS)` statement in example, above).

For future extension, statistics and range arrays should be large enough to store at least 10 elements.

GETNUMPTS will return an error when the image class is 16-bit grayscale or 48-bit true color (RGB). Therefore, use GETLNUMPTS which will return the number of points to a long variable.

Cmd options are as follows:

<table>
<tr><th><b><i>Cmd</i> VALUE</b></th><th><b>DESCRIPTION</b></th></tr>
<tr><td>GETINDEX</td><td>Use this command to determine the active histogram's ID. The ID will be written to <i>OutVal.</i> This value can be used later to select this histogram with <code>IpHstSelect( )</code>.
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>Not used by GETINDEX. Must be set to 0.</td><td>BASIC, <b>Integer</b>
C<b>, LPSHORT</b></td></tr>
</table></td></tr>
<tr><td>GETNUMPTS</td><td>Use this command to determine the number of bins into which the histogram is divided. This number will be written to <i>OutVal</i>.
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>Not used by GETNUMPTS. Must be set to 0.</td><td>BASIC, <b>Integer</b>
C<b>, LPSHORT</b></td></tr>
</table></td></tr>
<tr><td>GETLNUMPTS</td><td>Use this command to determine the number of bins into which the histogram is divided. This number will be written to <i>OutVal</i>.
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>Not used by GETLNUMPTS. Must be set to 0.</td><td>BASIC, <b>Integer</b>
C<b>, LONG</b></td></tr>
</table></td></tr>
<tr><td>GETVALUES</td><td>Use this command to get the selected histogram's values. These values will be written to the one-dimensional array you have specified in <i>OutVal.</i> For a <i>True Color</i> histogram the entire Red channel histogram is written into the array first, then the Green channel, then the Blue channel.
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>An integer specifying the length of your <i>OutVal</i> array. If you are getting data from a <i>True Color</i> image, your array must be large enough to hold 3 times the number of points in the histogram.
<i>Note - you can use GETNUMPTS to determine the number of elements needed in this array.</i></td><td>BASIC , <b>Single</b>
C, <b>LPSINGLE</b>
<i>Note - OutVal must specify an array.</i></td></tr>
</table></td></tr>
</table>

<table>
<tr><th><b><i>Cmd</i> VALUE</b></th><th><b>DESCRIPTION</b></th></tr>
<tr><td>GETSTATS</td><td>Use this command to get the statistical data associated with the selected histogram. For <i>True Color</i> images, information will be obtained for the color channel you specify in <i>Param</i> (see below).
This command writes the statistics to a 10-element array in <i>OutVal</i>, as follows:
<i>OutVal (0)</i> - Mean value
<i>OutVal (1)</i> - Standard Deviation
<i>OutVal (2)</i> - Sum
<i>OutVal (3)</i> - Minimum gray level (X-MIN)
<i>OutVal (4)</i> - Maximum gray level (X-MAX)
<i>OutVal (5)</i> - Not Currently Used</td></tr>
<tr><td></td><td><i>OutVal (6)</i> - Not Currently Used
<i>OutVal (7)</i> - Not Currently Used
<i>OutVal (8)</i> - Not Currently Used
<i>OutVal (9)</i> - Not Currently Used</td></tr>
<tr><td>GETSTATS</td><td><table>
<tr><th><i>Param</i> VALUE</th><th><i>OutVal</i> TYPE</th></tr>
<tr><td>An integer specifying the color channel for which statistics are to be obtained. Where:
0 - Red Channel
1 - Green Channel
2 - Blue Channel
This parameter is ignored if the image is not <i>True Color</i>. When this is the case, just set <i>Param</i> to 0.</td><td>BASIC, <b>Single</b>
C, <b>single</b>
<i>Note - OutVal must specify a 10-element array.</i></td></tr>
</table></td></tr>
<tr><td>GETRANGE</td><td>Use this command to get the range information associated with the selected histogram. For <i>True Color</i> images, information will be obtained for the color channel you specify in <i>Param</i> (see below).
This command will write the range information to a 10-element array in <i>OutVal</i>, as follows:
<i>OutVal (0)</i> - Start range (X1)
<i>OutVal (1)</i> - End range (X2)
<i>OutVal (2)</i> - Sum of histogram inside range (Area)
<i>OutVal (3)</i> - Sum, above, as a percent of total histogram (%)
<i>OutVal (4)</i> - Histogram value at start of range (X1)
<i>OutVal (5)</i> - Histogram value at end of range (X2)
<i>OutVal (6)</i> - Bin number at start of range (0-based)
<i>OutVal (7)</i> - Bin number at end of range (0-based)
<i>OutVal (8)</i> - Not Currently Used
<i>OutVal (9)</i> - Not Currently Used</td></tr>
</table>

Cmd **VALUE**	**DESCRIPTION**	
	Param **VALUE**	*OutVal* **TYPE**
GETRANGE	An integer specifying the color channel for which range information is to be obtained. Where: 0 - Red Channel 1 - Green Channel 2 - Blue Channel This parameter is ignored if the image is not *True Color*. When this is the case, just set *Param* to 0.	BASIC, **Single.** C, **single** *Note - OutVal must specify a 10-element array.*

See Also IpHstCreate, IpHstSelect

IpHstMaximize

Syntax **IpHstMaximize**( )

Description This function enlarges the active histogram window to full screen. Equivalent to clicking the maximize button on the **Histogram** window Control bar.

Comments Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstMaximize`.

See Also IpHstMinimize, IpHstRestore, IpHstSelect

IpHstMinimize

Syntax **IpHstMinimize**( )

Description This function reduces the active histogram window to an icon. Equivalent to clicking the minimize button on the **Histogram** window Control bar.

Comments Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstMinimize`.

See Also IpHstMaximize, IpHstRestore, IpHstSelect

IpHstMove

Syntax

IpHstMove(*x*, *y*)

Description

This function moves the active (i.e., selected) histogram window to the specified location. Equivalent to dragging the **Histogram** window with the mouse.

Parameters

x	**Integer**	An integer specifying the x-coordinate of the screen position to which you want the upper-left corner of the **Histogram** window moved.
y	**Integer**	An integer specifying the y-coordinate of the screen position to which you want the upper-left corner of the **Histogram** window moved.

Example

```
ret = IpHstMove(10, 40)
```

This statement will move the active histogram window 11 pixels to the right, and 41 pixels down from the upper-left corner of the screen.

Comments

The origin (0, 0) for the coordinate system used by the *x* and *y* parameters is the upper-left corner of the screen.

Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstMove`.

See Also

IpHstRestore, IpHstMaximize, IpHstMinimize, IpHstSelect

IpHstRestore

Syntax

IpHstRestore( )

Description

This function returns the active histogram window to its previous screen position and size. Equivalent to clicking the **Restore** button on a maximized histogram window, or double-clicking the icon of a minimized histogram window.

Comments

Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstRestore`.

See Also

IpHstMinimize, IpHstMaximize,

IpHstSave

Syntax

IpHstSave(*FileName*, *SaveMode*)

Description

This function saves, or appends, the active histogram data or statistics to the specified file. Equivalent to the **Save Histogram, Append Histogram, Save Statistics,** and **Append Statistics** commands on the *File* menu in the **Histogram** command window.

Parameters

FileName	**String**	A string specifying the name of the file to which the histogram data will be written. This parameter is ignored when data is stored to the Clipboard. When this is the case, set *Filename* to an empty string (i.e., "").
SaveMode	**Integer**	An enumerated integer, or an expression involving the addition of two or more enumerated integers, specifying the type of data to be stored and the place to which it is to be stored. Must contain one or more of the following: S_DATA or S_STATS S_APPEND or S_CLIPBOARD or S_PRINT_TABLE or S_PRINT_ GRAPH S_HEADER S_LEGEND S_X_AXIS S_DDE See Comments, below, for a definition of each name. See Example below for usage.

Example

```
ret = IpHstSave("C:\IPWIN\HISTO.HST", S_DATA)
```

This statement will save the current histogram data to a file called HISTO.HST in the \IPWIN directory on the C: drive. If the file already exists, it will be overwritten.

```
ret = IpHstSave("C:\IPWIN\HISTO.HST", S_STATS+S_APPEND)
```

This statement will append the current histogram statistics to a file called HISTO.HST in the \IPWIN directory on the C: drive.

```
ret = IpHstSave("C:\IPWIN\HISTO.HST", S_DATA+S_HEADER+S_LEGEND)
```

This statement will save the current histogram data to a file called HISTO.HST in the \IPWIN directory on the C: drive. The header and legend information will be stored with the data. If the file HISTO.HST already exists, it will be overwritten.

```
ret = IpHstSave("", S_CLIPBOARD)
```

This statement will save the current histogram data to the Clipboard (the function defaults to S_DATA). Note that the *FileName* parameter specifies a zero-length string.

```
ret = IpHstSave("C:\IPWIN\HISTO.HST",S_APPEND+S_DATA+S_X_AXIS)
```

This statement will append the current histogram data to a file called HISTO.HST in the \IPWIN directory on the C: drive. The X-axis data will be stored with the statistics.

Comments

Note that this function operates upon the "active" histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstSave`.

The following options can be used in the expression comprising the *SaveMode* parameter.

USAGE	*Save Mode*	**DESCRIPTION**
Use one or none...	S_DATA	Specifies that histogram data is to be stored.
	S_STATS	Specifies that histogram statistics are to be stored. *Note - if neither S_DATA nor S_STATS is included in the expression, S_DATA is assumed.*
Use one or none...	S_APPEND	Specifies that the data/statistics are to be appended to the specified file.
	S_CLIPBOARD	Specifies that the data/statistics are to be saved to the Clipboard. When this option is used, the *FileName* parameter is ignored.
	S_PRINT_TABLE	Specifies that the data in the table will be sent to the print.
	S_PRINT_GRAPH	Indicates that the graph displayed in the dialog box will be sent to the printer.
	S_DDE	Indicates that the graph or data will be sent to an external program, such as Excel *Note - if neither S_APPEND nor S_CLIPBOARD is included in the expression, histogram data/statistics are saved to a new file (if the file already exists, it will be overwritten).*
Use any, all or none...	S_HEADER	Specifies that the header is to be stored along with the data/statistics.
	S_LEGEND	Specifies that the legend is to be stored along with the data/statistics.
	S_X_AXIS	Specifies that the X-axis information is to be stored along with the data/statistics.

See Also

IpHstSelect

IpHstScale

Syntax

IpHstScale(*bVert*, *bAuto*, *From*, *End*)

Description

This function scales the X and Y axes of the active histogram to the specified points. Equivalent to the **Scaling** command in the **Histogram** window.

Parameters

bVert	**Integer**	An integer value of 0 or 1 that determines whether the X- or Y-axis is to be scaled by this function. Where: 0 - Specifies the X-axis. 1 - Specifies the Y-axis.
bAuto	**Integer**	An integer value of 0 or 1 that determines whether the selected axis should be automatically scaled to encompass the minimum and maximum values in its range. Where: 0 - Disables automatic scaling (scales the axis to the specified *From* and *End* values) 1 - Enables automatic scaling (scales the axis to minimum and maximum values)
From	**Single**	A number specifying the beginning of the axis. This value is ignored if *bAuto* is set to 1. When this is the case, set *From* to 0.
End	**Single**	A number specifying the end of the axis. This value is ignored if *bAuto* is set to 1. When this is the case, set *End* to 0.

Example

```
ret = IpHstScale(1, 0, 0.0, 1000.0)
```

This statement will scale the Y-axis of the histogram from 0 to 1000.

Comments

Note that this function operates upon the "active" histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstScale`.

See Also

IpHstSelect

IpHstSelect

Syntax **IpHstSelect**(*HstId*)

Description

This function activates the specified histogram window. It selects the histogram upon which all subsequent histogram functions will operate. Equivalent to clicking the **Histogram** window to activate it.

Parameters

HstId	**Integer**	An integer specifying the ID of the histogram that is to be selected. See comments, below, for more information about this number.

Example

```
ret = IpHstSelect(0)
```

This statement makes histogram window “0” the active histogram.

Comments

A histogram “ID” (*HstId*) is assigned to a histogram window when it is created. The window retains this ID for the duration of its existence. A histogram window is given the lowest unused ID number available at the time it is created. If a histogram window is opened while no other histograms are open, it is assigned an ID of “0”. If another histogram is created while “0” is open, the new histogram will be assigned an ID of “1”. If “0” is closed, and another histogram is opened (while “1” is still open), the new window will get an ID of “0”, since it is the lowest, unused ID available.

IpHstSetAttr

Syntax **IpHstSetAttr**(*AttrType, AttrValue*)

Description

This function selects, sets or deselects options relating to the **Histogram** window.

Parameters

AttrType	**Integer**	An enumerated integer specifying the option to be set. Must be one of the following: ACCUMULATE BIN CHANNEL1 CHANNEL2 CHANNEL3 COLORMODEL GRID ICAL LINETYPE SCAL STATISTICS See definitions under Comments, below.
AttrValue	**Integer**	An integer specifying how the *AttrType* option is to be set. See definitions under Comments, below, for the values allowed by each option.

Example

```
ret = IpHstSetAttr(BIN, 100)
```

This statement will set the number of bins in the histogram to 100.

Comments

AttrType options are as follows:

AttrType	**DESCRIPTION**	**ALLOWED VALUES**

ACCUMULATE	Determines whether the histogram is displayed in normal or cumulative form. Equivalent to selecting **Accumulate** in the **Histogram** window *Report* menu.	0 - Normal Form 1 - Accumulated form
BIN	Specifies the number of bins into which the histogram is to be divided. Equivalent to setting the **Bins** value in the **Histogram** window's *Report* menu.	An integer specifying the number of bins.
CHANNEL1	Enables or disables the histogram of the Red, Hue or Y channel, depending upon the color model.	0 - Disables Channel. 1 - Enables Channel.
CHANNEL2	Enables or disables the histogram of the Green, Saturation or In-Phase channel, depending upon the color model selected.	0 - Disables Channel. 1 - Enables Channel.
CHANNEL3	Enables or disables the histogram of the Blue, Intensity, Value or Quadrature channel, depending upon the color model selected.	0 - Disables Channel. 1 - Enables Channel.
COLORMODEL	Selects the color model in which the histogram is to be displayed. Equivalent to selecting color model in the **Histogram** window's *Color* menu.	CM_RGB CM_HSI CM_HSV CM_YIQ
GRID	Determines whether the histogram is displayed in table or graph form. Equivalent to setting the **Table** option in the **Histogram** window's *Report* menu.	0 - Selects Graph form. 1 - Se130lects Table form.

AttrType	**DESCRIPTION**	**ALLOWED VALUES**
ICAL	Specifies whether the intensity calibration is to be applied to the histogram. Equivalent to setting the **Intensity Cal** option in the **Histogram** window *Report* menu.	0 - Disables Calibration. 1 - Enables Calibration.
LINETYPE	Determines whether the histogram is to be shown in bar or line form. Equivalent to setting the **Bar** or **Line** option in the **Histogram** window *Report* menu.	0 - Selects Line form. 1 - Selects Bar form.
SCAL	Specifies whether the spatial calibration is to be applied to the histogram. Equivalent to setting the **Spatial Cal** option in the **Histogram** window *Report* menu.	0 - Disables Calibration. 1 - Enables Calibration.
STATISTICS	Specifies whether statistics or range information is to be displayed in the histogram window. Equivalent to setting the **Statistics** or **Range/Area** option in the **Histogram** window's *Report* menu.	0 - Suppresses display of statistics and range information. 1 - Displays Statistics. 2 - Displays Range Info.

Note that this function operates upon the “active” histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstSetAttr`.

IpHstSize

Syntax **IpHstSize**(*cx*, *cy*)

Description This function changes the size of the active histogram window to the specified width and height. Equivalent to resizing **Histogram** window with the mouse.

Parameters

cx	**Integer**	An integer specifying the width, in pixels, at which the **Histogram** window is to be displayed.
cy	**Integer**	An integer specifying the height, in pixels, at which the **Histogram** window is to be displayed.

Example

```
ret = IpHstSize(400, 175)
```

This statement will resize the **Histogram** window to dimensions of 400 pixels wide by 175 pixels tall.

Comments

Note that this function operates upon the "active" histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstSize`.

See Also

IpHstMove, IpHstMinimize, IpHstMaximize, IpHstRestore, IpHstSelect

IpHstUpdate

Syntax

IpHstUpdate( )

Description

This function updates the data within the active histogram window. Equivalent to selecting the **Update** command within the **Histogram** window.

Comments

Note that this function operates upon the "active" histogram window (i.e., the one most recently opened or selected). If the currently active histogram is not the one you want to use, you must use `IpHstSelect` to explicitly select (make active) the appropriate window before calling `IpHstUpdate`.

See Also

IpHstSelect

IpICalCalibValues

Syntax

IpICalCalibValues *(Calibration, NumPixels, PixelList, ValueList)*

Description

This function can be used to retrieve calibrated pixel intensities.

Parameters

Calibration	**Long**	The ID of the calibration of interest
NumPixels	**Integer**	The number of pixels supplied in the PixelList. See comments.
PixelList	**Double**	Pixel intensities to calibrate.
ValueList	**Double**	Calibrated pixel intensities

Comments

The NumPixels parameter indicates the length of the PixelList and ValueList arrays. The pixel intensities to be calibrated should be converted (e.g. using the CDbl() function) and copied into the PixelList array. The calibrated values will be returned in the ValueList array.

IpICalCreate

Syntax

IpICalCreate( )

Description

This function creates a new intensity calibration set. Equivalent to clicking **New** in the **Intensity Calibration** dialog box.

See Also

IpICalSelect, IpICalDestroy

IpICalDestroy

Syntax	**IpICalDestroy**( )
Description	This function deletes the current intensity calibration set. Equivalent to clicking **Delete** in the **Intensity Calibration** dialog box.
See Also	IpICalCreate, IpICalSelect

IpICalDestroyEx

Syntax	**IpICalDestroyEx***(Calibration)*		
Description	This function deletes the current intensity calibration set. Equivalent to clicking **Delete** in the **Intensity Calibration** dialog box.		
Parameters	*Calibration*	**Long**	The ID of the calibration to delete, or one of the following constants: ICAL_CURRENT_CAL = Save the attributes of the current calibration ICAL_ALL = Save all active calibrations ICAL_ALL_REF = Save all reference calibrations
Comments	The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.		
See Also	IpICalCreate, IpICalSelect		

IpICalGetLong

Syntax **IpICalGetLong***(Calibration, Attribute, Value)*

Description This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	This parameter is only used by ICAL_GET_ALL and ICAL_GET_REF. For these attributes, the command is the index of the calibration of interest
Attribute	**Integer**	The attribute of interest, which must be one of the following: ICAL_NUM_ALL = The number of active calibrations ICAL_NUM_REF = The number of reference calibrations ICAL_GET_ALL = Return the calibration ID of an active calibration ICAL_GET_REF = Return the calibration ID of a reference calibration ICAL_NUM_SAMPLES = Get the number of sample points in the in the specified calibration. ICAL_CURRENT = Return the calibration ID of the current calibration ICAL_SYSTEM = Return the calibration ID of the system calibration SCAL_IS_REFERENCE = Indicates a reference calibration. SCAL_IS_SYSTEM = Indicates a system calibration.
Value	**Long**	A long variable that will receive the requested attribute’s value

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value 0 if successful, a negative value if failed

See Also IpICalSetLong

IpICalGetSng

Syntax **IpICalGetSng***(Calibration, Attribute,Value)*

Description This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to ICAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: ICAL_OD_BLACK = Get the black level of an optical density calibration ICAL_OD_INCIDENT = Get the incident (white) level of an optical density calibration.
Value	**Single**	A Single (single point) variable that will receive the requested attribute's value

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active.

See Also IpICalSetSng

IpICalGetStr

Syntax

IpICalGetStr*(Calibration, Attribute,Value)*

Description

This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to ICAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_NAME = The name of the calibration SCAL_UNITS = The name of the calibration units
Value	**String**	A fixed-length string variable that will receive the requested attribute's value

Comments

The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong.** The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active

See Also

IpICalSetStr

IpICalGetSystem

Syntax

IpICalGetSystem *(Class)*

Description

This function sets the attributes of the specified calibration.

Parameters

Class	**Integer**	The image class that this calibration is designed for, which must be one of the following: IMC_GRAY 8 IMC_PALETTE IMC_RGB24 IMC_RGB36 IMC_RGB48 IMC_GRAY12 IMC_GRAY16 IMC_SINGLE

Comments

There are multiple system intensity calibrations with one for each image class.

Return Value

Returns the calibration ID of the system calibration for the specified image class, or IPCERR_NODOC if the specified image class's system calibration has not been set

IpICalLinearize

Syntax **IpICalLinearize**(*bNewImage, bInvert, bScale*)

Description This function uses the current intensity calibration, if any, to transform the pixel values of the active image into calibrated values. This is particularly useful for combining images that have non-linear calibrations (e.g., Optical Density calibration). Equivalent to the **Linearize Image** and **Linearize New** commands.

Parameters

bNewImage	**Integer**	A value of 0 or 1, specifying whether the linearization is to be applied directly to the current image (“Linearize Image”) or is to be written to a new, linear, single-point image (“Linearize New”). Where: 0 - Performs the transformation based upon the range allowed by the current document's class (result written to current window). Equivalent to the “Linearize Image” command, 1 - Performs the transformation based upon a single-point scale (result written to a new, *Single Point* window). The range of the single-point scale is determined by *bScale*. Equivalent to the “Linearize New” command.
bInvert	**Integer**	A value of 0 or 1, specifying whether the pixel values are to be inverted during transformation. Where: 0 - Does not invert the pixel values. 1 - Inverts the pixel values so that dark becomes bright, and bright becomes dark. This option can be used to keep an image with a non-linear, decreasing calibration (e.g., Optical Density) from being visually inverted when it is linearized. Regardless of whether *bInvert* is used, a calibrated analysis of the image will yield the same results.
bScale	**Integer**	A value of 0 or 1, specifying whether the range of a single-point transformation is determined by the image's class. Where: 0 - The range is determined by the minimum/maximum calibrated values in the image (i.e., the calibrated values become the pixel values). 1 - The range is determined by the original image's class (0 - 255 for *Gray Scale*, 0 - 4095 for *Gray Scale 12*). A linear calibration is attached to the image, which maps the calibrated values into that range. The *bScale* parameter is ignored when *bNewImage* is set to 1 (when this is the case, just set *bScale* to 0). *bScale* is used only when an image is linearized to a new, *Single Point* window.

Example

The following example linearizes two images with similar optical density calibrations, before subtracting them (subtracting non-linearly calibrated images would not yield the correct result). An image must be open before this example macro will run.

```
'select background image
ret = IpAppSelectDoc(0)
' linearize background image to new single point image.
ret = IpICalLinearize(1, 0, 0)
'select foreground image
ret = IpAppSelectDoc(1)
' linearize foreground image to new single point image.
ret = IpICalLinearize(1, 0, 0)
' perform subtraction of linearized images
ret = IpOpImageArithmetics(2, 0.0, OPA_SUB, 0)
```

Comments

After the transformation, the image will always have a linear calibration. That is, one in which equal differences in pixel values generate equal differences in calibration unit.

Ignoring round-off errors, the results of a calibrated histogram, line profile, or any other calibrated intensity analysis operation, is not changed by a linearization transformation. Round-off errors will result during in-place transformations of 8 or 12 bit images (when data precision is paramount, always use a single-point transformation — i.e., *bNewImage* = 1, *bScale* = 0).

See Also

IpICalCreate, IpOpBkgndCorrect

IpICalLoad

Syntax

IpICalLoad *(Filename, Ref)*

Description

This function loads an intensity calibration from a file.

Parameters

Filename	**String**	A string specifying the name of the file from which the calibration values will be read.
Ref	**Integer**	A non-zero value indicates that the calibration should be read into the list of reference calibrations. Otherwise the calibration is only added to the list of active calibrations.

Comments

The calibration will be applied to the active image, if an image is open. The calibration will not automatically replace the current system calibration.

Return Value

The calibration ID of the new calibration if successful, a negative value if the calibration file cannot be read

See Also

IpICalCreate

IpICalMove

Syntax **IpICalMove**(*x*, *y*)

Description This function moves the **Intensity Calibration** dialog box to the specified screen position. Equivalent to dragging the dialog box to a new position with the mouse.

Parameters

x	**Integer**	An integer specifying the x-coordinate of the screen position to which you want the upper-left corner of the **Intensity Calibration** window moved.
y	**Integer**	An integer specifying the y-coordinate of the screen position to which you want the upper-left corner of the **Intensity Calibration** window moved.

Example

```
ret = IpICalMove(6, 26)
```

This statement will move the **Intensity Calibration** window to screen position 6, 26 (near the upper-left corner of the screen).

IpICalReset

Syntax **IpICalReset**( )

Description This function resets the current calibration to default values. Equivalent to clicking **Defaults** in the **Intensity Calibration** dialog box.

IpICalSave

Syntax **IpICalSave***(Calibration, FileName)*

Description This function saves the specified calibration to a file.

Parameters

Calibration	**Long**	The ID of the calibration of interest. May also be one of the following constants: ICAL_CURRENT_CAL = Save the attributes of the current calibration ICAL_ALL = Save all active calibrations ICAL_ALL_REF = Save all reference calibrations
FileName	**String**	A string specifying the name of the file where the calibration will be saved.

Return Value A negative value if the calibration file cannot be written.

IpICalSelect

Syntax

IpICalSelect(*szICal*)

Description

This function selects a calibration set to attach to an image. Equivalent to selecting a set in the **Name** field in the **Intensity Calibration** dialog box.

Parameters

szICal	**String**	A string specifying the name of the calibration set that is to be made active.

Example

```
ret = IpICalSelect("DNA Gel")
```

This statement will activate an intensity calibration called “DNA Gel”.

Comments

The activated calibration set becomes the calibration for the active image (if there is one), and all image windows opened thereafter.

See Also

IpICalCreate, IpICalSetName, IpICalDestroy

IpICalSetLong

Syntax

IpICalSetLong*(Calibration, Attribute, Value)*

Description

This function sets the current or system calibration

Parameters

Calibration	**Long**	The calibration ID of the calibration of interest, not used for ICAL_ONIMAGE_COLOR. Calibration may also be set to ICAL_CURRENT_CAL to get the current calibration’s attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: ICAL_APPLY = Applies the specified calibration to the active image. ICAL_CURRENT =Set the current calibration to the specified calibration ICAL_ADD_TO_REF = Add the specified calibration to the list of reference calibrations. ICAL_REMOVE_FROM_REF = Remove the specified calibration from the list of reference calibrations.
Value	**Long**	The new value for the specified attribute.

Comments

The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations. There are multiple system intensity calibrations, with one ofr each image class (such as 8-bit grayscale vs. 16-bit grayscale). The system calibratio can be set by the **IpICalSetSystem** or **IpICalSetSystemByName** functions, and queried using the **IpICalGetSystem** function.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active

See Also IpICalGetLong, IpICalCreate

IpICalSetName

Syntax **IpICalSetName**(*szICal*)

Description This function changes the name of the current calibration set. Equivalent to retyping the name in the **Name** field of the **Intensity Calibration** dialog box.

Parameters

szICal	**String**	A string specifying the new name of the selected calibration set.

Example

```
ret = IpICalSetName("DNA Density")
```

This statement will change the name of the current calibration set to "DNA Density".

IpICalSetOptDens

Syntax **IpICalSetOptDens**(*BlackLevel*, *IncidentLevel*)

Description This function establishes the Black level and Incident level to be applied to the optical density curve. Equivalent to completing the **Optical Density Calibration** dialog box.

Parameters

BlackLevel	**Single**	A number (of IPBasic type, Single) specifying the value representing the pixel intensity of totally opaque material.
IncidentLevel	**Single**	A number (of IPBasic type, Single) specifying the value representing the pixel intensity of totally transparent material.

Example

```
ret = IpICalSetOptDens(23.0, 179.5)
```

This statement will set the Black level to 23.0 and the Incident level to 179.5.

IpICalSetPoints

Syntax **IpICalSetPoints**(*ipICalPoints*, *NumPoints*, *fitmode*)

Description This function establishes the points defining a custom calibration curve. Equivalent to completing the **Freeform Intensity Calibration** dialog box.

Parameters

ipICalPoints	**Single (Basic)** **LPSINGLE (C)**	The name and first element of an array containing the calibration points (of IPBasic type, Single). By default, this array is defined as `ipICal`.
NumPoints	**Integer**	An integer specifying the number of point definitions (coordinate pairs) contained in the array `ipICal.`
fitmode	**Integer**	An integer between 1 and 6 (inclusive) specifying the degree of fit to be applied to the custom curve.

Comments

```
  typedef enum
  {
  ICALSETFIT_POLYNOMIAL       = 1,    // First order polynomial
  (linear)
  ICALSETFIT_POLYNOMIAL2      = 2,    // Second order polynomial
  ICALSETFIT_POLYNOMIAL3      = 3,    // Third order polynomial
  ICALSETFIT_LAGRANGE1        = 4,    // First order Lagrange
  (linear)
  ICALSETFIT_LAGRANGE2        = 5,    // Second order Lagrange
  ICALSETFIT_LAGRANGE3        = 6,    // Third order Lagrange
  }ICALSETFIT_METHOD;
```

Example

```
ipICal(0) = 0
ipICal(1) = 2.4
ipICal(2) = 100
ipICal(3) = 1.2
ipICal(4) = 170
ipICal(5) = 1.0
ipICal(6) = 255
ipICal(7) = 0.1
IpICalSetPoints(ipICal(0), 4)
```

This set of statements will create the custom calibration curve from the points defined in *ipICalPoints* (i.e., the even-odd pairs of 0,2.4   100,1.2   170,1.0 and 255,0.1). A degree-of-fit value of 4 will be applied when the curve is calculated.

IpICalSetSamples

Syntax **IpICalSetSamples**(*NumSamples*)

Description This function sets the number of samples to be used to define the X-axis of the calibration curve. Equivalent to selecting a **Number of Samples** value in the **Intensity Calibration** dialog box.

Parameters

NumSamples	**Integer**	An integer specifying the number of samples comprising the X-axis.

Example

```
ret = IpICalSetSamples(100)
```

This statement will set the number of samples to 100.

IpICalSetSng

Syntax **IpICalSetSng***(Calibration, Attribute,Value)*

Description This function sets the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to ICAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: ICAL_OD_BLACK = Set the black level of an optical density calibration ICAL_OD_INCIDENT = Set the incident (white) level of an optical density calibration.

	Value	**Single**	A Single (single point) variable that will receive the requested attribute's value

Comments

The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active.

See Also

IpICalSetSng

IpICalSetStr

Syntax

IpICalSetStr*(Calibration, Attribute,Value)*

Description

This function sets the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to ICAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: ICAL_NAME = The name of the calibration ICAL_UNITS = The name of the calibration units
Value	**String**	The string containing the new value for the specified attribute.

Comments

The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong.** The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active

See Also

IpICalGetStr

IpICalSetSystem

Syntax

IpICalSetSystem *(Calibration, Class)*

Description

This function sets the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest.

Class	**Integer**	The image class that this calibration is designed for, which must be one of the following: IMC_GRAY 8 IMC_PALETTE IMC_RGB24 IMC_RGB36 IMC_RGB48 IMC_GRAY12 IMC_GRAY16 IMC_SINGLE

Comments

There are multiple system intensity calibrations with one for each image class.
The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active

IpICalSetSystemByName

Syntax

IpICalSetSystemByName *(Calibration, Class)*

Description

This function sets the attributes of the specified calibration.

Parameters

Calibration	**String**	The name of the calibration of interest.
Class	**Integer**	The image class that this calibration is designed for, which must be one of the following: IMC_GRAY 8 IMC_PALETTE IMC_RGB24 IMC_RGB36 IMC_RGB48 IMC_GRAY12 IMC_GRAY16 IMC_SINGLE

Comments

There are multiple system intensity calibrations with one for each image class.
The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpICalGetLong**. The calibration ID is also returned by functions such as **IpICalCreate** and **IpICalLoad** which create new calibrations.

Return Value

0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if ICAL_CURRENT_CAL was specified and there is no calibration active

IpICalSetUnitName

Syntax **IpICalSetUnitName**(*UnitName*)

Description This function changes the name of the current intensity unit. Equivalent to typing a name in the **Unit Name** field within the **Intensity Calibration** dialog box.

Parameters

UnitName	**String**	A string specifying the unit name.

Example

```
ret = IpICalSetUnitName("Degrees")
```

This statement will set the intensity unit name to “Degrees”.

IpICalShow

Syntax **IpICalShow**(*bShow*)

Description This function displays the **Intensity Calibration** dialog box. It is also used to close the dialog box if it is open.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the **Intensity Calibration** dialog box. Where: 0 - Closes the **Intensity Calibration** dialog box if it is open. 1 - Opens the **Intensity Calibration** dialog box.

Example

```
ret = IpICalShow(1)
```

This statement will display the **Intensity Calibration** dialog box.

Comments The dialog box does not have to be opened before assigning and selecting calibration values.

IpICalShowFormat

Syntax **IpICalShowFormat**(*bOptDens*)

Description This function specifies whether the calibration is in freeform or Optical Density format. Equivalent to selecting either the **Freeform** or **Standard Optical Density** radio button in the **Intensity Calibration** window.

Parameters

bOptDens	**Integer**	An integer value of 0 or 1 specifying the format of the calibration curve. Where: 0 - Specifies “Freeform” calibration. 1 - Specifies “Standard Optical Density” calibration.

Example

```
ret = IpICalShowFormat(0)
```

This statement specifies that the calibration curve is to be defined by the points contained in `ipICal`.

See Also IpICalSetPoints, IpICalSetOptDens

IpIniFile

Syntax

IpIniFile(*ValType, ValName, lpValue*)

Description

This function is used to read and write user-defined settings from/to the IPMACRO.INI file. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

ValType	**Integer**	An enumerated integer that specifies whether the setting is to be read or written to the IPMACRO.INI file, and identifies the setting's data type. Must be one of the following. GETINT GETSINGLE SETINT SETSINGLE See definitions under Comments, below.
ValName	**String**	A string specifying the name of the setting to be read or written.
lpValue	*See below*	The name of the variable that will receive the requested data when *ValType* is set to read (get). Or, the name of the variable that holds the setting when *ValType* is set to write (set). Be sure this variable is one that is compatible with the type of data written or returned by the command you have specified in *ValType*. See *ValType* description under Comments, below.

Return Value

0 if successful. Negative if the specified variable (to be read) cannot be found in the file.

Example

The following example reads two settings from the IPMACRO.INI file, and writes them to variables named `var1`, and `var2`.

```
Dim var1 as integer
Dim var2 as single
.
.
.
ret = IpIniFile(GETINT, "MyInteger", var1)
ret = IpIniFile(GETSINGLE, "MySingle", var2)
```

The following example writes values of the two variables, `var1`, and `var2` as settings in the IPMACRO.INI file.

```
Dim var1 as integer
Dim var2 as single
var1 = 123
var2 = 1.234
ret = IpIniFile(SETINT, "MyInteger", var1)
ret = IpIniFile(SETSINGLE, "MySingle", var2)
.
.
.
```

Comments

Variables are written in an ASCII file called IPMACRO.INI. Each variable generates an assignment line consisting of the setting's name, an "=" symbol and the setting's value. The example above would generate the following lines in the IPMACRO.INI file:

```
MyInteger=123
MySingle=1.234
```

ValType options are as follows:

ValType	**DESCRIPTION**
GETINT	This command reads an integer value from *ValName* in the IPMACRO.INI file. The integer is written to the variable you have specified in *lpVal*. Be sure this variable is of BASIC type, **Integer** (C, **LPSHORT**).
GETSINGLE	This command reads a single-point value from *ValName* in the IPMACRO.INI file. This number is written to the variable you have specified in *lpVal*. Be sure this variable is of BASIC type, **Single** (C, **LPSINGLE**).
SETINT	This command writes an integer value to *ValName* in the IPMACRO.INI file. The integer value is obtained from the contents of the variable you have specified in *lpVal*. Be sure this variable is of BASIC type, **Integer** (C, **LPSHORT**).
SETSINGLE	This command writes a single-point value to *ValName* in the IPMACRO.INI file. The single-point number is obtained from the contents of the variable you have specified in *lpVal*. Be sure this variable is of BASIC type, **Single** (C, **LPSINGLE**).

See Also

IpIniFileStr

IpIOvrApply

Syntax **IpIOvrApply** *(Position, FillColor, bApplyData)*

Description

This function allows you to apply the image information overlay to a copy of the currently active image. In applying the overlay, *Image-Pro* 'burns' it into either a header or footer it creates in the new image, depending on your specification for the *Position* parameter. This function corresponds to the options on the **Apply to New Image** dialog box.

To learn more about the image information overlay, see "IpIOvrSet".

Parameters

Position	**Integer**	An enumerated integer indicating where in the new image you want the overlay 'burned'. Must be one of the following: IOVR_LOC_HEADER (Indicates you want it burned in a header) IOVR_LOC_FOOTER (Indicates you want it burned in a footer)
FillColor	**Integer**	An RGB value indicating the fill color you want to use for the header or footer. Must be one of the following: IOVR_COL_WHITE IOVR_COL_GRAY IOVR_COL_BLACK

bApplyData	**Integer**	Indicates whether or not to apply ('burn') the data overlay with the image information overlay in the new image. Must be either: 1 – True 0 – False. This is the same as checking the **Apply Data Overlay** checkbox in the **Apply to New Image** dialog box.

See Also IpIOvrSet, IpIOvrSetStr, IpIOvrShow, IpIOvrGet

IpIOvrGet

Syntax **IpIOvrGet***(sAttribute, sParam, lpData)*

Description This function gets the currently-set attributes for the "image information overlay." With this function, you can get the overlay's font attributes, view and print settings, and display settings.

For more information about the image information overlay, refer to "IpIOvrSet."

Parameters

sAttribute	**Integer**	An enumerated integer specifying the type of information you want to retrieve. See the list of options and their definitions under Comments, below.
sParam	**Integer**	Depends on the value of *sAttribute*. See table below.
lpData	*See table below*	The name of the variable that will receive the requested data. Be sure this variable is of the type required by *sAttribute*, as described in the table below.

Comments The options for *sAttribute* are listed and described in the table below:

sAttribute **VALUE**	**DESCRIPTION**
IOVR_CURRENTBCG	Use this command to get the status of the **Current BCG** option of the **Image Info Overlay** dialog box. One of the following flags will be written to the variable you have specified in *lpData*: 0 = disabled (unchecked) 1 = enabled (checked)

sParam **VALUE**	***lpData***
Not used, must be 0.	Variable of type: **Integer**

<table>
<tr><td>IOVR_APPLIEDBCG</td><td>Use this command to get the status of the <b>Applied BCG</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_EXPOSURE</td><td>Use this command to get the status of the <b>Exposure</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_ACCUMULATED</td><td>Use this command to get the status of the <b>Accumulated</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_DATE</td><td>Use this command to get the status of the <b>Date</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
</table>

<table>
<tr><td>IOVR_TIME</td><td>Use this command to get the status of the <b>Time</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table></td></tr>
<tr><td>IOVR_FILENAME</td><td>Use this command to get the status of the <b>File Name</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table></td></tr>
<tr><td>IOVR_SETINFO</td><td>Use this command to get the image set information, if available.. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table></td></tr>
<tr><td>IOVR_IMAGESIGN</td><td>Use this command to get the status of the <b>Image Signature</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:
0 = disabled (unchecked)
1 = enabled (checked)
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table></td></tr>
</table>

<table>
<tr><td>IOVR_POSITION_
XYZ</td><td>Use this command to get the X, Y, and Z positions of the current frame . One of the following flags will be written to the variable you have specified in <i>lpData</i>:

0 = disabled (unchecked)
1 = enabled (checked)

<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_CHANNEL</td><td>Use this command to get the channel information from set and dyes . One of the following flags will be written to the variable you have specified in <i>lpData</i>:

0 = disabled (unchecked)
1 = enabled (checked)

<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_OVRLIMAGE</td><td>Use this command to get the status of the <b>Show Overlay on Image</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:

0 = disabled (unchecked)
1 = enabled (checked)

<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
<tr><td>IOVR_OVRLPRINT</td><td>Use this command to get the status of the <b>Show Overlay on Print</b> option of the <b>Image Info Overlay</b> dialog box. One of the following flags will be written to the variable you have specified in <i>lpData</i>:

0 = disabled (unchecked)
1 = enabled (checked)

<table><tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr><tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr></table></td></tr>
</table>

<table>
<tr>
<td>IOVR_LOCATION</td>
<td>Use this command to get the current setting controlling the placement of the image information overlay in new images/experiments. Values for IOVR_LOCATION are:
IOVR_LOC_UPPERLEFT
IOVR_LOC_LOWERLEFT
IOVR_LOC_UPPERRIGHT
IOVR_LOC_LOWERRIGHT
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table>
</td>
</tr>
<tr>
<td>IOVR_FONTFACE</td>
<td>Use this command to get current font face setting for the image information overlay. The result will be written to the variable you have specified in <i>lpData</i>.
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>String</b></td></tr>
</table>
</td>
</tr>
<tr>
<td>IOVR_FONTSTYLE</td>
<td>Use this command to get current font style setting for the image information overlay. One of the following integers will be written to the variable you have specified in <i>lpData</i>:
0 = IOVR_FONT_STYLE (normal)
1 = IOVR_FONT_BOLD
2 = IOVR_FONT_ITALIC
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table>
</td>
</tr>
<tr>
<td>IOVR_FONT_
EFFECTS</td>
<td>Use this command to get current font effects setting for the image information overlay. One of the following integers will be written to the variable you have specified in <i>lpData</i>:
0 = No effects
1 = IOVR_FONT_STRIKEOUT
2 = IOVER_FONT_UNDERLINE
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td>IOVR_FONTSIZE</td>
<td>Use this command to get current font size setting for the image information overlay. An integer representing the size in points will be written to the variable you have specified in <i>lpData</i>.
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Integer</b></td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td>IOVR_FONTCOLOR</td>
<td>Use this command to get current font color setting for the image information overlay. An hexadecimal value representing the red, green, and blue values will be written to the variable you have specified in <i>lpData</i>. The returned value is in the format 0x00<i>[bb][gg][rr]</i>, where <i>[bb]</i> is one byte for the blue component, <i>[gg]</i> is one byte for the green component, and <i>[rr]</i> is one byte for the red component.
<table>
<tr><th><i>sParam</i> VALUE</th><th><i>lpData</i></th></tr>
<tr><td>Not used, must be 0.</td><td>Variable of type:
<b>Long</b></td></tr>
</table>
</td>
</tr>
</table>

See Also IpIOvrSet, IpIOvrShow, IpIOvrApply

IpIOvrSet

Syntax **IpIOvrSet** *(sAttribute, sParam, lpData)*

Description This function corresponds to the options available on the **Image Info Overlay** dialog box of *Image-Pro*. It sets the values for the "image information overlay."

The image information overlay is a system-supplied set of annotations that provide basic information about image open in the Image-Pro work area. It can be enabled to overlay images associated with active experiments. For example, the image information overlay can be configured to display images' current BGC (background, gamma, and contrast) values, digital signatures, and date and time stamp information. Any of the attributes listed in the "Display Options" table below can be enabled or disabled in the overlay.

This function also allows you to control the overlay setting options (see the "Setting Options" table below). You can also use this function to control the position and font attributes (font style, color, size, and so on) to be applied to the overlay. All available position and font attributes that you can set are listed in the "Appearance Options" table below.

Parameters	*sAttribute*	**Integer**	An enumerated integer specifying the attribute you want to set. Must be one of the following: IOVR_CURRENTBCG IOVR_APPLIEDBCG IOVR_EXPOSURE IOVR_ACCUMULATED IOVR_DATE IOVR_TIME IOVR_FILENAME IOVR_IMAGESIGN IOVR_SETINFO IOVR_POSITION_XYZ IOVR_CHANNEL IOVR_OVRLIMAGE IOVR_OVRLPRINT IOVR_LOCATION IOVR_FONTFACE IOVR_FONTSIZE IOVR_FONTCOLOR IOVR_FONTSTYLE IOVR_FONTEFFECTS See the definitions for these options under IpIovrGet.
	sParam	**Integer**	Depends on the value of *sAttribute*. See tables under Comments.
	lpData	*See table below.*	Depends on the value of *sAttribute*. See tables under Comments.

Comments The options for *sAttribute* are listed and described in the tables below.

Display Attributes

sAttribute **VALUE**	***sParam***	*lpData*	**DESCRIPTION**
IOVR_CURRENTBCG	0 = disable 1 = enable	not used, must be 0	Displays the image's current BCG (brightness, contrast, and gamma) values in the image information overlay.
IOVR_APPLIEDBCG	0 = disable 1 = enable	not used, must be 0	Displays the image's applied BCG (brightness, contrast, and gamma) values in the image information overlay. The applied BCG values are those that have been applied to the image through *Image-Pro* reflecting any changes to these values from the original image.
IOVR_EXPOSURE	0 = disable 1 = enable	not used, must be 0	Displays the image's exposure value in the image information overlay. For images captured through *Image-Pro*'s **Acquire** function, this value represents the exposure time used to capture the image. For all other images, the **Exposure** value will be "NONE."
IOVR_ACCUMULATED	0 = disable 1 = enable	not used, must be 0	Displays the image's 'accumulated frames' value in the image information overlay. For images captured through *Image-Pro*'s **Acquire** function, this value represents the number of video frames that were added together to create the image. This corresponds to the value for **Accumulate frames** that was entered through the **Integration** tab of the **Analog Simulation** dialog box when the image was captured. For images originating outside of *Image-Pro*, the **Accumulated** value will be "NONE."
IOVR_DATE	0 = disable 1 = enable	not used, must be 0	Displays the image's date stamp in the image information overlay. For images captured through *Image-Pro*'s **Acquire** function, the date stamp represents the date the image was captured. For all other images, the overlay date stamp corresponds to the date stamp of the image file.

IOVR_TIME	0 = disable 1 = enable	not used, must be 0	Displays the image's time stamp in the image information overlay. For images captured through *Image-Pro*'s **Acquire** function, the time stamp represents the time the image was captured. For all other images, the overlay time stamp corresponds to the time stamp of the image file.
IOVR_FILENAME	0 = disable 1 = enable	not used, must be 0	Displays the image's file name in the image information overlay.
IOVR_IMAGESIGN	0 = disable 1 = enable	not used, must be 0	Displays the image's 'signature' in the image information overlay. The image signature is a digital signature of the image based on its current pixel values.

View and Print Settings

sAttribute **VALUE**	***sParam***	*lpData*	**DESCRIPTION**
IOVR_OVRLIMAGE	0 = disable 1 = enable	not used, must be 0	Sets whether or not the image information overlay is to appear on active images in the *Image-Pro* work area.
IOVR_OVRLPRINT	0 = disable 1 = enable	not used, must be 0	Sets whether or not the image information overlay is to appear on images when they are printed.

Appearance Attributes

sAttribute **VALUE**	***sParam***	*lpData*	**DESCRIPTION**
IOVR_LOCATION	Must be one of the following defined constants: IOVR_LOC_UPPERLEFT IOVR_LOC_LOWERLEFT IOVR_LOC_UPPERRIGHT IOVR_LOC_LOWERRIGHT	not used, must be 0	Sets the default placement setting controlling where the image information overlay will be initially placed in new images. This is equivalent to the **Image Overlay Initial Position** setting on the "Veiw Settings" tab of the **Preference Views** dialog. *Note: The **Preference Views** Dialog must be CLOSED for this macro to function properly*.
IOVR_FONT_FACE	not used, must be 0	Must be a string specifying the font face name. The data type is **String**.	Sets the font face (Times New Roman, Courier, Helvetica, etc.) to be used in the overlay.
IOVR_FONT_STYLE	Must be one of the following constants: IOVR_FONT_NORMAL IOVR_FONT_BOLD IOVR_FONT_ITALIC	not used, must be 0	Sets the font style you want to use in the overlay. You *can* ask Image-Pro to set the style as both bold and italics.
IOVR_FONT_SIZE	An integer specifying the font size, in points.	not used, must be 0	Sets the font size to be used in the overlay. For example, a value of "12" indicates you want text to appear as 12 points.

IOVR_FONT_EFFECTS	Must be one of the following constants: IOVR_FONT_NOEFFECTS IOVR_FONT_STRIKEOUT IOVR_FONT_UNDERLINE	not used, must be 0	Sets any font effects you want to use in the overlay.
IOVR_FONT_COLOR	not used, must be 0	Must specify an RGB color. Specification must be a hexadecimal value of the format: 0x00*[bb][gg][rr]* where *[bb]* = one byte for the blue component *[gg]* = one byte for the green component *[rr]* = one byte for the red component. The data type is **Long**.	Sets the color of text you want to use in the overlay. For example, a value of “0x00FFFFFF” indicates that you want the text to appear white.

See Also IpIOvrGet, IpIOvrShow, IpIOvrApply

IpIOvrSetStr

Syntax **IpIOvrSetStr** *(sAttribute, sParam, FontName)*

Description This function corresponds to font face option available on the **Image Info Overlay** dialog box of *Image-Pro*. It sets the display font for the “image information overlay.”

The image information overlay is a system-supplied set of annotations that provide basic information about image open in the Image-Pro work area. It can be enabled to overlay images associated with active experiments. For example, the image information overlay can be configured to display images’ current BGC (background, gamma, and contrast) values, digital signatures, and date and time stamp information. Any of the attributes listed in the “Display Options” table below can be enabled or disabled in the overlay.

This function also allows you to control the overlay setting options (see the “Setting Options” table below). You can also use this function to control the position and font attributes (font style, color, size, and so on) to be applied to the overlay. All available position and font attributes that you can set are listed in the “Appearance Options” table below.

Parameters *sAttribute*	**Integer**	Must be one of the following: IOVR_FONT_FACE = 0

FontName	**String**	fontName =Verdana

Comments For more information about the image information overlay, refer to “IpIOvrSet.”

See Also IpIOvrSet, IpIOvrGet, IpIOvrApply

IpIOvrShow

Syntax **IpIOvrShow**(*bShow*)

Description This function opens and closes the **Image Info Overlay** dialog box.

Parameters

bShow	**Integer**	Must be one of the following: 0 = Close dialog 1 = Open dialog

Comments For more information about the image information overlay, refer to “IpIOvrSet.”

See Also IpIOvrSet, IpIOvrGet, IpIOvrApply

IpIniFileStr

Syntax

IpIniFileStr(*ValType, ValName, lpValue*)

Description

This function is used to read and write user-defined string settings from/to the IPMACRO.INI file. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

ValType	**Integer**	An enumerated integer that specifies whether the string setting is to be read or written to the IPMACRO.INI file, and identifies the setting's data type. Must be one of the following. GETSTRING SETSTRING See definitions under Comments, below.
ValName	**String**	A string specifying the name of the setting to be read or written.
lpValue	*See below*	The name of the string variable that will receive the requested data when *ValType* is set to read (get). Or, the name of the string variable that holds the setting when *ValType* is set to write (set)..

Return Value

0 if successful. Negative if the specified variable (to be read) cannot be found in the file.

Example

The following example reads a string setting from the IPMACRO.INI file, and writes it to a variable named `var1`

```
Dim var1 as String * 255
.
.
.
ret = IpIniFileStr(GETSTRING, "MySetting", var1)
```

The following example writes the value of the variable, `var1`, as a setting in the IPMACRO.INI file.

```
Dim var1 as String
ret = IpIniFileStr(SETSTRING, "MySetting", var1)
.
.
.
```

Comments

Variables are written in an ASCII file called IPMACRO.INI. Each variable generates an assignment line consisting of the setting's name, an “=” symbol and the setting's value. The example above would generate the following lines in the IPMACRO.INI file:

```
MySetting = c:\IPWIN\Images\sports.tif
```

ValType options are as follows:

ValType	**DESCRIPTION**
GETSTRING	This command reads a string value from *ValName* in the IPMACRO.INI file. This string is written to a fixed-length string variable you have specified in *lpVal*. Be sure this variable is a of BASIC type, **String** (C, **LPSTR**). ***Important** - be sure the length of your fixed-length string is large enough to accommodate the returned string.*
SETSTRING	This command writes a string to *ValName* in the IPMACRO.INI file. The string is obtained from the contents of the variable specified in *lpVal*. Be sure this variable is of BASIC type, **String** (C, **LPSTR**).

See Also IpIniFile

IpIsGet

Syntax **IpIsGet** *(File, Attribute, Signature)*

Description Indicates the image signature attribute that should be returned.

Parameters

Attribute	**Integer**	Identifies the type of data to be returned. Must be one of the following: IS_SIGNATURE The current image signature is returned as a 128-bit number. IS_COMPARE The 128-bit number provided is compared to the current signarture.
Data	**Any**	Provides the user variable to receive the attribute.

Return Value When using IS_COMPARE, returns 1 for identical signatures, otherwise returns 0.Will return an error code if failed. This command does not record.

See Also IpIsShow, IpIsGetStr

IpIsGetStr

Syntax	**IpIsGetStr***(Attribute, Signature)*		
Description	Indicates the digital signature attribute that should be returned.		
Parameters	*Attribute*	**Integer**	Determines the type of data to be returned. Must be one of the following: IS_SIGNATURE_STR The current image signature is returned as a string IS_COMPARE_STR The provided string is compared to the current signature.
	Signature	**String * 40**	Provides the user variable to receive the attribute.
Return Value	When using IS_COMPARE_STR, returns 1 for identical signatures, otherwise returns 0. Will return an error code if failed. This command does not record.		
See Also	IpIsShow, IpIsGet		

IpIsShow

Syntax	**IpIsShow (***Show)*		
Description	Shows or hides the image signature dialog.		
Parameters	*Show*	**Integer**	An integer value specifying whether to display or hide the image signature dialog. 0 = Hide Image Signature dialog 1 = Show Image Signature dialog.
Return Value	Returns 0 if successful, a negative error code if failed.		
See Also	IpIsGet, IpIsGetStr		

IpLensAdd

Syntax IpLensAdd *(Lens, Magnification, NA, RI)*

Description This function displays the Edit Lens dialog and lets the user add a new lens.

Parameters

Lens	**String**	A string specifying the name of the new lens
Magnification	**Single**	The magnification of the new lens, from 0.001 to 3000.0
NA	**Single**	The numeric aperature of the new lens, from 1.0 to 2.0
RI	**Single**	The reflective index of the new lens, from 1.0 to 3.0

Comments `IpLensAdd` will create a lens definition file in the current lens location (see the `LENS_PATH` command for `IpLensGetStr` and `IpLensSetStr`). The new file will overwrite any existing dye files with the same name. The name may include the `.IPD` extension, or if it does not the extension will be added automatically. The dye's hue is determined automatically by conversion from the emission wavelength.

IpLensDelete

Syntax **IpLensDelete** *(Lens)*

Description This function removes the specified lens.

Parameters

Lens	**String**	A string specifying the name of an existing lens

IpLensEdit

Syntax **IpLensEdit** *(Lens, New Lens)*

Description This function displays the Edit Lens dialog, and lets the user edit a dye.

Parameters

Lens	**String**	A string specifying the name of an existing Image-Pro Lens file
New Lens	**String**	A fixed-length string to which the lens file name is returned.

Return Value The name of the new lens file, or IPCEERR_EMPTY if you cancel editing the lens.

Comments The NewLens parameter should be a fixed-length string, typically fixed at 255 characters, which will return the final name of the lens after editing (the user can change the lens name while editing). **IpLensEdit** returns IPCERR_EMPTY if the user cancels editing the lens. Note: **IpLensEdit** inherently requires user interaction prior to continuation of the macro script.

IpLensGetLong

Syntax **IpLensGetLong***(Command, Value)*

Description This function returns information about the list of lenses.

Parameters

Command	**Integer**	Command should be: LENS_NUMLENSES = return the number of lenses
Value	**Long**	A long variable which will receive the specified lens parameter

See Also IpDyeGetSng, IpDyeGetStr

IpLensGetStr

Syntax **IpLensGetStr** *(Command, Index, Value)*

Description This function gets information about the lens management settings.

Parameters

Command	**Integer**	Should be one of the following: LENS_PATH = return the current lens location LENS_LIST = return the name of the specificed lens
Index	**Integer**	Index of the specified lens for the LENS_LIST command
Value	**String**	A fixed-length string to receive the current lens file location or the specified lens name.

See Also IpDyeGetLong, IpDyeGetSng

IpLensGetSng

Syntax **IpLensGetSng** *(Lens, Command, Value)*

Description This function gets information about a particular lens.

Parameters

Lens	**String**	Name of a specific Image-Pro lens
Command	**Integer**	Should be one of the following: LENS_MAGNIFICATION = return the current lens magnification LENS_NA = return numeric aperature of the specified lens LENS_RI = return the reflective index of the specified lens
Value	**Single**	A single value to receive the specified lens parameter.

See Also IpDyeGetLong, IpDyeGetStr

IpLensSelect

Syntax **IpLensSelect***(Lens)*

Description This function displays the Edit Lens Dialog and let the user select a lens.

Parameters

Lens	**String**	A fixed-length string to which the name of the selected lens is returned..

Return Value IpLensSelect returns IPCERR_EMPTY if the user cancels selecting a lens. Note: IpLensSelect inherently requires user interaction prior to continuation of the macro script. The name returned is the name of the selected lens – it is not a full path name, nor does it include the .IPL extension**.**

IpLensSetStr

Syntax **IpLensSetStr** *(Command,Value)*

Description This function sets the lens management settings.

Parameters

Command	**Integer**	Should be the following: LENS_PATH = return the current lens location
Value	**String**	A string containing the new lens file location.

IpListPts / IpMorePts

Syntax **IpListPts**(*Points, ListString*)

IpMorePts(*ListString*)

Description These functions are used to fill an array of points from a string that defines a list of pixel coordinates. `IpMorePts` is used after `IpListPts` if more than a single image line is needed. There are no *Image-Pro* commands equivalent to these function; they are ones that must be manually written with the macro editor.

Parameters

Points	**POINTAPI**	The address (name) of the array of point coordinates (BASIC type, POINTAPI) that will be filled from the string specified in *ListString*.
ListString	**String**	A string containing a list of the point coordinates. See Comments, below, for more about the structure of this list.

Return Value `IpListPts` returns the number of points found in *ListString*.

`IpMorePts` returns the total number of points found in all the strings since, and including, the last `IpListPts` call.

Example In the following example `IpListPts` and `IpMorePts` are used to create an array defining the outline of a freeform AOI. Contrast this method with the other way of setting POINTAPI elements using individual assignment statements (also shown below).

```
 ' The new way:
Dim AoiPts(10) as POINTAPI
Dim numPts as integer
numPts=IpListPts(AoiPts(0),"101 147 150 121 193 145 193 198 ")
numPts=IpMorePts("153 221 153 222 153 221 124 216 ")
numPts=IpMorePts("105 205 90 180")
ret=IpAoiCreateIrregular(AoiPts(0), numPts)
```

```
' The old way:
Dim AoiPts(10) as POINTAPI
AoiPts(0).x = 101
AoiPts(0).y = 147
AoiPts(1).x = 150
AoiPts(1).y = 121
AoiPts(2).x = 193
AoiPts(2).y = 145
AoiPts(3).x = 193
AoiPts(3).y = 198
AoiPts(4).x = 153
AoiPts(4).y = 221
AoiPts(5).x = 153
AoiPts(5).y = 222
AoiPts(6).x = 153
AoiPts(6).y = 221
AoiPts(7).x = 124
AoiPts(7).y = 216
AoiPts(8).x = 105
AoiPts(8).y = 205
AoiPts(9).x = 90
AoiPts(9).y = 180
ret = IpAoiCreateIrregular(AoiPts(0), 10)
```

Comments

ListString must specify a list of coordinates, separated by spaces, where the first number is the horizontal position of the first point, the second number is the vertical position of the first point, and so on. The example below illustrates how three points — 10,16 150,120 70,200 — would be defined as a string:

```
"10 16 150 120 70 200"
```

Because a point is made up of two coordinates (X and Y), there must be an even number of items in the string (i.e., the number of points read from *ListString* will be half the number of items in the string).

`IpMorePts` cannot be called alone. It has to follow a call to `IpListPts` or `IpMorePts`.

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (See `IpListPts` statement in example, above).

IpLiveEDFSetInt

Syntax	**IpLiveEDFSetInt** *(sAttribute, sParam, l Param*		
Description	This function sets the various live EDF parameters and executes the functions.		
Parameters	*sAttribute*	**Integer**	The attribute to set and execute. See table below.
	sParam	**Integer**	See table below.
	lParam	**Long**	See table below.

Comments

Attrib options are as follows:

Attribute	**Description**	**sParam**	**lParam**
LIVEEDF_ LOWER_ IMAGE	Sets base image to EDF	frame index (when live EDF is active, 0 frame is used by default)	image handle (when life EDF is active, the current frame is used as the base image)
LIVEEDF_ STEREO_ MODE	Activates stereo mode (auto-alignment)	Not used	1 = on 0 = off
LIVEDF_ DO_EDF	Perform EDF of the current image with the base image (not adding it to base, see LIVEEDF_ADD_TO_EDF)	frame index	image handle
LIVEEDF_ FILTER_SIZE	Sets the size of the variance filter	Not used	Variance filter size (default is 6)
LIVEEDF_ SEARCH_SIZE_H	auto-alignment horizontal pattern size	Not used	Horizontal pattern size (default is 256)
LIVEEDF_ SEARCH_SIZE_V	auto-alignment vertical pattern size	Not used	Vertical pattern size (default is 64)

Attribute	Description	sParam	lParam
LIVEEDF_ ACTIVATE	activate live EDF (image is updated on ImageChange event, fired by workspace preview)	Not used	1 = on 0 = off
LIVEEDF_ MULTIFRAME	in live mode,use accumulated EDF	Not used	1 = on 0 = off
LIVEEDF_ DUAL_VIEW	sets dual view mode	Not used	must be one of the following: DUALVIEW_NONE: normal view of EDF DUALVIEW_ HORIZONTAL: horizontal views side by side DUALVIEW_LIVE: normal veiw of live image DUALVIEW_PIP_EDF: pcture in picture in the EDF corner DUALVIEW_PIP_LIVE: picture in picture live in the corner
LIVEEDF_COMP_MODE	Composition mode	Not used	Live composition mode, must be one of the following: LIVECOMP_LOCAL_CONTRAST:EDF mode LIVECOMP_MAX: maximim signal LIVECOMP_MIN: miniumum signal LIVECOMP_DIFF: difference between current and base image LIVECOMP_ABS_DIFFERENCE: absolute difference
LIVEEDF_ADD_TO_EDF	perform EDF adding current image to base image	frame index (when live EDF is active, 0 frame is used by default)	image handle (when EDF is acrive the current live image is used)

Attribute	**Description**	**sParam**	**lParam**
LIVEEDF_ FULL_FFT	use full FFT for alignment in stereo mode, if 0, phase only alignment is used	Not used	1 - full FFT 0 = phase only
LIVEEDF_ ALIGN_BY_ PREV	align image usng the previous result (if 0, the first image will be used as the search pattern	Not used	1 = previous image 0 = first image
LIVEEDF_ BLENDING_ RADIUS	size of the blending area along edges of zones	Not used	blending radius in pixels. if 0 (default) no blending is used
LIVEEDF_ CREATE_LIV E_IMAGE	creates outputimage	defines image type: 0 = lower image 1= variance lower image 3 = upper image 4 = variance upper image	Not used

LiveEDFGet

Syntax **IpLiveEDFGet** *(sAttribute, sParam, l Param)*

Description This function gets the live EDF parameters .

Parameters

sAttribute	**Integer**	LIVEEDF_FPS: get frames per second of live EDF
sParam	**Integer**	not used
lParam	**Long**	single value receving the variable

IpLiveTileSetInt

Syntax **IpLiveTileSetInt** *(sAttribute, sParam, l Param*

Description This function sets the various live tiling parameters and executes the functions.

Parameters

sAttribute	**Integer**	The attribute to set and execute. See table below.
sParam	**Integer**	See table below.
lParam	**Long**	See table below.

Comments *Attrib* options are as follows:

Attribute	**DESCRIPTION**	**sParam**	**lParam**
LIVETILING_ ACTIVATE	activates live tiling	Not used	1 = on 0 = off
LIVETILING_ SEARCH_ IMAGE	sets search image	frame index (when live tiling is active, 0 frame is used by default)	image handle (when live tiling is active, the current image is used as the search image)
LIVETILING_ ADD_TILE	adds a tile	frame index (when live tiling is active, 0 frame is used by default)	image handle (when live tiling is active, the current image is used)

Attribute	**DESCRIPTION**	**sParam**	**lParam**
LIVETILING_ BACK_IMAGE	sets background image	frame index (when live tiling is active, 0 frame is used by default)	image handle (when live tiling is active, the current image is used)
LIVETILE_ SEARCH_ IMAGE_ADD	set search image and add output	frame index (when live tiling is active, 0 frame is used by default)	image handle (when live tiling is active, the current image is used)
LIVETILE_OVL_COLOR	sets the color of the overlay rectangle	Not used	color in &HBBGGRR& format
LIVETILE_OVL_COLOR_ERROR	sets the color of the error overlay rectangle	Not used	color in &HBBGGRR& format
LIVETILE_ OVL_COLOR _WIDTH	width of rectangle line	Not used	width in pixels

IpLocZoomMove

Syntax **IpLocZoomMove** *(xPos, yPos)*

Description This function moves the local zoom window to the specified location.

Parameters

xPos	**Integer**	An integer specifying the x-coordinate of the pixel to which the upper-left corner of the local zoom window is to be moved.
yPos	**Integer**	An integer specifying the y-coordinate of the pixel to which the upper-left corner of the local zoom window is to be moved.

Example

```
Ret = IpLocZoomMove(86, 758)
```

Return Value This function returns the object ID.

IpLocZoomSet

Syntax **IpLocZoomSet** *(sCommand, sValue)*

Description This function sets the parameters of the local zoom window.

Parameters

sCommand	**Short**	Should be one of the following: LP_LZ_ZOOM - sets the zoom factor for the local zoom window. IP_LZ_CROSS – shows or hides the crosshairs of the local zoom window.
sValue	**Integer**	If IP_LZ_ZOOM, indicates the zoom factor from 1 to 100. If P_LZ_CROSS, 1 = show crosshairs, 0= hide crosshairs

Example

```
Ret = IpLocZoomSet(IP_LZ_CROSS,1)
Ret = IpLocZoomSet(IP_LZ_ZOOM, 800)
```

IpLocZoomSetPos

Syntax **IpLocZoomSetPos***(xPos, yPos)*

Description This function sets the center of the viewing area in the active image. It has the same effect as moving the mouse to the specified position.

Parameters

xPos	**Integer**	An integer specifying the x-coordinate of the pixel in the center of the active image
yPos	**Integer**	An integer specifying the y-coordinate of the pixel in the center of the active image

Example

```
Ret = IpLocZoomSetPos(i,i)
```

IpLocZoomShow

Syntax **IpLocZoomShow***(bShow)*

Description This function shows or hides the local zoom window.

Parameters

bShow	**Short**	A value of 0 or 1, indicating whether to show or hide the local zoom window 0 - hides the window 1 - shows the window

Example

```
Ret = IpLocZoomShow(1)
```

IpLocZoomSize

Syntax **IpLocZoomSize** *(xSize, ySize)*

Description This function resizes the local zoom window.

xSize	**Integer**	The size, in pixels of the x dimension of the local zoom window.

ySize	**Integer**	The size, in pixels of the y dimension of the local zoom window.

Example

```
Ret = IpLocZoomSize(941, 335)
```

IpLFltApply

Syntax **IpLFltApply***(Type, Width, Height, Passes, Strength)*

Description This function applies one of the Large Spectral Filters

Parameters

Type	**Integer**	Type indicates the kind of filter that should be applied. Must be one of the following: LF_LOPASS a low-pass filter LF_HIPASS a high-pass filter LF_EDGEPL a bright-edge filter LF_EDGEMN a dark edge filter LF_BANDPASS a band-pass filter
Width	**Integer**	Width indicates the width of the filter to apply.
Height	**Integer**	Height indicates the height of the filter to apply.
Passes	**Integer**	Passes indicates the number of times the filter should be applied.
Strength	**Integer**	Strength indicates the filter strength, where 100 is full strength and 0 is no effect.

Return Value 0 if successful, a negative error code if failed.

Example

```
‘The following statement will filter the image data using the
‘LoPass Large filter with size 5x81. The filter will be applied
‘3 times.

ret=IpLFltApply(LF_LOPASS,5,81,3,1)

‘Next sample will apply a Large BandPass filter to the image. ‘At
first the LoPass 5x5 filter will be applied 3 times and ‘then
27x27 HiPass filter with strength 7 will be applied 1 ‘time.

ret=IpLFltApply (LF_BANDPASS,27,5,3,7)

'The last sample shows the definition of the Large HiPass
'159x211 filter with strength 97 that will be applied 2 times.

ret=IpLFltApply (LF_HIPASS,159,211,2,97)
```

Comments

The following table describes the values allowed in the Ftype parameter:
These values are equivalent to the options presented within the Large Kernel window's Filter Type group box.

VALUE	*DESCRIPTION*
LF_LOPASS	applies LoPass filter
LF_HIPASS	applies HiPass filter
LF_BANDPASS	applies BandPass filter
LF_EDGEPL	applies Edge + filter
LF_EDGEMN	applies Edge – filter

See Also

IpLFltShow

IpLFltShow

Syntax

IpLFltShow*(Show)*

Description

This function shows or hides the Large Spectral Filters dialog box.

Parameters

Show	**Integer**	An integer value of 0 or 1 indicating whether to show or hide the Large Spectral Filters dialog 0 - Hide the Large Spectral Filters dialog. 1 - Show the Large Spectral Filters dialog

Return Value

0 if successful, a negative error code if failed.

Example

```
Ret = IpLFltShow(1)
```

See Also

IpLFltApply

IpLutApply

Syntax

IpLutApply( )

Description

This function makes permanent the current Brightness, Contrast and Gamma adjustments. Equivalent to selecting **Apply LUTs** on the *Image* menu or clicking the **Apply** button on the Ribbon.

Comments

This function clears the Lookup Table (LUT). If you want to save the LUT, you must do so before you perform this function.

See Also

IpLutReset, IpLutSave

IpLutBinarize

Syntax

IpLutBinarize(*MinRange*, *MaxRange*, *WhiteOnBlack*)

Description

This function reduces your image or AOI to two colors: black and white. Equivalent to selecting the **Threshold** command.

Parameters

MinRange	**Integer**	An integer from 0 - 255 specifying the lowest value in the range to be highlighted.
MaxRange	**Integer**	An integer from 0 - 255 specifying the highest value in the range to be highlighted.
WhiteOnBlack	**Integer**	An integer value of 0 or 1 specifying whether pixels within the range are to be set to White or Black. Where: 0 - Sets the range to Black. Equivalent to the “Black on White” option in the “Binarize” dialog box. 1 - Sets the range to White. Equivalent to the “White on Black” option in the “Binarize” dialog box.

Example

```
ret = IpLutBinarize(100, 255, 1)
```

This statement will set pixels with values between 100 and 255 (inclusive) to white; all other pixels will be set to black.

Comments

If your image is *True Color* or *Palette*, the luminance channel will be used for the conversion.

In 12-bit and single-point images, the normalized equivalents to the *MaxRange* and *MinRange* values will be used.

This function maintains the pixel depth (BPP) of the original image.

IpLutData

Syntax

IpLutData *(sAttrType,pData)*

Description

This function sets/gets the LUT (lookup table) of the active image.

Parameters

sAttrType	**Integer**	An attribute, which may be one of the following: LUT_GET_LENGTH = returns length of the current LUT. pData is ignored. LUT_GET_DATA = returns LUT of the active image. pData is an array of Bytes that receives the values. The size of the array can be retrieved using LUT_GET_LENGTH. LUT_GET_BRIGHTNESS = Returns the current brightness setting using a range of 0 to 100. pData is ignored. LUT_GET_CONTRAST = Returns the current contrast setting using a range of 0 to 100. pData is ignored. LUT_GET_GAMMA = Returns the current gamma setting using a range of 0 to 970, where a gamma of 1.0 is indicated by 100. pData is ignored. These functions operate on the current channel as set through IpLutSetAttr. LUT_SET_DATA = sets LUT to the active image. pData is an array of Bytes with values
pData	**Any**	

Return Value

Returns the desired value of the function if successful, an error code if failed, i.e.

```
Brightness = IpLutData(LUT_GET_BRIGHTNESS, IpNull)
```

Example

```
Sub LutTest()
Dim LutLength As Long,i%
LutLength = IpLutData(LUT_GET_LENGTH,IpNull)

ReDim LutData(LutLength) As Byte
ret = IpLutData(LUT_GET_DATA,LutData(0))
Debug.Print "LUT of the active image"
For i=0 To LutLength-1
    Debug.Print i & " : " & LutData(i)
Next i
IpOutputShow(1)

MsgBox "The current LUT is printed in the Output window. Now we
will invert image LUT."

Dim dInfo As IPDOCINFO
ret = IpDocGet(GETDOCINFO, DOCSEL_ACTIVE, dInfo)
ReDim NewLutData(3*256) As Byte
If ((dInfo.iClass=IMC_RGB) Or (dInfo.iClass=IMC_RGB36) Or
(dInfo.iClass=IMC_RGB48)) Then
    'color image
    For i=0 To 255
        NewLutData(i)=255-i 'red
        NewLutData(256+i)=Abs(240-i) 'green
        NewLutData(512+i)=Abs(220-i) 'blue
    Next i
Else
    'gray image
    For i=0 To 255
        NewLutData(i)=255-i
    Next i
End If
ret = IpLutData(LUT_SET_DATA,NewLutData(0))
End Sub
```

Comments

The returned Lookup Table for all Gray Scale image classes is a single 256-entry lookup table.The returned Response Lookup Table for true-color image classes is arranged in RGB planar format:

256 lookup table values for red, immediately followed by...

256 lookup table values for green, immediately followed by...

256 lookup table values for blue.

There is no Response Lookup Table for IMC_BILEVEL class images.

This command resets the BCGM structure of a virtual image, sets the free-form advanced control to the specified response and applies it to the Response Table.

For IMC_GRAY, IMC_GRAY12, IMC_GRAY16, and IMC_SINGLE class images, pParam must point to 256 Gray values.

For IMC_RGB, IMC_PALETTE, IMC_RGB36, and IMC_RGB48, pParam must point to a [3][256] array, where:

0 contains the Red channel values.

1 contains the Green channel values.

2 contains the Blue channel values

IpLutLoad

Syntax

IpLutLoad(*FileName*)

Description

This function loads intensity and color adjustments that have been saved. Equivalent to selecting **Load LUT** from the **LUT** command on the *File* menu.

Parameters

FileName	**String**	A string specifying the name of the file from which the LUT values will be read.

Example

```
ret = IpLutLoad("C:\IPWIN\HPLJ.LUT")
```

This statement will recall the lookup table settings from the file HPLJ.LUT in the \IPWIN directory on the C: drive.

See Also

IpLutSave

IpLutReset

Syntax

IpLutReset(*Channel, Type*)

Description

This function resets any BCG and/or advanced control modifications you have made but not yet applied to your image. Equivalent to **Reset LUTs** on the *Image* menu (however, it offers more functionality than this command).

Parameters

Channel	**Integer**	An integer from 0 to 4 specifying the channel to be reset. Where: 0 - Luminance 1 - Red 2 - Green 3 - Blue 4 - All 4 Channels
Type	**Integer**	An enumerated integer specifying the property to be reset in the specified channel. Must be one of the following: LUT_HISHAD LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA LUT_4TONES LUT_8TONES LUT_COMPOSIT LUT_ALL See definitions under Comments, below.

Example

```
ret = IpLutReset(4, LUT_ALL)
```

This statement will reset the LUT for all properties of all channels.

```
ret = IpLutReset(0, LUT_8TONES)
```

This statement will reset the LUT for the luminance channel of the 1/8-tone curve.

Comments

Selecting the **Reset LUTs** command always records an `IpLutReset(4,LUT_ALL)` statement, however, once recorded, this statement can be modified to reset only a single channel and/or property.

The following table describes the values allowed in the *Type* parameter.

Type	**DESCRIPTION**
LUT_HISHAD	Resets the Highlight and Shadow controls for the specified channel.
LUT_BRIGHTNESS	Resets the Brightness control for the specified channel.
LUT_CONTRAST	Resets the Contrast control for the specified channel.
LUT_GAMMA	Resets the Gamma control for the specified channel.
LUT_4TONES	Resets the 1/4-tone curve for the specified channel.
LUT_8TONES	Resets the 1/8-tone curve for the specified channel.
LUT_COMPOSITE	Resets the Composite curve for the specified channel.
LUT_ALL	Resets all controls for the specified channel.

See Also

IpLutApply, IpLutSave

IpLutSave

Syntax

IpLutSave(*FileName, Description*)

Description

This function saves the Lookup Table (LUT) settings. Equivalent to selecting **Save LUT** from the **LUT** command.

Parameters

FileName	**String**	A string specifying the name of the file to which the LUT values are to be written.
Description	**String**	A string containing information describing the file.

Example

```
ret = IpLutSave("C:\IPWIN\FILENAME.LUT", "For Scanned Images")
```

This statement will create a new Lookup Table file called FILENAME.LUT in the \IPWIN directory on the C: drive.

See Also

IpLutApply, IpLutLoad

IpLutSetAttr

Syntax

IpLutSetAttr(*AttrType*, *AttrValue*)

Description

This function selects, deselects or sets a Lookup Table (LUT) attribute. Equivalent to adjusting the LUT using the BCG controls or the **Show Map** command.

Parameters

AttrType	**Integer**	An enumerated integer specifying the attribute type to be set. Must be one of the following: LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA CHANNEL CURVE GRID See definitions under Comments, below.
AttrValue	**Integer**	An integer value specifying the setting for the attribute. See Comments, below, for the allowed settings for each *AttrType*.

Example

```
ret = IpLutSetAttr(CHANNEL, 2)
ret = IpLutSetAttr(LUT_BRIGHTNESS, 78)
```

The statements above select the Green channel and adjust its BRIGHTNESS to a value of 78.

```
ret = IpLutSetAttr(CURVE,4)
```

This statement selects the 1/4 Tone response curve on the “Color Map” window.

Comments

The following table describes the values allowed in the *AttrType* parameter.

AttrType	**DESCRIPTION**	**ALLOWED VALUES**
LUT_BRIGHTNESS	Sets the Brightness value of the selected channel to the specified amount.	0 - 100
LUT_CONTRAST	Sets the Contrast value of the selected channel to the specified amount. Invert the Lookup Table Invert the image data	0 - 100 -1 -2
LUT_GAMMA	Sets the Gamma value of the selected channel to the specified value.	10 – 970 (100 times the desired gamma setting, where a value of 10 corresponds to a gamma of .10 and a value of 970 corresponds to a gamma of 9.70.
CURVE	Selects a curve of the type specified by *AttrValue*.	LUT_HISHAD LUT_4TONES LUT_8TONES LUT_FREEFORM
CHANNEL	Selects the active Channel.	0 - Luminance 1 - Red or Cyan 2 - Green or Magenta 3 - Blue or Yellow
GRID	Selects whether or not to display the Grid.	0 - Suppresses the grid 1 - Displays the grid

See Also IpLutSetControl

IpLutSetControl

Syntax **IpLutSetControl**(*ControlType*, *ipLutControls*, *Count*)

Description This function sets the values associated with the specified LUT curves. Equivalent to modifying the intensity curve in the **Color Map** dialog box.

Parameters

ControlType	**Integer**	An enumerated integer specifying the kind of control to be activated. Must be one of the following: LUT_HISHAD LUT_4TONES LUT_8TONES LUT_COMPOSITE See definitions under Comments, below.
ipLutControls	**Integer (Basic)** **LPSHORT (C)**	The name and first element of an array containing the integer values to which the controls are to be set. By default this array is defined as `Lut`.

Count	**Integer**	An integer specifying the number of elements to be used in the `Lut` array.

Example

```
Lut(0) = 0
Lut(1) = 100
Lut(2) = 169
Lut(3) = 231
Lut(4) = 255
ret = IpLutSetControl(LUT_4TONES, Lut(0), 5)
```

These statements set the 1/4-tone control points to 0, 100, 169, 231 and 255.

Comments

The value of *Count* is dependent on the value of *ControlType*, as follows:

ControlType	***Count***
LUT_HISHAD	2
LUT_4TONES	5
LUT_8TONES	9
LUT_COMPOSITE	256

See Also

IpLutSetAttr

IpLutShow

Syntax

IpLutShow(*bShow*)

Description

This function is used to open or close the **Color Map** window. Equivalent to selecting the **Show Map** command to open the window, and double-clicking its control box to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the “Color Map” window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Example

```
ret = IpLutShow(1)
```

This statement will open the **Color Map** window if it is not already open; if already open, it has no effect.

Comments

The **Color Map** window does not have to be open during execution of any LUT function. Its disposition, visible or hidden, is entirely your choice. You will want to display the window if your users will be required to make choices within it, but if your objective is simply to adjust the LUT values, you may want to run without opening it.

IpMacroLoad

Syntax

IpMacroLoad(*ScriptFile*)

Description

This function loads the specified script file and makes it the active script file. Equivalent to the **Change** and **Reload** buttons in the **Macro** dialog box.

Parameters

ScriptFile	**String**	A string specifying the name of the script file that is to be loaded. If a zero-length string is specified (i.e., `""`), the current script file is assumed.

Example

```
ret = IpMacroLoad("C:\IPWIN\SLIDEPRC.IPM")
```

This statement will load the SLIDEPRC.IPM script file from \IPWIN on the C: drive.

```
ret = IpMacroLoad("")
```

This statement will refresh the active script file with the current contents of its disk file.

Comments

Once a script file is loaded, it becomes the current script file.

See Also

IpMacroRun

IpMacroPause

Syntax

IpMacroPause(*Message, Mode,Delay*)

Description

This function pauses the macro, displays a message in a dialog box, and either waits for the specified delay period or for the user to click one of the dialog's buttons before continuing. This function can be written into your macro using the macro editor, or it can be inserted while a macro is being recorded using the **Pause/Message** command on the Insert sub-menu of the Macro menu.

Parameters

Message	**String**	A string specifying the message that is to be displayed in the message box.
Mode	**Integer**	An expression specifying the dialog box's mode (modal or modeless) and button configuration. Where: 0 - Issues a “modeless” message box. MS_MODAL - Issues a “modal” message box. MS_WAITFORRESPPONSE MS_RESPECTSETTING MP_PAUSEANDCONTINUE When an MS_MODAL dialog is used, the following flags can also be set:

		MS_YESNO MS_OKCAN MS_YESNOCAN MS_STOP MS_EXCLAM MS_QUEST MS_DEF2 MS_DEF3 See Comments, below, for definitions.
Delay	**Long**	Specifies the number of milliseconds to show the message before continuing, or -1 to wait for the user to click one of the dialog buttons (see Comments).

Comments

The *Mode* parameter determines the status of *Image-Pro* while the message box is active, where:

0 - specifies that *Image-Pro* is to remain active, and accessible to the user, while the message box is displayed. This mode can be used to instruct the user to make or modify certain selections during playback.

MS_MODAL - specifies that *Image-Pro* is to remain inactive, and inaccessible to the user, while the message box is displayed. This mode can be used to issue an error message, or convey other “read-only” type information to your user. It can also be combined with the following flags to equip the message box with special buttons and symbols.

MP_WAITFORRESPONSE - When this mode is specified as part of the Mode parameter, IpMacroPause will display the message until the user clicks one of the dialog buttons**.**

MP_WAITFORRESPONSE - When this mode is specified as part of the Mode parameter, IpMacroPause will display the message until the user clicks one of the dialog buttons**.**

MP_RESPECTSETTING - When this mode is specified, IpMacroPause will respect the current setting of the IpAppGet/Set command MACRO_PAUSE_TYPE, where a non-zero value will wait for a user response and a zero value will pause and continue.
Note: For functions that must wait for a user response even in free-running demo mode, a Delay of -1 can be specified, or the existing IpMacroStop function can be used.

MP_PAUSEANDCONTINUE - When this mode is specified, **IpMacroPause** will pause for the specified Delay, or if Delay is -1, will wait for a user response

Comments

FLAG	DESCRIPTION
MS_YESNO	Displays a “Yes” and a “No” button in the message box. Returns a 0 when the user clicks “No”; 1 when the user clicks “Yes.”
MS_OKCAN.	Displays an **OK** and a **Cancel** button in the message box. Returns a 1 when the user clicks **OK**; 2 when the user clicks “Cancel.”
MS_YESNOCAN	Displays a “Yes,” a “No” and a **Cancel** button in the message box. Returns a 0 when the user clicks “No”; 1 when the user clicks “Yes”; 2 when the user clicks “Cancel.”
MS_STOP	Displays a red stop sign symbol in the message box. Cannot be used concurrently with MS_EXCLAM or MS_QUEST (i.e., only one symbol is allowed per message).
MS_EXCLAM	Displays an exclamation symbol in the message box. Cannot be used concurrently with MS_STOP or MS_QUEST (i.e., only one symbol is allowed per message).
MS_QUEST	Displays a question mark symbol in the message box. Cannot be used concurrently with MS_EXCLAM or MS_STOP (i.e., only one symbol is allowed per message).
MS_DEF2	Defaults to the second button from the left when the user presses The Enter key. If not used, the first button is the default.
MS_DEF3	Defaults to the third button from the left when user presses the Enter key. If not used, the first button is the default.

IpMacroProgGet

Syntax **IpMacroProgGet** *(Attribute, Param, Data)*

Description This function gets the attributes of the macro progress bar

Parameters

Attribute	**Short**	See comments below.
Param	**Short**	See comments below.
Data	**Short**	See comments below.

Example See example in IpMacroProgSetStr

Comments Destination must be an integer variable

sAttribute	**sParam**	**sData**
MPROG_BUTTONTYPE	Button number 1-4	Button type: MPROG_BUTTON_ CANCEL MPROG_BUTTON_STOP MPROG_BUTTON_DONE MPROG_BUTTON_USER
MPROG_BUTTONTEXT	Not used, set to 0	Button text
MPROG_FLAG	Not used, set to 0	Gets the button state 0 = no buttons pressed
MPROG_NUMBUTTONS	Not used, set to 0	Button 1-4

IpMacroProgGetStr

Syntax **IpMacroProgGetStr** *(Cmd, Param, Data)*

Description This function gets the string attributes of the macro progress bar

Parameters

Attribute	**Short**	See comments below.
Param	**Short**	See comments below.
Data	**Short**	See comments below.

Example See example in IpMacroProgSetStr

Comments Destination must be an integer variable

sAttribute	**sParam**	**sData**
MPROG_TITLE	Not used, set to 0	Title of the progress dialog
MPROG_TEXT	Not used, set to 0	Progress text
MPROG_BUTTONTEXT	Button number 1-4	Button text for MPROG_BUTTON_USER butons

IpMacroProgSetInt

Syntax **IpMacroProgSetInt** *(Attribute, Param, Data)*

Description This function gets the attributes of the macro progress bar

Parameters

Attribute	**Short**	See comments below.
Param	**Short**	See comments below.
Data	**Short**	See comments below.

Example See example in IpMacroProgSetStr

Comments Destination must be an integer variable

sAttribute	**sParam**	**sData**
MPROG_BUTTONTYPE	Button number 1-4	Button type: MPROG_BUTTON_ CANCEL MPROG_BUTTON_STOP MPROG_BUTTON_DONE MPROG_BUTTON_USER
MPROG_BUTTONTEXT	Not used, set to 0	Button text
MPROG_FLAG	Not used, set to 0	Sets the button state 0 = no buttons pressed
MPROG_NUMBUTTONS	Not used, set to 0	Button 1-4

IpMacroProgSetStr

Syntax **IpMacroProgSetStr** *(Cmd, Param, Data)*

Description This function gets the string attributes of the macro progress bar

Parameters

Attribute	**Short**	See comments below.
Param	**Short**	See comments below.
Data	**Short**	See comments below.

Comments Destination must be an integer variable

sAttribute	sParam	sData
MPROG_TITLE	Not used, set to 0	Title of the progress dialog
MPROG_TEXT	Not used, set to 0	Progress text
MPROG_BUTTONTEXT	Button number 1-4	Button text for MPROG_BUTTON_USER butons

Example

```
Const NUMOPERATIONS = 10
Const OPERATION_SECONDS = 2.0
' Demonstrate the IpMacroProg functions
Sub MacroProgTest()
Dim i As Integer
Dim bEndFlag As Integer
Dim timeNow As Double, timeNext As Double

ret = IpMacroProgSetStr(MPROG_TITLE, 0, "Processing stuff")
ret = IpMacroProgSetStr(MPROG_TEXT, 0, "Operations...")
' There are options for up to 3 buttons, so that the user can
' do whatever is appropriate...
ret = IpMacroProgSetInt(MPROG_BUTTONTYPE, 0,
MPROG_BUTTON_CANCEL)
ret = IpMacroProgSetInt(MPROG_NUMBUTTONS, 0, 1)

ret = IpMacroProgShow(1)
```

```
For i=1 To 10
    ' Update the dialog display for progress...
    ret = IpMacroProgSetStr(MPROG_TEXT, 0, "Operation no." &
Str(i) _
        & " of" & Str(NUMOPERATIONS))

    timeNext = Timer() + OPERATION_SECONDS
      Do
        timeNow = Timer
        DoEvents
    Loop Until timeNow > timeNext

    ' This dialog allows you to check whether the user has
clicked a button
    ' at any appropriate time in the macro - so that you can
stop when you
    ' want to, rather than in the middle of things...
    ret = IpMacroProgGet(MPROG_FLAG, 0, bEndFlag)
    If bEndFlag <> 0 Then
        ret = IpMacroStop("Processing cancelled!", 0)
        GoTo cleanup
    End If
Next i

' Let the user know that we've finished
ret = IpMacroStop("All operations completed.", MS_MODAL)

cleanup:
ret = IpMacroProgShow(0)
End Sub
```

IpMacroProgShow

Syntax **IpMacroProgShow**(*bShow*)

Description This function displays or hides the macro progress bar.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the macro progress bar is to be shown or hidden. Where: 0 - hides the bar 1 - displays the bar.

Example

```
ret = IpMacroProgShow(1)
```

This statement will display the macro progress bar.

IpMacroRun

Syntax

IpMacroRun(*MacroName, ScriptFile*)

Description

This function loads and executes the specified macro from the specified script file. It can be used to transfer control to another script file in an *Auto-Pro* macro. It can also be used to execute an *Image-Pro* macro from a Visual BASIC or Visual C++ program.

Parameters

MacroName	**String**	A string specifying the name of the macro to be run.
ScriptFile	**String**	A string specifying the name of the script file containing the macro. If a zero-length string is specified (i.e., `""`), the current script file is assumed.

Example

```
ret = IpMacroRun("PREP1","C:\IPWIN\UTILTIIES.IPM")
```

This statement will execute the macro "PREP1" in the “UTILITIES.IPM” script file.

Comments

When this function is used in an *Auto-Pro* macro, it differs from the IPBasic `Call` statement in two important ways:

1. It can be used to execute a macro that does not reside in the current script file.
2. It does not return to the calling macro after execution of the specified macro. In this respect, it behaves like a “GoTo” operation instead of a “Call” operation.

In a Visual Basic or Visual C++ program, this function must be used to invoke a macro that is defined in *Image-Pro* (i.e., one whose statements have not been ported into the Visual Basic or Visual C++ environment).

See Also

Call, IpMacroLoad

IpMacroStop

Syntax

IpMacroStop(*Message, Mode*)

Description

This function stops the macro, displays a message in a dialog box and waits for the user to click one of the dialog's buttons before continuing. This function can be written into your macro using the macro editor, or it can be inserted while the macro is being recorded, using the **Stop/Message** command.

Parameters

Message	**String**	A string specifying the message that is to be displayed in the message box.
Mode	**Integer**	An expression specifying the dialog box's mode (modal or modeless) and button configuration. Where: 0 - Issues a “modeless” message box. MS_MODAL - Issues a “modal” message box. When an MS_MODAL dialog is used, the following flags can also be set:

MS_YESNO
MS_OKCAN
MS_YESNOCAN
MS_STOP
MS_EXCLAM
MS_QUEST
MS_DEF2
MS_DEF3
See Comments, below, for definitions.

Example

The following example will issue a message box containing the message “Error: Could Not Find Image”. *Image-Pro* will be disabled until the **Continue** button is clicked.

```
ret = IpMacroStop("Error: No Objects Found", MS_MODAL)
```

The following example issues a modal message box configured with “Yes” and “No” buttons. If the user clicks “Yes”, the filter statement will be executed, otherwise it will be skipped.

```
ret=IpMacroStop("Filter Image?",MS_MODAL+MS_YESNO+ MS_QUEST)
if ret=1 then
ret=IpFltSobel()
End If
```

The set of statements below will issue a “modeless” message box, allowing the user to move their AOI before continuing to the next step. An image must be open before the example macro will run.

```
ipRect, left = 53
ipRect, right = 102
ipRect, top = 111
ipRect, bottom = 162
ret=IpAoiCreateBox(ipRect)
ret=IpMacroStop("Move Box to Required Location",0)
ret=IpFltSobel
```

Comments

The *Mode* parameter determines the status of *Image-Pro* while the message box is active, where:

0 - specifies that *Image-Pro* is to remain active, and accessible to the user, while the message box is displayed. This mode can be used to instruct the user to make or modify certain selections during playback.

MS_MODAL - specifies that *Image-Pro* is to remain inactive, and inaccessible to the user, while the message box is displayed. This mode can be used to issue an error message, or convey other “read-only” type information to your user. It can also be combined with the following flags to equip the message box with special buttons and symbols.

FLAG	DESCRIPTION
MS_YESNO	Displays a “Yes” and a “No” button in the message box. Returns a 0 when the user clicks “No”; 1 when the user clicks “Yes.”
MS_OKCAN.	Displays an **OK** and a **Cancel** button in the message box. Returns a 1 when the user clicks **OK**; 2 when the user clicks “Cancel.”
MS_YESNOCAN	Displays a “Yes,” a “No” and a **Cancel** button in the message box. Returns a 0 when the user clicks “No”; 1 when the user clicks “Yes”; 2 when the user clicks “Cancel.”
MS_STOP	Displays a red stop sign symbol in the message box. Cannot be used concurrently with MS_EXCLAM or MS_QUEST (i.e., only one symbol is allowed per message).
MS_EXCLAM	Displays an exclamation symbol in the message box. Cannot be used concurrently with MS_STOP or MS_QUEST (i.e., only one symbol is allowed per message).
MS_QUEST	Displays a question mark symbol in the message box. Cannot be used concurrently with MS_EXCLAM or MS_STOP (i.e., only one symbol is allowed per message).
MS_DEF2	Defaults to the second button from the left when the user presses The Enter key. If not used, the first button is the default.
MS_DEF3	Defaults to the third button from the left when user presses the Enter key. If not used, the first button is the default.

See Also IpTemplateMode

IpMacroWait

Syntax **IpMacroWait**(*Delay*)

Description This function pauses the macro for a specified duration. You might insert this command to “slow down” a particular step so that its results can be easily observed on the screen. Or, you might use it to allow sufficient time for an external event to occur (e.g., await a result from an external application). This function can be written into your macro using the macro editor, or it can be inserted while the macro is being recorded, using the **Delay** command.

Parameters

Delay	**Integer**	An integer that specifies the length of the delay, in tenths (i.e., 1/10) of a second.

Example The statement below stops the macro for 5 seconds.

```
ret = IpMacroWait(50)
```

Comments *Image-Pro* is disabled while the macro is stopped.

See Also IpMacroStop

IpMail

Syntax **IpMail** *(IpTo, IpCC, IpSubuct, IpMessage, IpAttachment)*

Description This function enables you to compose and send Internet mail.

Parameters

IpTo	**String**	Name of the recipient. At least one “to” recipent must be specified.
IpCC	**String**	Name of the recipient getting “carbon copy.”
IpSubject	**String**	Specifies the text for the subject line. A subject must be specified.
IpMessage	**String**	Specifies the text for the message, or a valid file name. If a file name is used, the text from the file will be inserted in the message line. Some amount of message text must be specified.
IpAttachment	**String**	Specifies an image, a valid file name, or a null string (“”). If IpAttachment specifies “image”, there is an active image open, and if the image has been saved to disk, then the image is used as the message attachment. If IpAttachment specifies a valid file name, then the specified file is used as the message attachment. If IpAttachment specifies a null string, then the message will be sent with no attachment. Specification of “image” when none is open or when the active image has not been saved to disk, or specification of an invalid file name in IpAttachment will result in an error.

Return Value 1= success, 0 = failed. Return value should IPCERR_XXX where 0 = IPCERR_NONE. Actually, the macro will indeed return IPCERR values. Success will indeed be IPCERR_NONE, failure will be one of the others

Comments

In template mode, the supplied information will be filled in and the dialog displayed. When not in template mode, the message will be sent as specified.

With internet mail, it may not be possible to return an error if invalid addresses are provided.

IpMeasAdd

Syntax

IpMeasAdd*(Tool, NumPoints, Points)*

Description

This function is used to add measurement features to an image programmatically.

Parameters

Tool	**Integer**	Feature to be added, specified by the feature's tool type, from the following list: MEAS_LENGTH Adds a line feature. MEAS_AREA Adds a polygon feature. MEAS_ANGLE Adds an angle measurement between two existing features. MEAS_TRACE Adds a trace (polyliine) feature. MEAS_POINT Adds a point feature. MEAS_RECT Adds a rectangle feature. MEAS_CIRCLE Adds a circle feature. MEAS_BFLINE Adds a best-fit line feature MEAS_BFCIRCLE Adds a best-fit circle feature MEAS_BFARC Adds a best-fit arc feature MEAS_DIST Adds a distance measurement between two existing features. MEAS_NEWANGLE Adds an angle measurement between two new lines. MEAS_HTHICK Adds a horizontal thickness measurement between two line features: (MEAS_LINE, MEAS_BFLINE or MEAS_DIST). MEAS_VTHICK Adds a vertical thickness measurement between two line features: (MEAS_LINE, MEAS_BFLINE or MEAS_DIST). MEAS_CTHICK Adds a curved thickness measurement between two existing features (all types except points).
NumPoints	**Integer**	Specifies the number of points supplied in the point array. Many features have a fixed number of points that are required. See Comments.
Points	**POINTAPI**	An array of one or more points as required by the feature. See comments.

Return Value

Return value is the index of the feature created.

Comments

The various types of features require different numbers and/or types of point information:

MEAS_LENGTH 2 points (starting point and ending point of line)

MEAS_AREA 3 or more points

MEAS_ANGLE 2 points, where the X element of the first point specifies the ID of the first line feature, and the X element of the second point specifies the second line feature.

MEAS_TRACE 2 or more points.

MEAS_POINT 1 point.

MEAS_RECT 2 points (the top-left corner point and the bottom left corner point)

MEAS_CIRCLE 2 points (the top-left corner point of the square that bounds the desired circle, and the bottom-left corner point of that square)

MEAS_BFLINE 2 or more points

MEAS_BFCIRCLE 3 or more points

MEAS_BFARC 3 or more points

MEAS_DIST 2 points, where the X element of the first point specifies the ID of the first feature, and the X element of the second point specifies the second feature.

MEAS_NEWANGLE 3 or 4 points. The first two points are the starting and ending point of the first line defining the angle. If 3 points are supplied, the ending point of the first line is the vertex of the angle, and is used as the starting point of the second line and the third point supplied is used as the ending point. If 4 points are supplied, the third point is the starting point of the second line, and the fourth point the ending point.

MEAS_HTHICK 2 points, where the X element of the first point specifies the ID of the first line feature, and the X element of the second point specifies the second line feature.

MEAS_VTHICK 2 points, where the X element of the first point specifies the ID of the first line feature, and the X element of the second point specifies the second line feature.

MEAS_CTHICK 2 points, where the X element of the first point specifies the ID of the first feature, and the X element of the second point specifies the second feature.

IpMeasAddMeasure

Syntax **IpMeasAddMeasure***(sFeature, sMeasure, fTargetVal, fMinTot, fMaxTol)*

Description Adds the specified measurements to the measurement grid.

Parameters

sFeature	**Integer**	Specifies the feature index.
sMeasure	**Integer**	Specifies the particular feature measurement .
fTargetVal	**Single**	Specifies the target value for tolerance testing.
fMinTot	**Single**	Specifies minimum tolerance.
fMaxTot	**Single**	Specifies maximum tolerance.

Example

```
ret = IpMeasAddMeasure(2, MDATA_PERPDIST, 46.1, .0010, .0010)
```

This statement will add a Perpendicular Distance measurement to the pass/fail Measurements table, with a target value of 46 and with minimum and maximum tolerances of .001 .

Comments Tolerances are always specified using the target value plus or minus the tolerance formula. Tolerances can be calculated given a minimum and maximum acceptable value.

The measurement requested must be valid for the indicated feature. In the example above, feature number 2 must be a distance measurement.Both tolerances are expressed as positive deviations from the target value. In the example above, values between 45.999 and 46.101 will pass.

IpMeasAttr

Syntax

IpMeasAttr (*AttrType*, *AttrValue*)

Description

This function selects, sets or deselects options relating to the **Measurements** window.

Parameters

AttrType	**Integer**	An enumerated integer specifying the option to be set. Must be one of the following: MEAS_ANGLE180 MEAS_DISPBFPTS MEAS_DISPCOLOR MEAS_DISPCOUNTOPTS MEAS_DISPLAYFEATURES MEAS_DISPLAYTYPE MEAS_LABELCOLOR MEAS_MAXARCPTS MEAS_MAXCIRCLEPTS MEAS_MAXLINEPOTS MEAS_MEASCOLOR MEAS_PROMPTS MEAS_PASSFAILTYPE MEAS_SHOWLAYOUT MEAS_SIGNIFICANTDIGITS MEAS_STATS MEAS_THICKMODE MEAS_UPDATE See definitions under Comments, below.
AttrValue	**Integer**	An integer specifying how the option specified by *AttrType* is to be set. See definitions under Comments, below, for the values allowed by each option.

Example

```
ret = IpMeasShow(1)
ret = IpMeasAttr(THICKMODE, 1)
```

This pair of statements will open the **Measurements** window, then set the option to display the maximum value of a thickness measurement.

Comments

AttrType options are as follows:

AttrType	DESCRIPTION	ALLOWED VALUES
MEAS_ANGEL180	indicates if angles are limited to 0 to 180 degrees, or may be -180 to 180 degrees	1 = constrained to 0 to 180 degrees 0 = -180 to 180 degrees
MEAS_DISPBFPTS	Turn display of best fit points on/off	1 - Display best fit points 0 - Hide best fit points
MEAS_DISPCOLOR	Selects the color to be used to display the measurement outlines in the image. Equivalent to selecting the outline color in the **Measurement Options** dialog box.	0 - Red 1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black
MEAS_DISPCOUNTOPTS	Enable or disable count options dialog	1 - Display **Count Objects** dialog after selecting object intensity 0 - Do not display options dialog
MEAS_LABELCOLOR	Specifies the color to be used to label the measurements. Equivalent to selecting the label color in the **Measurement Options** dialog box.	0 - Red 1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black
MEAS_MAXARCPTS	Sets maximum points for best-fit arc	3 to 20
MEAS_MAXCIRCLEPTS	Sets maximum points for best-fit circle	3 to 20
MEAS_MAXLINEPTS	Sets maximum points for best-fit line	2 to 1000
MEAS_MEASCOLOR	Selects the color to be used to display the measurement outlines in the image.	0 - Red 1 - Green 2 - Blue 3 - Yellow 4 - Cyan 5 - Magenta 6 - White 7 - Black
MEAS_PROMPTS	turns feature prompts on/off	0 – prompts off 1 – prompts on
MEAS_PASSFAILTYPE	Sets the pass/fail type	MPF_NONE – no pass/fail check MPF_TOLERANCES – pass/fail based on tolerances MPF_MINMAX – pass/fail based on minimum and maximum values
MEAS_SHOWLAYOUT	turn layout display on/off	0 – do not show layout 1 – show layout
MEAS_STATS	Specifies whether the datasheet will display feature statistics.	0 - Hide Measurements 1 - Display Measurements And Statistics
MEAS_DISPLAYFEATURES	turns display of measurement features on or off	0 – Hide Features 1 – Display Features
MEAS_SIGNIFICANTDIGITS	Modify the number of Signficant digits displayed on the image and in the dialog	Allowed values are from 3 -20 inclusive

AttrType	DESCRIPTION	ALLOWED VALUES
MEAS_DISPLAYTYPE	Specify what will be used as labels on the image	Allowed values, which can be combined, are; MDISP_NONE MDISP_NAME MDISP_VALUE MDISP_UNITS
MEAS_THICKMODE	Selects the measurement result that is to be displayed when a **Thickness** measurement is performed. Equivalent to selecting the **Display Thickness** option in the **Measurement Options** dialog box.	0 - Minimum thickness 1 - Maximum thickness 2 - Both thicknesses
MEAS_UPDATE	Determines whether or not to update the feature measurments while moving or resizing the feature.	0 – Do not update features 1 – Update features

See Also IpMeasShow

IpMeasAttrStr

Syntax **IpMeasAttrStr**(*AttrType, Index AttrValue,*)

Description This function defines a new name for the feature of interest.

Parameters

AttrType	**Integer**	MEAS_SETNAME = indicates the new name of the feature of interest
Index	**Integer**	An integer indicating the feature of interest
AttrValue	**String**	A string specifying the new name of the feature of interest

IpMeasDelMeasure

Syntax **IpMeasDelMeasure*(sMeas)***

Description Removes one or all measurements from the measurement grid.

Parameters

sMeas	**Integer**	An integer value indicating the measurement index, or -1 to delete all measurements.

Example

```
ret = IpMeasDelMeasure(1)
```

Comments See IpMeasGet and IpMeasAttr for constants.

IpMeasDelete

Syntax

IpMeasDelete(*Index*)

Description

This function deletes the selected (tagged) measurements, or all measurements. Equivalent to the **Delete** and **Delete All** buttons in the **Measurements** window.

Parameters

Index	**Integer**	An enumerated integer specifying whether tagged measurements or all measurements are to be deleted. Where: MEAS_TAG - Deletes only selected records (i.e., ones tagged with `IpMeasTag`). MEAS_ALL - Deletes all datasheet records.

Example

```
ret = IpMeasTag(0,1)
ret = IpMeasTag(2,1)
ret = IpMeasDelete(MEAS_TAG)
```

The set of statements above will select, then delete, the first and third measurements listed in the **Measurements** datasheet.

```
ret = IpMeasDelete(MEAS_ALL)
```

The statement above will delete all measurements in the **Measurements** datasheet.

Comments

The **Measurements** command window must be open before this function is called.

See Also

IpMeasShow, IpMeasTag

IpMeasGet

Syntax

IpMeasGet(*Cmd, Param, OutVal*)

Description

Use this function to get information relating to the **Measurements** tool associated with the current image. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETNUMOBJ GETFEATVALUES GETFEATURES GETNUMMEAS GETMEASVALUES GETVALUES GETTYPE GETLABEL GETINDEX GETNUMPTS GETPOINTS GETSTATS GETIPPSETTINGS See definitions under Comments, below

Parameters	*Param*	**Integer**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command
	OutVal	*See below*	The variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Example

The following example transforms the area measurements into AOIs and XORs them.

```
Dim numpoints As Integer, numobj As Integer
Dim status As Integer, i As Integer

ret = IpMeasGet(GETNUMOBJ, 0, numobj)

For i = 0 To numobj - 1
   ret = IpMeasGet(GETTYPE, i, status)
   ret = IpMeasGet(GETNUMPTS, i, numpoints)
   If status = MEAS_AREA Then
      If numpoints > 0 Then
      Redim blbpts(numpoints) As pointapi
      ret = IpMeasGet(GETPOINTS, i, blbpts(0))
      ret = IpAoiCreateIrregular(blbpts(0), numpoints)
      ret = IpOpNumberLogic(0, OPL_NOT, 0)
   End If
End If
Next I


Dim fValues(15) as Single
dim fXPos as Single, fYPos as Single
‘following gets the measurement values for the FIRST feature
‘change the zero to a number form 0 to the number of features
‘–1 for other feature changes
ret = IpMeasGet(GETFEATVALUES, 0, fValues (0))
fXPos=fValues(-MDATA_POS)
fYPos=fValues(-MDATA_POSY)
```

Comments

Cmd options are as follows:

Cmd **VALUE**	**DESCRIPTION**	
GETNUMOBJ	Returns the number of features	
	Param **VALUE**	*OutVal* **TYPE**
	Not used, set to zero.	**Integer**
	OutVal should be an integer variable to receive the number of features that have been measured on the active image.	

Cmd **VALUE**	**DESCRIPTION**	
GETFEATVALUES	Returns the measurement for the indicated features.	
	Param **VALUE**	*OutVal* **TYPE**
	The index of the feature of interest	**Single**
	OutVal should be an array of Singles with 15 elements. The negative of the MDATA constants can be used to index the array to reference particular measurements, e.g. the array `(-MDATA_ANGLE)`element contains the angular measurement for the specified feature. See the preceding example.	

Cmd **VALUE**	**DESCRIPTION**	
GETNUMMEAS	Returns the number of measurements.	
	Param **VALUE**	*OutVal* **TYPE**
	Not used, set to zero.	**Integer**
	OutVal should be an integer variable to receive the number of pass/fail measurements on the active image.	

Cmd **VALUE**	**DESCRIPTION**	
GETFEATURES	Returns whether features are displayed on the image	
	Param **VALUE**	*OutVal* **TYPE**
	Not used, set to zero.	**Integer**
	OutVal should be an integer variable to receive a flag indicating if measurement features are displayed on the image.	

Cmd **VALUE**	**DESCRIPTION**	
GETIPPSETTINGS	Returns the current value of the measurement attribute. Add the constant for the attribute of interest. Ex: GETIPPSETTINGS + MEAS_DISPCOLOR	
	Param **VALUE**	*OutVal* **TYPE**
	Not used, set to zero.	**Integer**
	OutVal should be an integer variable to receive the current value of the specified attribute.	

The following are measurement constants for GETSETTINGS. Refer to IpMeasAttr for the values returned by each attribute.

AttrType	**DESCRIPTION**
MEAS_ANGEL180	Indicates if angles are limited to 0 to 180 degrees, or may be -180 to 180 degrees
MEAS_DISPBFPTS	Turn display of best fit points on/off
MEAS_DISPCOLOR	Returns the color to be used to display the measure-ment outlines in the image..
MEAS_DISPCOUNTOPTS	Enable or disable count options dialog.
MEAS_LABELCOLOR	Returns the color to be used to label the measure ments. Equivalent to selecting the outline color in the **Measurement Options** dialog box.
MEAS_MAXARCPTS	Returns maximum points for best-fit arc
MEAS_MAXCIRCLEPTS	Returns maximum points for best-fit circle
MEAS_MAXLINEPTS	Returns maximum points for best-fit line
MEAS_MEASCOLOR	Returns the color to be used to display the measurement outlines in the image.
MEAS_PROMPTS	Turns feature prompts on/off
MEAS_PASSFAILTYPE	Returns ets the pass/fail type
MEAS_SHOWLAYOUT	Turn layout display on/off
MEAS_STATS	Returns whether the data sheet will display feature statistics.
MEAS_DISPLAYFEATURES	Turns display of measurement features on or off
MEAS_SIGNIFICANTDIGITS	Modify the number of Signficant digits displayed on the image and in the dialog
MEAS_DISPLAYTYPE	Returns what will be used as labels on the image
MEAS_THICKMODE	Returns the measurement result that will be displayed when a Thickness measurement is performed. Equivalent to selecting the Display Thickness option in the Measurement Options dialog box.
MEAS_UPDATE	Returnswhether or not to update the feature measurments while moving or resizing the feature.

Cmd **VALUE**	**DESCRIPTION**
GETMEASVALUES	Returns the specified pass/fail measurements.

Param **VALUE**	*OutVal* **TYPE**
The index of the pass/fail measurements of interest.	**Single**

OutVal should be an array of Singles with 5 elements:

array (0) is the measured value
array (1) is the target value
array (2) is the minimum tolerance
array (3) is the maximum tolerance
array (4) is the pass/fail indicator:
1 = pass, 0 = fail

Cmd **VALUE**	**DESCRIPTION**
GETVALUES	This command gets the three values associated with a specific measurement in the datasheet. *Note:* This command is obsolete and is only retained for backward compatibility with macros written for previous versions of *Image-Pro Plus*. Use the GETFEATVALUES command instead.

Param **VALUE**	*OutVal* **TYPE**
Not used, set to zero	**Single**

OutVal should be an array of Singles, with 3 elements. Their interpretation depends on the feature type.
If the specified feature is a thickness measurement:

array (0) is the average distance (thickness)
array (1) is the minimum distance
array (2) is the maximum distance

If the specified feature is a distance measurement:
array (0) is the center-to-center distance
array (1) is the minimum distance
array (2) is the maximum distance

If the specified feature is any other feature type:
array (0) is the feature length
array (1) is the feature area
array (2) is the feature angle

Cmd **VALUE**	**DESCRIPTION**	
GETTYPE	This command is used to determine the type of a specific feature.	
	Param **VALUE**	*OutVal* **TYPE**
	The index of the feature of interest.	**Integer**
	OutVal should be an integer variable to receive the type of the specified feature. The feature types that will be returned are defined in **IpMeasTool**.	

Cmd **VALUE**	**DESCRIPTION**	
GETLABEL	This command is used to get the numeric portion of a feature's label (the label is the number displayed with the feature in the image and the datasheet; e.g., A1, L2, G3).	
	Param **VALUE**	*OutVal* **TYPE**
	The index of the feature of interest.	**Integer**
	OutVal should be an integer variable to receive the label number. *Note:* This command is obsolete and is only retained for backward compatibility with macros written for previous versions of *Image-Pro Plus*. New macros should use feature index numbers instead.	

Cmd **VALUE**	**DESCRIPTION**	
GETINDEX	This command is used to get a feature's index from it label number.	
	Param **VALUE**	*OutVal* **TYPE**
	The label number of the feature of interest. Note that feature labels begin with 1 not zero.	**Integer**
	OutVal should be an integer variable to receive the index number. *Note:* This command is obsolete and is only retained for backward compatibility with macros written for previous versions of *Image-Pro Plus*. New macros should use feature index numbers instead.	

Cmd **VALUE**	**DESCRIPTION**	
GETNUMPTS	This command gets the number of points defining the outline of the specified feature.	
	Param **VALUE**	*OutVal* **TYPE**
	The index of the feature of interest.	**Integer**
	OutVal should be an integer variable to receive the number of points used to define a feature. This number can be used to dimension an array for use with the GETPOINTS command.	

<table>
<tr><th><i>Cmd</i> VALUE</th><th>DESCRIPTION</th></tr>
<tr><td>GETPOINTS</td><td>This command gets the coordinates defining the outline of the specified feature.
<table>
<tr><th><i>Param</i> VALUE</th><th><i>OutVal</i> TYPE</th></tr>
<tr><td>The index of the feature of interest</td><td><b>POINTAPI</b></td></tr>
<tr><td colspan="2"><i>OutVal</i> should be an array of <b>POINTAPI</b> structures with enough elements to contain all of the points used to define the specified feature.</td></tr>
</table></td></tr>
<tr><th><i>Cmd</i> VALUE</th><th>DESCRIPTION</th></tr>
<tr><td>GETBOUNDS</td><td>This command gets the bounding rectangle of the specified feature.
<table>
<tr><th><i>Param</i> VALUE</th><th><i>OutVal</i> TYPE</th></tr>
<tr><td>The index of the feature of interest</td><td><b>RECT</b></td></tr>
<tr><td colspan="2"><i>OutVal</i> should be an RECT variable to receive the bounding box of the specified feature.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th colspan="2"><i>Cmd</i> VALUE</th></tr>
<tr><td>GETSTATS</td><td>Use this command to get the statistical data associated with a specified measurement type (e.g. length, area, thickness).
<table>
<tr><th><i>Param</i> VALUE</th><th><i>OutVal</i> TYPE</th></tr>
<tr><td>The constant for the measurement of interest (see the following labels).</td><td><b>Single</b></td></tr>
<tr><td colspan="2"><i>OutVal</i> should be an array of Singles with 9 elements.
<table>
<tr><td>array(0)</td><td>Minimum value</td></tr>
<tr><td>array(1)</td><td>ID of the feature with the minium value</td></tr>
<tr><td>array(2)</td><td>Maximum value</td></tr>
<tr><td>array(3)</td><td>ID of the feature with the maximum value</td></tr>
<tr><td>array(4)</td><td>Range of values</td></tr>
<tr><td>array(5)</td><td>Mean value</td></tr>
<tr><td>array(6)</td><td>Standard deviation</td></tr>
<tr><td>array(7)</td><td>Sum of values</td></tr>
<tr><td>array(8)</td><td>Number of measurements</td></tr>
</table></td></tr>
</table></td></tr>
</table>

The following are constants for the measurement data types.

Constant	**Description**
MDATA_POS	X position of feature center
MDATA_POSY	Y position of feature center
MDATA_AREA	area
MDATA_LEN	length (perimeter for polygon features)
MDATA_RADIUS	radius of circle or arc
MDATA_START	X position of feature start point
MDATA_STARTY	Y position of feature start point
MDATA_END	X position of feature end point
MDATA_ENDY	Y position of feature end point
MDATA_ANGLE	angle
MDATA_AVGDIST	average distance
MDATA_COUNT	number of objects
MDATA_MINDIST	minimum distance
MDATA_MAXDIST	maximum distance
MDATA_CTRDIST	center to center distance
MDATA_PERPDIST	perpendicular distance of center to line
Note that the negative of these constants (0 to 14) can be used to index the array of feature measurements returned by IpMeasGet (GETFEATVALUES)	

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (See `IpMeasGet` statement in example, above)

See Also IpMeasShow, IpMeasTool

IpMeasGetStr

Syntax **IpMeasGetStr**(*Cmd, lpParam, OutVal*)

Description Use this function to get string information relating to the **Measurements** tool associated with the current image.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETNAME
Param	**Integer**	An integer specifying the feature with which *Cmd* will operate.
OutVal	**String**	A fixed-length string to receive the feature name

Comments The GETNAME command will return the full name of the specified feature.

IpMeasLoad

Syntax **IpMeasLoad** *(lpszFileName, sHow)*

Description This function loads the specified measurements file.

Parameters

lpszFileName	**String**	Indicates the name of the measurement file to be loaded
sHow	**Integer**	Flag governing how file is loaded, now only supports MLOAD_INTERACTIVE

Example

```
ret = IpMeasLoad("C:\IPWIN\CIRCLE1.MSR")
```

Comments Measurement files are always loaded in interactive mode. The user will be prompted to create the features.

See Also IpMeasSave, IpMeasShow

IpMeasLoadOutline

Syntax **IpMeasLoadOutline**(*OutlineFile*)

Description This function loads an outline file into the active image. Equivalent to the **Load Outlines** command located on the **Measurements** window's *File* menu.

Parameters

OutlineFile	**String**	A string specifying the name of the file from which the outlines are to be read.

Example

```
ret = IpMeasLoadOutline("C:\IPWIN\SLIDE1.OUT")
```

```
This statement will load outlines from SLIDE1.OUT in the \IPWIN
directory on the C: drive.
```

Comments The **Measurements** command window must be open before this function is called.

The file specified by *OutlineFile* must be an *Image-Pro* binary .OUT file, not an ASCII outline file. See `IpMeasSaveOutline`.

See Also IpMeasSaveOutline, IpMeasShow

IpMeasMove

Syntax **IpMeasMove**(*X*, *Y*)

Description This function moves the **Measurements** window to the specified location. Equivalent to dragging the **Measurements** window with the mouse.

Parameters

X	**Integer**	An integer specifying the x-coordinate of the screen position to which the upper-left corner of the **Measurements** window is to be moved.
Y	**Integer**	An integer specifying the y-coordinate of the screen position to which the upper-left corner of the **Measurements** window is to be moved.

Example

```
ret = IpMeasMove(6, 26)
```

This statement will move the **Measurements** window to screen position 6, 26, a position near the upper-left corner of the screen.

Comments The origin (0, 0) for the coordinate system used by the *x* and *y* parameters is the upper-left corner of the screen.

IpMeasRestore

Syntax **IpMeasRestore**( )

Description This function returns the **Measurements** window to its previous screen position and size. Equivalent to clicking the **Restore** button on a maximized **Measurements** window, or double-clicking the icon of a minimized **Measurements** Window.

Return Value In IPP 4.0 OR HIGHER, this macro will return IPCERR_NONE but won't do anything.

See Also IpMeasSaveOutline, IpMeasShow, IpMeasSize

IpMeasSave

Syntax

IpMeasSave(*FileName*)

Description

This function saves the current set of features and measurements to the specified measurements file.

Parameters

lpszFileName	**String**	Indicates the name of the measurement file to be loaded

Example

```
ret = IpMeasSave("C:\IPWIN\CIRCLE1.MSR")
```

This statement will save the current measurement data to a file called Circle1.msr in the \IPWIN directory on the C: drive.

See Also

IpMeasSaveData, IpMeasShow, IpMeasLoad

IpMeasSaveData

Syntax

IpMeasSaveData(*FileName, SaveMode*)

Description

This function saves the current measurement data to a file. Equivalent to the **Save Data** command on the *File* menu in the **Measurements** command window.

Parameters

lpszFileName	**String**	A string specifying the name of the file to which the measurement data will be written.
SaveMode	**Integer**	Must be a combination of one of the following data type constants: S_DATA = save feature data S_STATS = save feature statistics S_DATA2 = save measurement data And one of the following destination constants: S_FILE = save data to file S_CLIPBOARD = copy table to clipboard S_DDE = send table contents to external program via DDE (Excel is the default) S_APPEND = append to the existing file S_PRINTER = send data to printer S_OUTPUT = send data to the output window

Example

```
ret = IpMeasSaveData("C:\IPWIN\MEASDATA.DAT", S_DATA + S_FILE)
```

This statement will save the current measurement data to a file called MEASDATA.DAT in the \IPWIN directory on the C: drive, overwriting the file if it already exists.

```
Ret = IpMeasSaveData("C:\IPWIN\MEASDATA.DAT", S_DATA + S_APPEND)
```

This statement will append the current measurement data to a file called MEASDATA.DAT in the \IPWIN directory on the C: drive, creating the file if it does not exist.

```
Ret = IpMeasSaveData("", S_DATA + S_CLIPBOARD)
```

This statement will place the current measurement data on the clipboard.

Comments

The **Measurements** command window *must* be open before this function is called. You cannot combine two data type constants or two destination type constants. The FileName parameter is ignored if the destination is not S_FILE or S_APPEND. Note that Image-Pro Plus 4.0/4.1 does NOT save `.tls` files (as the previous versions did).

See Also	IpMeasSaveOutline, IpMeasShow,IpMeasTool

IpMeasSaveOutline

Syntax	**IpMeasSaveOutline**(*OutlineFile*)		
Description	This function saves the current measured object outlines to a file. Equivalent to the **Save Outlines** command on the File menuin the **Measurements** window.		
Parameters	*OutlineFile*	**String**	A string specifying the name of the file to which the current measurement outlines will be written. The file name's extension determines the format in which it is saved. Where: .OUT - Specifies a binary outline file. Anything else specifies an ASCII-format outline file.

Example

```
ret = IpMeasSaveOutline("C:\IPWIN\MEASOUT.OUT")
```

This statement will save the current outlines in binary format to the MEASOUT.OUT file in the \IPWIN directory on the C: drive.

Return Value	In IPP 4.0 OR HIGHER, this macro will return IPCERR_INVCOMMAND
Comments	The **Measurements** command window <u>must</u> be open before this function is called.
See Also	IpMeasLoadOutline, IpMeasShow

IpMeasShow

Syntax	**IpMeasShow*(bShow)***		
Description	This function is used to open or close the Measurements command window. Equivalent to selecting the Measurements command to open the window, and clicking the Close button within it to close it.		
Parameters	*bShow*	**Integer**	See table below.

Example

```
ret = IpMeasShow(1)
```

This statement will make the **Measurements** command window visible during execution of the macro.

Comments

The **Measurements** command window *must* be open before any measurement functions are performed.

The following are constants for the measurement data types.

Constant	Description
MEAS_HIDE	Hide the window
MEAS_SHOW	Show last used page
MEAS_SHOWADVANCED	Switch to Advanced mode
MEAS_SHOWBASIC	Switch back to Basic mode
MEAS_SHOWFEATURES	Show Features page*
MEAS_SHOWMEASUREMENTS	Show Measurements page**
MEAS_SHOWINPUTOUT	Show Input/Output page
MEAS_SHOWOPTIONS	Show Options page
MEAS_SHOWADVAOPTIONS	Show Advanced Options page**
* MEAS_SHOWFEATURES, MEAS_SHOWINPUTOUTPUT and MEAS_SHOWOPTIONS can be combined with MEAS_SHOWADVANCED or MEAS_SHOWBASIC (to switch the mode and the page at the same time). ** MEAS_SHOWMEASUREMENTS and MEAS_SHOWADVOPTIONS are only valid in Advanced mode, so they will switch to Advanced mode if necessary.	
These are the enum values:	
MEASSHOW_HIDE =	MEAS_HIDE
MEASSHOW_SHOW =	MEAS_SHOW
MEASSHOW_SHOWADVANCED =	MEAS_SHOWADVANCED
MEASSHOW_SHOWBASIC =	MEAS_SHOWBASIC
MEASSHOW_SHOWFEATURES =	MEAS_SHOWFEATURES
MEASSHOW_SHOWMEASUREMENTS =	MEAS_SHOWMEASUREMENTS
MEASSHOW_SHOWINPUTOUTPUT =	MEAS_SHOWINPUTOUT
MEASSHOW_SHOWPTIONS =	MEAS_SHOWOPTIONS
MEASSHOW_SHOWADVOPTIONS	MEAS_SHOWADVOPTIONS

IpMeasSize

Syntax **IpMeasSize**(*cx*, *cy*)

Description This function changes the size of the **Measurements** window to the specified width and height. Equivalent to resizing the **Line Profile** window with the mouse.

Parameters

cx	**Integer**	An integer specifying the width, in pixels, at which the **Measurements** window is to be displayed.
cy	**Integer**	An integer specifying the height, in pixels, at which the **Measurements** window is to be displayed.

Example

```
ret = IpMeasSize(400, 175)
```

This statement will resize the **Measurements** window to dimensions of 400 pixels wide by 175 pixels tall.

See Also IpMeasMove, IpMeasRestore

IpMeasTag

Syntax

IpMeasTag(*Index*, *OnOff*)

Description

This function selects/deselects a measurement record. Equivalent to clicking the measurement record in the **Measurements** datasheet.

Parameters

Index	**Integer**	An integer specifying the position of the record in the datasheet (where the first record occupies position 0), or MEAS_ALL, to specify all records in the datasheet.
OnOff	**Integer**	An integer value of 0 or 1 specifying whether the record is to be selected or deselected. Where: 0 - Deselects 1 - Selects

Example

```
ret = IpMeasTag(0, 1)
ret = IpMeasTag(2, 1)
```

The statements above will select the first and third measurement records in the **Measurements** datasheet.

```
ret = IpMeasTag(MEAS_ALL, 0)
```

This statement will deselect all measurement records in the **Measurements** datasheet.

Comments

This function is used to select individual measurements for deletion by the `IpMeasDelete` function. It is also used to select the pair of measurements upon which a thickness measurement with `IpMeasTool(MEAS_THICK)` is performed.

The **Measurements** command window *must* be open before this function is called.

See Also

IpMeasDelete, IpMeasTool, IpMeasShow

IpMeasTool

Syntax

IpMeasTool(*Tool*)

Description

This function selects a measurement tool. Equivalent to clicking one of the measurement tool buttons (e.g., **Length, Area, Thickness**) in the **Measurements** window.

Parameters

Tool	**Integer**	An enumerated integer specifying the tool to be selected. Must be one of the following: MEAS_ANGLE MEAS_AREA MEAS_LENGTH MEAS_THICK MEAS_TRACE MEAS_POINT MEAS_RECT MEAS_CIRCLE MEAS_BFLINE MEAS_BFCIRCLE MEAS_BFARC MEAS_DIST MEAS_NEWANGLE MEAS_HTHICK MEAS_VTHICK MEAS_CTHICK MEAS_COUNT MEAS_PERPDIST MEAS_DATA_TO_IMAGE MEAS_SELECT MEAS_NONE see definitions under comments, below

Example

The statements below will select the length tool, allow the user to make length measurements, then save the measurement data to a file called MEASDATA.DAT in the \IPWIN directory on the C: drive.

```
Ret = IpMeasSaveData("C:\IPWIN\MEASDATA.DAT", S_DATA + S_FILE)
```

The statements below will select the first and third measurement records in the **Measurements** datasheet, then perform a thickness measurement upon the two.

```
Ret = IpMeasTag(0, 1)
ret = IpMeasTag(2, 1)
ret = IpMeasTool(MEAS_THICK)
```

Comments The **Measurements** command window *must* be open before this function is called.

TOOL	**DESCRIPTION**
MEAS_AREA	Selects the Polygon tool. Equivalent to clicking the **Trace** or **Polygon** tool in the **Measurements** window.
MEAS_ANGLE	Selects the **Click-and-Drag Angle Measurement** tool. Equivalent to clicking the **Click-and-Drag Angle Measurement** button in the **Measurements** window.
MEAS_LENGTH	Selects the **Line** tool. Equivalent to clicking the **Straight Line** button in the **Measurements** window.
MEAS_THICK	Selects the **Curved Thick ness** tool. Equivalent to clicking the **Curved Thickness** button in the **Measurements** window.
MEAS_TRACE	Selects the **Trace** tool. Equivalent to clicking the **Trace** button in the **Measurements** window.
MEAS_POINT	Selects the **Point** tool.
MEAS_RECT	Selects the **Rectangle** tool. Equivalent to clicking the **Rectangle** button in the **Measurements** window.
MEAS_CIRCLE	Selects the **Circle** tool. Equivalent to clicking the **Circle** button in the **Measurements** window.
MEAS_BFLINE	Selects the **Best Fit Line** tool. Equivalent to clicking the **Best Fit Line** button in the **Measurements** window.
MEAS_BFCIRCLE	Selects the **Best Fit Circle** tool. Equivalent to clicking the **Best Fit Circle** button in the **Measurements** window.
MEAS_BEFARC	Selects the **Best Fit Arc** tool. Equivalent to clicking the **Best Fit Arc** button in the **Measurements** window.
MEAS_DIST	Selects the **New Distance** Measurements.
MEAS_PERPDIST	Selects the **Pitch** tool
MEAS_COUNT	Selects the **Count Gray Spots** tool.
MEAS_DATA_TO_ IMAGE	Selects **Data To Image**. Equivalent to clicking **the Data To Image** button on the **Measurement** toolbar

TOOL	DESCRIPTION
MEAS_NEWANGLE	Selects the Angle tool. Equivalent to clicking the **Add Angle Measurement** button in the **Measurements** window
MEAS_HTHICK	Selects the **Horizontal Thickness** tool.
MEAS_VTHICK	Selects the **Vertical Thickness** tool.
MEAS_CTHICK	Selects the **Curved Thickness** tool.
MEAS_SELECT	Selects the **Feature Selection** tool.
MEAS_NONE	Turns all measurement tools off (no tools are active).

See Also IpMeasTag, IpMeasShow

IpMeasUpdate

Syntax **IpMeasUpdate*()***

Description This function can be used to update all exisiting features on an image programmatically. This is useful if the image's calibration has changed.

See Also IpMeasAdd

IpMmonGet

Syntax **IpMmonGet** *(sAttribute, sParam, lpData)*

Description This function gets the Memory Manager attributes

Parameters

sAttribute	**Integer**	The MMON_VMENABLE attribute determines if the virtual memory manager is enabled.
sParam	**Integer**	Not used, should be set to 0
lpData	**Any**	An integer variable to receive the value; non-zero if the memory manager is enabled.

See Also IpMmonShow, IpMmonSet

IpMmonSet

Syntax	**IpMmonSet** *(sAttribute, sParam, Value)*		
Description	This function sets the Memory Manager attributes		
Parameters	*sAttribute*	**Integer**	The MMON_VMENABLE attribute enables or disables the virtual memory manager.
	sParam	**Integer**	Not used, should be set to 0
	Value	**Long**	A value indicating if the memory manager is on or off: zero to turn it off, a non-zero value to turn it on.
See Also	IpMmonShow, IpMmonGet, IpMmonSetInt		

IpMmonSetInt

Syntax	**IpMmonSetInt** *(sAttribute, sParam, Value)*		
Description	This function sets a value, rather than a variable, for the Memory Manager attributes		
Parameters	*sAttribute*	**Integer**	Attribute to modify; in this case, MMON_VMENABLE
	sParam	**Integer**	Not used, should be set to 0
	Value	**Long**	The new value for the attribute
See Also	IpMmonShow, IpMmonGet, IpMmonSet		

IpMmonShow

Syntax	**IpMmonShow** *(nWindow)*		
Description	This function shows or hides the Memory Manager window.		
Parameters	nWindow	**Short**	Must be one of the following: MMON_HIDE - Hide current window MMON_SHOW - Show last used window MMON_MAXIMIZE - Show large dialog MMON_MINIMIZE - Show small dialog
See Also	IpMmonGet, IpMmonSet		

IpMorePts

See IpListPts.

IpMosaicCreate

Syntax	**IpMosaicCreate*(ImageList, NumofImages)***		
Description	This function creates a mosaic of the selected images.		
Parameters	*ImageList*	**String**	A semi-colon delimited string containing a list of workspace names to specify the images in the mosaic. There should not be any extraneous spaces in the string.
	NumofImages	**Integer**	Specifys the number of images in the Image List. Use -1 to specify all open images in the workspace.
Return Value	This function returns the Document ID of the mosaic, which will be an integer greater than 0. A negative return value indicates an error.		
Example	`ret = IpMosaicCreate (“Test.tif;Untitled”,2)` This command creates a mosaic from the open workspaces called, “Test.tif” and “Untitled. tif.” The workspace names specified in the image list are separated with a semicolon.		
Comments	The `ImageList` parameter is ignored if the number of images less -1.		

IpMosaicGet

Syntax **IpMosaicGet(*sAttributes,Value)***

Description

This function queries the mosaic attributes.

Parameters

Attributes	**Integer**	See list below.
Value	**Integer** **LPSHORT (C)**	Pointer to a long variable to receive the attribute's new setting.

ATTRIB	**Short Value**
MA_AUTOGRID	0 = Autogrid on 1 = Autogrid off
MA_CAPTION	0 = none 1 = Image/Workspace name 2 = File Name 3 = Date/Time 4 = Descrption (one line only) 5 = Frame number
MA_COLUMNS	number of columns (ignored if using Autogrid)
MA_FONTSIZE	font size in points
MA_IMAGESIZE	0 = printer default paper size 1 = ¼ printer default paper size 2 = User defined
ATTRIB	**Short Value**
MA_IMAGEWIDTH	Number of pixels
MA_IMAGEHEIGHT	Number of pixels
MA_IMAGECLASS	-1 = highest precision class (Best Fit) 1 = 8-bit Grayscale 2 = Palette 3 = 24-bit True Color 4 = 12-bit Grayscale 5 = Single Point 6 = 16-bit Grayscale 7 = 48-bit True Color 8 = 36-bit True Color
MA_PAGENUMBERS	0 = Page numbers off 1 = Page number on
MA_ROWS	number of rows (ignored if using Autogrid)
MA_SPACING	Spacing in pixels between rows or columns

Return Value

This function returns the Document ID of the mosaic, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
Sub MosaicGet1()
        ret = IpOutputShow(1)
        dim parm as integer
        ret = IpMoasicGet(MA_ROWS,parm)
        Debug.print parm
end sub
```

```
Sub MosaicGet2()
        ret = IpOutputShow(1)
        dim parm as string* 255
        ret = IpMoasicGetStr(MA_TITLE,parm)
        Print parm
end sub
```

This command creates a mosaic from the currently open workspace.

See Also

IpMosaicSet

IpMosaicSet

Syntax

IpMosaicSet*(sAttributes, sValue, lpValue)*

Description

This function sets the mosaic attributes.

Parameters

Attributes	**Integer**	Determines the mosaic attribute to set. Must be one of the following:
		IMC_GRAY = 1
		IMC_PALETTE = 2
		IMC_RGB = 3
		IMC_GRAY12 = 4
		IMC_SINGLE = 5
		IMC_GRAY16 = 6
		IMC_RGB36 = 8
		IMC_RGB48 = 9

sValue	**Integer**	New attribute value.
lpValue	**String**	New attribute string. Must be one of the following: MA_TITLE MA_FOOTER MA_FONT

Example

```
ret = IpMosaicSet (MA_IMAGESIZE,0, IPNULL)
ret = IpMosaicSet (MA_TITLE, 0, “Mosaic#1”)
```

See Also

IpMosaicGet

IpMosaicShow

Syntax

IpMosaicShow(*bShow*)

Description

This function is used to show or hide the Mosaic Image dialog.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to show or hide the Mosaic Image dialog box. Where: 0 - Hides the dialog . 1 - Shows the dialog

Example

```
ret = IpMosaicShow(1)
```

This statement displays the Mosaic Image dialog box.

IpOpBkgndCorrect

Syntax

IpOpBkgndCorrect(*WsBackId*, *BlackLevel*, *bNewImage*)

Description

This function corrects for uneven background lighting in the active image. Equivalent to the **Background Correction** option button in the **Background Correction** dialog box.

Parameters

WsBackId	**Integer**	An integer specifying the ID of the open image to be used as the background image. See Comments, below, for more about this ID number.
BlackLevel	**Integer**	An integer between 0 and 255 specifying the black level.
bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 - Writes the transformed results to the active window. 1 - Writes the transformed results to a new image window.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret =  IpOpBkgndCorrect(0, 50, 1)
```

This statement will perform a background correction on the active window, using image 0 as the characteristic background image. A value of 50 defines the black level.The corrected result will be written to a new window.

Comments

Use this function when you want to correct the background of an image measuring optical density via transmitted light. It is similar to `IpOpBkgndSubtract` but uses division instead of subtraction to account for the fact that optical density is not a linear function of the gray scale.

A document "ID" is assigned to an image window when it is opened. It retains this ID for the duration of its existence. ID's are assigned consecutively in the order in which images are opened. The next higher number is used when a new window is created — e.g., if image 4 is already open, the next image is assigned an ID of 5.

Because of the dynamic nature of document IDs (the mix and sequence of images on your desktop varies from session to session), macros involving multiple images should be recorded and played back from an empty imaging area (i.e., one in which there are no images open). This measure will ensure that the recorded image numbers select the intended images on playback.

See Also

IpOpBkgndSubtract

IpOpBkgndSubtract

Syntax

IpOpBkgndSubtract(*WsBackId*, *bNewImage*)

Description

This function corrects for uneven background lighting of the active image. Equivalent to the *Background Subtraction* option button in the **Background Correction** dialog box.

Parameters

WsBackId	**Integer**	An integer specifying the ID of the open image to be used as the background image. See Comments, below, for more about this ID number.
bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 - Writes the results to the active window. 1 - Writes the results to a new image window.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpOpBkgndSubtract(2,0)
```

This statement will perform a background subtraction using image number 2 as the background image. The corrected result will be written to the active image window.

Comments

Use this function when you want to flatten the background of an image prior to counting or measuring objects. `IpOpBkgndSubtract` compares the active image to the background image and replaces, in the active image, pixels that are deemed to be part of the background with a value close to the mean background intensity.

A document "ID" is assigned to an image window when it is opened. It retains this ID number for the duration of its existence. ID's are assigned consecutively in the order in which images are opened. The next higher number is used when a new window is created — e.g., if image 4 is already open, the next image is assigned an ID of 5.

Because of the dynamic nature of document IDs (the mix and sequence of images on your desktop varies from session to session), macros involving multiple images should be recorded and played back from an empty imaging area (i.e., one in which there are no images open). This measure will ensure that the recorded image numbers select the intended images on playback.

See Also

IpOpBkgndCorrect

IpOpImageArithmetics

Syntax

IpOpImageArithmetics(*WsId*, *Number*, *OpaCode*, *bNewImage*)

Description

This function performs arithmetic operations upon the active image or AOI, in conjunction with a second image. Equivalent to performing an arithmetic operation using the **Other Image** option in the **Arithmetic Operations** dialog box.

Parameters

WsId	**Integer**	An integer specifying the ID of the open image to be used as the operand. See Comments, below, for more about this ID number.
Number	**Single**	A single point number specifying the value to be used to offset or scale the result, as follows: If *OpaCode* is set to OPA_ADD, OPA_SUB or OPA_DIFF, this value will be added to the result. If *OpaCode* is set to OPA_MULT or OPA_DIV, the result will be multiplied by this value. For all other operations, this parameter is ignored (just set it to 0).
OpaCode	**Integer**	An enumerated integer specifying the kind of arithmetic operation to be performed. Must be one of the following: OPA_ACC OPA_ADD OPA_AVG OPA_DIFF OPA_DIV OPA_MAX OPA_MIN OPA_MULT OPA_NOT OPA_SUB See definitions under Comments, below.

bNewImage	**Integer**	An integer value of 0, 1, ro 2 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 -Writes the transformed results to the active window. 1 -Writes the transformed results to a new image window. 2 - Writes the transformed results to the image designated as the first operand. 3 – Writes the transformed results to a new image with the operands reversed 4 – Float image output 5 – Float image output with operands reversed.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpOpImageArithmetics(0, 20.0, OPA_SUB, 1)
```

This statement will subtract image 0 from the active image, add 20 to the result in each pixel, and write the result to a new image window.

```
ret = IpOpImageArithmetics(2, 0.01, OPA_MULT, 0)
```

This statement will multiply the active image by image 2, multiply the result of each pixel by 0.01, and write the result back to the active image.

Comments

A document “ID” is assigned to an image window when it is opened. It retains this ID number for the duration of its existence. ID's are assigned consecutively in the order in which images are opened. The next higher number is used when a new window is created — e.g., if image 4 is already open, the next image is assigned an ID of 5.
Because of the dynamic nature of document IDs (the mix and sequence of images on your desktop varies from session to session), macros involving multiple images should be recorded and played back from an empty imaging area (i.e., one in which there are no images open). This measure will ensure that the recorded image numbers select the intended images on playback.

The following table describes the values allowed in the *OpaCode* parameter.

OpaCode	**DESCRIPTION**
OPA_ACC	Adds the active image (with the “as is” option turned off.
OPA_ADD	Adds the active image and the other image.
OPA_AVG	Replaces each pixel with the mean value of the two images.
OPA_DIFF	Obtains the absolute value of the difference between the active image and the other image.
OPA_DIV	Divides the active image by the other image.
OPA_MAX	Replaces each pixel with the largest value of the two images.
OPA_MIN	Replaces each pixel with the smallest value of the two images.
OPA_MULT	Multiplies the active image by the other image.
OPA_NOT	Reverses the pixel values of the active image.
OPA_SUB	Subtracts the other image from the active image.

See Also IpOpNumberArithmetics, IpOpImageLogic, IpOpNumberLogic

IpOpImageLogic

Syntax **IpOpImageLogic**(*WsId, OplCode, bNewImage*)

Description This function performs logical operations upon the active image or AOI, in conjunction with a second image. Equivalent to selecting one of the logical operations with the **Other Image** option in the **Arithmetic Operations** dialog box.

Parameters

WsId	**Integer**	An integer specifying the ID of the open image to be used as the operand. See Comments, below, for more about this ID number.
OplCode	**Integer**	An enumerated integer specifying the kind of logic operation to be performed. Must be one of the following: OPL_AND OPL_OR OPL_XOR OPL_NAND OPL_NOR OPL_NOT OPL_COPY Can also be used with IMC_C_DIRECT if the “as is” checkbox is checked.

bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the result is to be written to a new image window, or back into the active image window. Where: 0 - Writes the transformed results to the active window. 1 - Writes the transformed results to a new image window.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpOpImageLogic(0, OPL_NOR, 0)
```

This statement will perform a logical "NOR" between the active image and image 0. The results will be written back to the active image.

Comments

A document "ID" is assigned to an image window when it is opened. It retains this ID number for the duration of its existence. ID's are assigned consecutively in the order in which images are opened. The next higher number is used when a new window is created — e.g., if image window 4 is already open, the next image is assigned an ID of 5.

Because of the dynamic nature of document IDs (the mix and sequence of images on your desktop varies from session to session), macros involving multiple images should be recorded and played back from an empty imaging area (i.e., one in which there are no images open). This measure will ensure that the recorded image numbers select the intended images on playback.

The following table describes the values allowed in the *OplCode* parameter.

OplCode	**DESCRIPTION**
OPL_AND	Performs a logical "AND" between your active image and the other image. Only bit values that are "on" in both operands will be "on" in the result.
OPL_OR	Performs a logical "OR" between your active image and the other image. Bit values that are "on" in either operand will be "on" in the result.
OPL_XOR	Performs a logical "XOR" between your active image and the other image. Only when a bit value is "on" in one operand and "off" in the other will the bit be "on" in the result. If bit values are "on" in both operands, or if they are "off" in both operands, they will be "off" in the result.
OPL_NAND	Performs a logical "NAND" between your active image and the other image. Bit values that are "off" in either, or both, operands will be "on" in the result.
OPL_COPY	Copies the active image to a new image.

OplCode	**DESCRIPTION**
OPL_NOR	Performs a logical "NOR" between your active image and the other image. Bit values that are "off" in both images will be "on" in the result.
OPL_NOT	Performs a logical "NOT" on the bit values in the active image. Every bit value that is "on" in the active image will be "off" in the result. Every bit value that is "off" in the active image will be "on" in the result.

See Also IpOpNumberLogic, IpOpNumberArithmetics, IpOpImageArithmetics

IpOpNumberArithmetics

Syntax **IpOpNumberArithmetics**(*Number*, *OpaCode*, *bNewImage*)

Description This function performs arithmetic operations upon the active image or AOI, in conjunction with a numeric value. Equivalent to selecting one of the arithmetic operations and the **Number** option in the **Arithmetic Operations** dialog box.

Note - if you are working with a True Color image you can use the IpOpNumberRgb function to operate upon the three color channels simultaneously.

Parameters

Number	**Single**	A number (of IPBasic type, Single) representing the operand to be used with the active image.
OpaCode	**Integer**	An enumerated integer specifying the kind of arithmetic operation to be performed. Must be one of the following: OPA_ADD OPA_SUB OPA_DIFF OPA_MULT OPA_DIV OPA_AVG OPA_MAX OPA_MIN OPA_SQR OPA_X2 OPA_X2Y See definitions under Comments, below. Can also be used with IMC_C_DIRECT if the "as is" checkbox is checked.

bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 -Writes the transformed results to the active window. 1 -Writes the transformed results to a new image window. 2 - Writes the transformed results to the image designated as the first operand. 3 – Writes the transformed results to a new image with the operands reversed 4 – Float image output 5 – Float image output with operands reversed.

Return Value

This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpOpNumberArithmetics(120.0, OPA_MAX, 1)
```

This statement will compare each pixel of the active image or AOI against the value 120.0, select whichever one is higher, and write the result to a new window.

Comments

The following table describes the values allowed in the *OpaCode* parameter.

OpaCode	**DESCRIPTION**
OPA_ADD	Adds the active image and *Number*.
OPA_SUB	Subtracts *Number* from the active image.
OPA_DIFF	Obtains the absolute value of the difference between the active image pixel and *Number*.
OPA_MULT	Multiplies the active image pixel by *Number*.
OPA_DIV	Divides the active image pixel by *Number*.
OPA_AVG	Replaces pixel with the mean value of the active image pixel and *Number*.
OPA_MAX	Replaces pixel with the larger of the two values, the one in the active image or *Number*.
OPA_MIN	Replaces pixel with the smaller of the two values, the one in the active image or *Number*.
OPA_SQR	Replaces the pixel with the square root of the active image pixel
OPA_X2	Replaces the pixel with the square of the active image pixel
OPA_X2Y	Replaces the pixel with the value of the active image pixe raised to Y power

See Also

IpOpNumberRgb, IpOpImageArithmetics, IpOpImageLogic, IpOpNumberLogic

IpOpNumberLogic

Syntax **IpOpNumberLogic**(*Number, OplCode, bNewImage*)

Description This function performs logical operations upon the active image or AOI in conjunction with a numeric value. Equivalent to selecting a logic operation and the **"Number"** option in the **Arithmetic Operations** dialog box.

Parameters

Number	**Integer**	An integer specifying the operand to be used with the active image. This parameter is ignored when *OplCode* is set to OPL_NOT (in this case, just set *Number* to 0).
OplCode	**Integer**	An enumerated integer specifying the kind of logic operation to be performed. Must be one of the following: OPL_AND OPL_OR OPL_XOR OPL_NAND OPL_NOR OPL_NOT See definitions under Comments, below.
bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back to the active image. Where: 0 - Writes the transformed results to the active window. 1 - Writes the transformed results to a new image window.

Return Value This function returns the Document ID of the resulting image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpOpNumberLogic(0, OPL_NOT, 1)
```

This statement will produce a negative image of the active image and write the results to a new window.

```
ret = IpOpNumberLogic(1, OPL_NOR, 0)
```

This statement will perform a logical "NOR" between the active image and the number 1, then write the results to the active image.

Comments The following table describes the values allowed in the *OplCode* parameter.

OplCode	**DESCRIPTION**
OPL_AND	Performs a logical “AND” between the active image and *Number*. Only bit values that are “on” in both operands will be “on” in the result.
OPL_OR	Performs a logical “OR” between the active image and *Number*. Bit values that are “on” in either operand will be “on” in the result.
OPL_XOR	Performs a logical “XOR” between the active image and *Number*. Only when a bit value is “on” in one operand and “off” in the other will the bit be “on” in the result. If bit values are “on” in both operands, or if they are “off” in both operands, they will be “off” in the result.
OPL_NAND	Performs a logical “NAND” between the active image and *Number*. Bit values that are “off” in either, or both, operands will be “on” in the result.
OPL_NOR	Performs a logical “NOR” between the active image and *Number*. Bit values that are “off” in both images will be “on” in the result.
OPL_NOT	Performs a logical “NOT” on the bit values in the active image. Every bit value that is “on” in the active image will be “off” in the result. Every bit value that is “off” in the active image will be “on” in the result.

See Also IpOpImageLogic, IpOpNumberArithmetics, IpOpImageArithmetics

IpOpNumberRgb

Syntax

IpOpNumberRgb(*Numbers, OpaCode, bNewImage*)

Description

This function is a special version of the `IpOpNumberArithmetics` function. It is designed to be used with *True Color* images, and allows you to, with a single step, arithmetically combine the image's (or AOI's) three color channels with 3 numbers.

Parameters

Numbers	**Single (Basic)** **LPSINGLE (C)**	The name of an array of three, single-precision, single-point values, specifying the operands that are to be arithmetically combined with the three color channels. The contents of these elements, 0, 1 and 2, are applied to the Red, Green and Blue channels, respectively.
OpaCode	**Integer**	An enumerated integer specifying the kind of arithmetic operation to be performed. Must be one of the following: OPA_ADD OPA_SUB OPA_DIFF OPA_MULT OPA_DIV OPA_AVG OPA_MAX OPA_MIN See `IpOpNumberArithmetics` for definitions of these values.
bNewImage	**Integer**	An integer value of 0 or 1 specifying whether the transformed image is to be written to a new image window, or back into the active image window. Where: 0 - Writes the transformed results to the active window. 1 - Writes the transformed results to a new image window.

Return Value

The document ID of the current or new image, depending on the value of *bNewImage*. If a new image is to be created, a return code of -1 indicates a failure.

Example

The following example performs a white balance on an RGB image

```
dim stats(10) as single
dim offsets(3) as single
dim average as single
' Ask the user to place a small AOI over a white or gray area.
ipRect.left = 95
ipRect.top = 33
ipRect.right = 127
ipRect.bottom = 55
ret = IpAoiCreateBox(ipRect)
ret = IpMacroStop("Position box on gray or white area", 0)
' calculate the histogram of the sample.
ret = IpHstCreate()
ret = IpHstSetAttr(ICAL, 0)
' get the average red content.
ret = IpHstGet(GETSTATS, 0, stats(0))
offsets(0) = stats(0)
```

```
' get the average green content.
ret = IpHstGet(GETSTATS, 1, stats(0))
offsets(1) = stats(0)
' get the average blue content.
ret = IpHstGet(GETSTATS, 2, stats(0))
offsets(2) = stats(0)
ret = IpHstDestroy()
' calculate the average white content
average = (offsets(0) + offsets(1) + offsets(2) ) / 3
' Add values to each channel in the image.
ret = IpAoiShow(FRAME_NONE)
offsets(0) = average - offsets(0)
offsets(1) = average - offsets(1)
offsets(2) = average - offsets(2)
ret = IpOpNumberRgb(offsets(0), OPA_ADD, 0)
```

Comments See Comments under IpOpNumberArithmetics.

See Also IpOpNumberArithmetics

IpOpShow

Syntax **IpOpShow**(*bShow*)

Description This function is used to open or close the **Image Operations** dialog box. Equivalent to selecting the **Operations** command to open the box, and clicking its **Close** button to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the **Arithmetic Operations** dialog box. Where: 0 - Closes the **Arithmetic Operations** dialog box if it is open. 1 - Opens the **Arithmetic Operations** dialog box. 2 - Close the **Background Correction** dialog box. 3 – Opens the **Background Correction** dialog box.

Example

```
ret = IpOpShow(1)
```

This statement displays the **Image Operations** dialog box.

Comments The **Arithmetic Operations** dialog box does not have to be open during execution of any of the arithmetic or logical operations. Its disposition, visible or hidden, is entirely your choice. You will want to display the window if your users will be required to make choices within it, but if your objective is simply to perform a predefined operation, you may want to run without opening it.

IpOutput

Syntax	**IpOutput**(*message*)
Description	This function prints a string to the **Macro Output** window. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.
Parameters	*message* **String** The string that is it to be printed to the **Macro Output** window.

Example

The following example prints the number of objects obtained from an earlier procedure. Notice that a line-ending sequence (i.e., a carriage return and a line feed) is included at the end of the string. This moves the cursor to the beginning of the next line so that is it in the proper positioned for the next `IpOutput` or `Debug.print` statement.

```
Dim numobj as integer
Dim NL as String
NL = Chr$(13) + Chr$(10)
ret = IpOutput("Number of objects: " + Str$(numobj)+ NL)
```

Comments

This function is similar to the IPBasic `Debug.print` function, which you may want to use instead of `IpOutput` because of the automatic formatting it provides. `Debug.print` also lets you print non-string expressions, directly.

The **Macro Output** window is limited to 25,000 characters. When this limit is reached, the oldest lines in the window are erased. To generate data files larger than 25,000 characters, save the contents of the window to a file, then append to that file in intervals.

It is not necessary to show the **Macro Output** window to print to it. In fact, your program will execute faster if you print while the window is closed, since the display will not require any processing.

See Also Print, IpOutputShow, IpOutputClear, IpOutputSave

IpOutputClear

Syntax	**IpOutputClear**( )
Description	This function clears the contents of the **Macro Output** window. It is equivalent to selecting the **Clear Screen** command on the **Macro Output** window's *Edit* menu.
Comments	It is not necessary to show the **Macro Output** window to clear it.
See Also	IpOutputShow, IpOutput, IpOutputSave

IpOutputSave

Syntax

IpOutputSave(*Filename, sMode*)

Description

This function saves the current contents of the **Macro Output** window to a file or to the Clipboard. It is equivalent to selecting the **Save**, **Append** or **Copy to Clipboard** command on the **Macro Output** window's *File* menu.

Parameters

Filename	**String**	A string specifying the name of the file to which the window contents will be will be written. This parameter is ignored if *sMode* is set to S_CLIPBOARD. When this is the case, just set *Filename* to an empty string (i.e., "").
sMode	**Integer**	An enumerated integer specifying whether the data is to be stored as a new file, appended to an existing file or written to the Clipboard. Where: 0 - Stores data to a new ASCII file (if the file already exists, it will be overwritten). S_APPEND - Appends data to existing ASCII file. S_CLIPBOARD - Copies data to the Clipboard.

Example

The following statement saves **Macro Output** window to an ASCII file.

```
ret = IpOutputSave("c:\ipwin\count.txt", 0)
```

The following statement appends **Macro Output** window to an ASCII file.

```
ret = IpOutputSave("c:\ipwin\count.txt", S_APPEND)
```

The following statement copies the **Macro Output** window to the Clipboard.

```
ret = IpOutputSave("", S_CLIPBOARD)
```

Comments

It is not necessary to show the **Macro Output** window to save its contents.

See Also

IpOutputShow, IpOutput, IpOutputClear

IpOutputSet

Syntax

IpOutputSet*(sCmd, sParam, lpParam)*

Description

This function sets tab stops in the **Macro Output** window.

Parameters

Command	**Integer**	An integer indicating the Output command. SETTABS is the only valid command, currently.
sParam	**Integer**	An integer indicating the number of tab stops in the lpParam array.
lpParam	**Integer**	An array of integers indicating the tab stops to be set.

See Also

IpOutputClear, IpOutputShow, IpOutput, IpOutputSave

IpOutputShow

Syntax **IpOutputShow**(*bShow*)

Description This function is used to open or close the **Macro Output** window. Equivalent to selecting the "Output Window" command to open the window, and double-clicking its control box to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the **Macro Output** window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Example The following statement displays the **Macro Output** window**.**

```
ret = IpOutputShow(1)
```

Comments It is not necessary to show the **Macro Output** window to print to it, save it or clear it. In fact, your program will execute faster if you leave the window closed while working with its contents, since the display will not have to be processed.

See Also IpOutput, IpOutputClear, IpOutputSave

IpPalSetGrayBrush

Syntax **IpPalSetGrayBrush**(*bForeGround*, *GrayIndex*)

Description This function sets the Foreground or Background color on the gray scale palette. Equivalent to clicking a color-square in the palette to assign it as the **Foreground** or **Background** color.

Parameters

bForeGround	**Integer**	An integer value of 0 or 1 specifying whether the color is to be selected as the Foreground or Background color. Where: 0 - Specifies Background color. 1 - Specifies Foreground color.
GrayIndex	**Integer**	An integer between 0 and 255 (inclusive) specifying the gray level to be assigned as the Foreground or Background color.

Example

```
ret = IpPalSetGrayBrush(0, 111)
```

This statement will set the gray scale-palette Background color to gray level 111.

See Also IpPalSetPaletteBrush, IpPalSetRGBBrush

IpPalSetPaletteBrush

Syntax **IpPalSetPaletteBrush**(*bForeGround*, *PaletteIndex*)

Description This function sets the Foreground or Background color for the palette-class palette. Equivalent to clicking a color-square in the palette to assign it as the **Foreground** or **Background** color.

Parameters

bForeGround	**Integer**	An integer value of 0 or 1 specifying whether the color is to be selected as the Foreground or Background color. Where: 0 - Specifies Background color. 1 - Specifies Foreground color.
PaletteIndex	**Integer**	An integer between 0 and 255 (inclusive) specifying the index (i.e., palette position) to be assigned as the Foreground or Background color.

Example

```
IpPalSetPaletteBrush(0, 10)
```

This statement will set the Palette-class Background color to index 10.

See Also

IpPalSetRGBBrush, IpPalSetGrayBrush

IpPalSetPaletteColor

Syntax

IpPalSetPaletteColor(*PaletteIndex, Red, Green, Blue*)

Description

This function changes the RGB values assigned to the specified palette index. Equivalent to double-clicking a color-square in the palette and editing the RGB values within it.

Parameters

PaletteIndex	**Integer**	An integer between 0 and 255 (inclusive) specifying the index to which the *Red, Green* and *Blue* values are to be applied.
Red	**Integer**	An integer between 0 and 255 (inclusive) specifying the Red value of the specified palette index.
Green	**Integer**	An integer between 0 and 255 (inclusive) specifying the Green value of the specified palette index.
Blue	**Integer**	An integer between 0 and 255 (inclusive) specifying the Blue value of the specified palette index.

Example

```
ret = IpPalSetPaletteColor(111, 0, 0, 192)
```

This statement will set index 111 to a bright blue (0 / 0 / 192).

IpPalSetRGBBrush

Syntax

IpPalSetRGBBrush(*bForeGround, Red, Green, Blue*)

Description

This function sets the Foreground or Background color for the RGB palette. Equivalent to clicking a color-square in the palette to assign it as the **Foreground** or **Background** color.

Parameters

bForeGround	**Integer**	An integer value of 0 or 1 specifying whether the color is to be selected as the Foreground or Background color. Where: 0 - Specifies Background color. 1 - Specifies Foreground color.
Red	**Integer**	An integer between 0 and 255 (inclusive) specifying the Red value of the color to be assigned as the Foreground or Background color.

Green	**Integer**	An integer between 0 and 255 (inclusive) specifying the Green value of the color to be assigned as the Foreground or Background color.
Blue	**Integer**	An integer between 0 and 255 (inclusive) specifying the Blue value of the color to be assigned as the Foreground or Background color.

Example

```
ret = IpPalSetRGBBrush(0, 255, 255, 0)
```

This statement will set the Background color on the RGB palette to yellow (i.e., 255 / 255 / 0).

See Also

IpPalSetGrayBrush, IpPalSetPaletteBrush

IpPalShow

Syntax

IpPalShow(*bShow*)

Description

This function is used to open or close the brush color selection or the image palette window. Equivalent to selecting the color patches button/window or selecting the **Edit Palette** command .

Parameters

bShow	**Integer**	An integer value specifying whether the window is to be shown. Where: 1 - Opens the brush color selection window. 2 - Opens the image palette window (for Palette class images only).

Example

```
ret = IpPalShow(1)
```

This statement will open the brush color selection window.

IpPcDefineColorSpread

Syntax

IpPcDefineColorSpread *(ColorSpread, ClrFrom, ClrTo, Method)*

Description

This function loads defines a custom color spread for the pseudo-color palette.

Parameters

ColorSpread	**Integer**	An integer value specifying the custom color spread to be defined, ColorSpread is greater than or equal to 8 (Custom 1) and less than or equal to 11 (Custom 4).
ClrFrom	**Long**	A long value specifying the starting color value. This color value is constructed by combining the desired red, green, and blue intensities (from 0 - 255) as follows: ClrFrom = red + green * 256 + blue * 65536
ClrTo	**Long**	A long value specifying the ending color value. This color value is constructed by combining the desired red, green and blue intensities (from 0 to 255) as follows: ClrTo = red + green * 256 + blue * 65536

	Method	**Integer**	An integer value specifying the method of interpolation between the starting and ending color values. Where: 0 - interpolate in RGB color space 1 - interpolate clockwise in HSI color space 2 - interpolate counter-clockwise in HSI color space

Example

```
ret = IpPcDefineColorSpread(8, 0, 16711680, 0)
```

This statement will define the Custom 1 color spread as being an RGB ramp from black to blue.

```
        ret = IpPcDefineColorSpread(9, 255, 65280, 1)
```

This statement will define the Custom 2 color spread as being a clockwise HSI ramp from red to green.

Comments

The custom color spread defined by this function will only be used if it is the active color spread.

See Also

IpPcSetColorSpread

IpPcDyeTint

Syntax

IpPcDyeTint (*DyeFile)*

Description

This function applies a dye tint to the current channel of the active workspace.

Parameters

	DyeFile	**String**	A string specifying the name of the dye file.

Comments

The DyeFile specification can be just the name of the dye (e.g. "DAPI"), in which case the dye will be loaded from the current dye path. If the DyeFile specification includes a full path to the dye file, that will override the current dye path. The name may include the `.IPD` extension, or if it does not the extension will be added automatically.

Tinting is applied to all of the frames of the active workspace that belong to the currently selected channel (the channel to which the active frame belongs). If the active workspace contains channel or wavelength information, the contiguous set of frames with identical information will be considered a channel set, and will be tinted. If this information is not available, the current sequence information (active portion or active frame) will be used.

Tinting inherently conflicts with Pseudo-Coloring. Pseudo-coloring is applied to the image (to all frames identically), while tinting is applied to sets of frames. Applying tinting will remove any pseudo-coloring, and vice-versa.

See Also

IpPcTint, IpDyeSelect

IpPcLoad

Syntax

IpPcLoad(*PseudoColorFile*)

Description

This function loads a pseudo-color palette from the specified file. Equivalent to clicking **File:Load** in the **Pseudo-Color** dialog box.

Parameters

	PseudoColorFile	**String**	A string specifying the name of the file from which the pseudo-color palette will be read.

Example

```
ret = IpPcLoad("C:\IPWIN\FOLIAGE.PSC")
```

This statement will load the pseudo-color file from a file called FOLIAGE.PSC in the \IPWIN directory on the C: drive.

See Also

IpPcSave

IpPcSave

Syntax

IpPcSave(*PseudoColorFile*)

Description

This function saves the current pseudo-color palette to a file. Equivalent to clicking **File**:**Save** in the **Pseudo-Color** dialog box.

Parameters

PseudoColorFile	**String**	A string specifying the name of the file to which the current pseudo-color palette will be written.

Example

```
ret = IpPcSave("C:\IPWIN\BONEMASS.PSC")
```

This statement will save the current pseudo-color palette to the BONEMASS.PSC file in the \IPWIN directory on the C: drive.

See Also

IpPcLoad

IpPcSaveData

Syntax

IpPcSaveData*(Filename, Flag)*

Description

This function saves the pseudocolor percentage area information into the specified file.

Parameters

Filename	**String**	Name of the data file.
Flag	**Integer**	Valid values for Flag are: S_STATS = append statistical information to the end of the file S_HEADER = save with header S_X_AXIS = save with the left column S_DDE = transfer data using DDE S_APPEND = append data to end of file, will overwrite exiting file if not specified S_CLIPBOARD = copies the data to the Windows Clipboard

Example

```
ret = IpPcSaveData(“C:\IPWIN\Pseudo.pc”, S_DDE+S_HEADER+S_X_AXIS+
S_STATS)
```

Comments

Flag values can be "OR'd" together.

IpPcSetColor

Syntax

IpPcSetColor(*DivNo*, *Red*, *Green*, *Blue*)

Description

This function assigns a color to the specified pseudo-color palette interval. Equivalent to clicking the **Edit** button in the **Pseudo-Color** dialog box, and setting the division and color values in the **Division Attributes** dialog box.

Parameters

DivNo	**Integer**	An integer between 1 and 128 (inclusive) specifying the interval to which the specified color is to be assigned.
Red	**Integer**	An integer between 0 and 255 (inclusive) specifying the level of Red in the assigned color.
Green	**Integer**	An integer between 0 and 255 (inclusive) specifying the level of Green in the assigned color.
Blue	**Integer**	An integer between 0 and 255 (inclusive) specifying the level of Blue in the assigned color.

Example

```
ret = IpPcSetColor(1, 200, 0, 0)
```

This statement will assign the color Red (255, 0, 0) to the first interval in the selected range.

Comments

Note that *DivNo* numbering begins with one, not zero.

See Also

IpPcSetRange, IpPcSetDivisions

IpPcSetColorSpread

Syntax **IpPcSetColorSpread** *(ColorSpread)*

Description This function selects a particular color spread for the pseudo-color palette.

Parameters

ColorSpread	**Integer**	An integer value specifying the custom color spread to define. Where ColorSpread: 0 - red to green to blue 1 - blue to green to red 2 - black to red 3 - black to green 4 - black to blue 5 - black to cyan 6 - black to magenta 7 - black to yellow 8 - Custom spread 1 9 - Custom spread 2 10 - Custom spread 3 11 - Custom spread 4

Example

```
ret = IpPcSetColorSpread(8)
```

This statement will select the Custom 1 color spread.

See Also IpPcDefineColorSpread

IpPcSetDivisions

Syntax **IpPcSetDivisions**(*Divisions*)

Description This function sets the number of colors (intervals) into which the selected intensity-range is divided. Equivalent to setting the **Divisions** value in the **Pseudo-Color** dialog box.

Parameters

Divisions	**Integer**	An integer specifying the number of intervals into which the selected range is to be divided. Must be a value between 1 and 128 (inclusive).

Example

```
ret = IpPcSetDivisions(100)
```

This statement will divide the current range into 100 pseudo-color intervals.

See Also IpPcSetRange

IpPcSetRange

Syntax **IpPcSetRange**(*DivNo*, *FromVal*, *ToVal*)

Description This function specifies the intensity range to which pseudo-coloring is to be applied. Also used to specify the beginning and ending value of a specified palette interval. Equivalent to adjusting the upper and lower limit values in the **Pseudo-Color** dialog box. Also equivalent to setting the interval start/end values in the **Division Attributes** dialog box.

Parameters

DivNo	**Integer**	An integer between 1 and 128, specifying the interval for which beginning (*FromVal*) and endpoints (*ToVal*) are to be set, or -1 to specify the entire range.
FromVal	**Integer**	An integer between 0 and 255 (inclusive) specifying the first value in the specified interval or range.
ToVal	**Integer**	An integer between 0 and 255 (inclusive) specifying the last value in the specified interval or range.

Example

```
ret = IpPcSetRange(2, 60, 100)
```

This statement will assign a range of 60 - 100 (inclusive) to the second interval.

```
ret = IpPcSetRange(-1, 0, 110)
```

This statement will set 0 to 110 (inclusive) as the range to which all pseudo-coloring will be applied.

Comments

The *FromVal* and *ToVal* values must be expressed as an integer from 0 to 255 (inclusive). If your image is *Gray Scale 12* or *Single Point*, the normalized equivalents of these values will be used.

When you record a macro that sets ranges, *Auto-Pro* may record more than one `IpPcSetRange` statement for each division. This occurs because one statement is posted when you set the starting value, and another is posted when you set the end value. You may edit out the unnecessary `IpPcSetRange` statements, and leave only the single statement that actually sets the range that is to be defined.

IpPcShow

Syntax

IpPcShow(*bShow*)

Description

This function is used to apply or reset the pseudo-color palette for the active image. Equivalent to selecting the **Pseudo-Color** command to open the dialog box, and clicking the **OK** or **Cancel** buttons to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the **Pseudo-Color** palette is to be applied or removed from the active image. Where: 0 - Resets the pseudo-color palette, and removes pseudo-coloring from the active image. 1 - Applies the pseudo-color palette to the active image.

Example

```
ret = IpPcShow(1)
```

This statement will apply the pseudo-color palette to the active image.

IpPcTint

Syntax

IpPcTint *(Tint)*

Description

This function applies or removes a tint to the current channel of the active workspace.

Parameters	*Tint*	**Integer**	Tint must be one of the following constants, or a wavelength expressed in nanometers from 300-800:
			TINT_REMOVE = Removes any tinting
			TINT_RED = Tints Red
			TINT_GREEN = Tints Green
			TINT_BLUE = Tints Blue

Comments

Tinting is applied to all of the frames of the active workspace that belong to the currently selected channel (the channel to which the active frame belongs). If the active workspace contains channel or wavelength information, the contiguous set of frames with identical information will be considered a channel set, and will be tinted. If this information is not available, the current sequence information (active portion or active frame) will be used.

Tinting inherently conflicts with Pseudo-Coloring. Pseudo-coloring is applied to the image (to all frames identically), while tinting is applied to sets of frames. Applying tinting will remove any pseudo-coloring, and vice-versa.

The TINT_REMOVE command will remove tinting applied by **IpPcDyeTint**

See Also IpPcDyeTint

IpPlFilter

Syntax **IpPlFilter** *(szCategory, szFilter)*

Description This function specifies which filter and category to use.

Parameters	*szCategory*	**String**	Specifies the filter category
	SzFilter	**String**	Specifies the filter function to use

Return Value

DocID if successful
IPCERR_INVARG if incorrect parameters are specified
IPCERR_FUNC otherwise

See Also IpPlShow, IpPlImport

IpPlImport

Syntax	**IpPlImport** *(szImportName)*		
Description	This function specifies which third-party import function to use.		
Parameters	*szImportName*	**String**	Name of the import function
Return Value	DocID if successful IPCERR_INVARG if incorrect parameters are specified IPCERR_FUNC otherwise		
See Also	IpPlShow, IpPlFilter		

IpPlShow

Syntax	IpPlShow **(***PlugWindow, bShow*)		
Description	This function shows or hides the third-party plug-in dialogs.		
Parameters	*PlugWindow*	**integer**	0 = selects the Import dialog. 1 = selects the Filter dialog.
	bShow	**integer**	A value of 0 or 1, specifying whether the plug-in command window is to be open or closed. Where: 0 - Closes the window if it is already open. 1 - Opens the window.
Return Value	IPCERR_NONE if successful IPCERR_INVARG if incorrect parameters are specified IPCERR_FUNC otherwise		
See Also	IpPlImport, IpPlFilter		

IpPlotCreate

Syntax	**IpPlotCreate***(title)*		
Description	Create a plot window with the given title.		
Parameters	*title*	**String**	Names the plot window
See Also	IpPlotData, IpPlotRange, IpPlotSet, IpPlotShow, IpPlotUpdate, IpPlotDestroy		

IpPlotData

Syntax **IpPlotData***(plotId, axis, valueType, values, count)*

Description Plots the data in the window referenced by *plotID.*

Parameters

axis	**Integer**	Can be either the vertical axis (1) or the horizontal axis (0).
plotID	**Integer**	Integer value greater than zero.
valueType	**Integer**	Type of data to be plotted: PDT_INT16, PDT_INT32, PDT_SINGLE, PDT_DSINGLE
values	**Integer**	Contains the data to be plotted.
count	**Integer**	Number of elements to be plotted.

See Also IpPlotCreate, IpPlotRange, IpPlotSet, IpPlotShow, IpPlotUpdate, IpPlotDestroy

Comments For most plots, only the y-axis data needs to be set; the x-axis is incremented automatically by default.

IpPlotDestroy

Syntax **IpPlotUpdate** *(plotID)*

Description Destroys the plot

Parameters

plotID	**Integer**	Integer value greater than zero.

See Also IpPlotCreate, IpPlotData, IpPlotRange, IpPlotSet, IpPlotShow, IpPlotUpdate

IpPlotRange

Syntax **IpPlotRange***(plotId, axis, valueType, rangeType, values,)*

Description Sets the range for the values that will be visible on the graph for the horizontal or vertical axis.

Parameters

axis	**Integer**	Can be either the vertical axis (1) or the horizontal axis (0).
plotID	**Integer**	Integer value greater than zero.
valueType	**Integer**	Type of data to be plotted: PDT_INT16, PDT_INT32, PDT_SINGLE, PDT_DSINGLE

rangeType	**Integer**	Must be one of the following: RGE_FIXEDMIN *values* contins the lower range value. The upper range is calculated automatically from the data itself. RGE_FIXEDMAX *values* contains the upper range values. RGE_FIXED*values* contains the upper and lower range values. RGE_AUTO *values* is not used. The lower and upper range values are calculated automatically from the data itself.
values	**Integer**	Contains one or two numbers defining the range.

See Also IpPlotData, IpPlotCreate, IpPlotSet, IpPlotShow, IpPlotUpdate, IpPlotDestroy

IpPlotSet

Syntax **IpPlotSet***(plotId, commandString,)*

Description Sets the graph parameters, legends, styles, etc.

Parameters

plotID	**Integer**	Integer value greater than zero.
commandString	**String**	Can contain any number of parameters and is of the following form: [ ] indicate optional parameters.

Parameter1 [=value1], parameter2 [=value2], parameter3 = [value3]…

Parameters	**Values**	**Description**
histogram	none	bar chart without gaps between bars
line	none	line plot
scattergram	none	points plot
bars	none	bar chart with gaps
title	string	title of the graph
title	on, off	title of the graph on or off
axis	string	“on” or “off” i.e. axis is shown or hidden
x label	string	title of the x-axis
x label	on, off	title of the x-axis on or off
y label	string	title of the y-axis
y label	on, off	title of the y-axis on or off

Parameters	Values	Description
majortics	string	major tic marks turned “on” or “off”
minortics	string	minor tic marks turned “on” or “off”
grid	string	grid on the graph turned “on” or “off”
legend	string	graph legend turned “on” or “off”
line style	string	style of the plot line: solid, dash, dashdot, dot, dashdotdot
plot title	string	title of the data plot
x tics	number	number of tics on x-axis
y tics	number	number of tics on y-axis

See Also IpPlotData, IpPlotCreate, IpPlotShow, IpPlotUpdate, IpPlotDestroy

IpPlotShow

Syntax **IpPlotShow***(plotID, sMode)*

Description Shows or hides the plot

Parameters

plotID	**Integer**	Integer value greater than zero.
sMode	**Integer**	1 = show plot, 0 = hide plot

See Also IpPlotCreate, IpPlotData, IpPlotRange, IpPlotSet, IpPlotUpdate, IpPlotDestroy

IpPlotUpdate

Syntax	**IpPlotUpdate***(plotID)*		
Description	Updates the plot, after the data has changed		
Parameters	*plotID*	**Integer**	Integer value greater than zero.
See Also	IpPlotCreate, IpPlotData, IpPlotRange, IpPlotSet, IpPlotShow, IpPlotDestroy		

IpPlShow

Syntax **IpPlShow (*PlugWindow, bShow*)**

Description This function shows or hides the third-party plug-in dialogs.

Parameters	*PlugWindow*	**integer**	0 = selects the Import dialog. 1 = selects the Filter dialog.
	bShow	**integer**	A value of 0 or 1, specifying whether the plug-in command window is to be open or closed. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Return Value IPCERR_NONE if successful
IPCERR_INVARG if incorrect parameters are specified
IPCERR_FUNC otherwise

See Also IpPlImport, IpPlFilter

IpPortIOControl

Syntax

IpPortIOControl *(Port, Command)*

Description

This function gets the current value of a specified attribute or setting.

Parameters

Port	**Integer**	The serial port to control, from 1-8
Command	**Integer**	The command to apply to the serial port (see below)

Return Value

0 if the command can be completed, a negative error code if not.

Comments

The following commands are supported after configuring the ports:

Command	**Description**
PORTIO_INIT	Initializes the port with the current serial I/O configuration (baud rate, parity, etc.), making the port ready for use with IpPortIORead and/or IpPortIOWrite.
PORTIO_CLOSE	Closes the port, releasing the port to other applications.
PORTIO_UPDATE	Updates the communications configuration for the port.
PORTIO_CLEAR	Clears the port's input buffer, recommended prior to sending a new command IpPortIOWrite that may result in a response string.

Example

```
Attribute VB_Name = "Module1"
Option Explicit
Private Const COM1 = 1
Private Const COM2 = 2
Private Const COM3 = 3
Private Const COM4 = 4
Sub Open_Port()
ret = IpPortIOSetInt(PORTIOSET_SERIAL_BAUD, COM1,
PORTIO_BAUD_115200)
ret = IpPortIOSetInt(PORTIOSET_SERIAL_DATASIZE, COM1,
PORTIO_DATASIZE_EIGHT)
ret = IpPortIOSetInt(PORTIOSET_SERIAL_PARITY, COM1,
PORTIO_PARITY_NONE)
ret = IpPortIOSetInt(PORTIOSET_SERIAL_STOPBITS, COM1,
PORTIO_STOP_ONE)
ret = IpPortIOSetInt(PORTIOSET_SERIAL_FLOW, COM1,
PORTIO_FLOW_NONE)
ret = IpPortIOControl(COM1, PORTIO_INIT)
End Sub
Sub HelloWorld()
Dim sMessage As String
Dim sOut As String*255
sOut = "Hello World"
ret = IpStGetString("Message to send:", sOut, 255)
sMessage = IpTrim(sOut)
ret = IpPortIOWrite(COM1, sMessage, 1, -1)
Debug.Print ret; vbTab; Len(sMessage); vbTab; sMessage
End Sub
Sub ReadPort()
```

```
Dim sOut As String*255
Dim sMessage As String
Dim count As Long
Debug.Clear
ret = IpOutputClear()
sOut = " "
count = 0
sMessage = ""
Debug.Print "Begin read"
  Do
    count = count + 1
    ret = IpPortIORead(COM1, sOut, 1, 255, 100)
    'If sOut <> Chr(0) Then Debug.Print ret; vbTab; count;
vbTab; sOut
    If ret > 0 And Asc(sOut) <> 10 And Asc(sOut) <> 13
Then
        Debug.Print ret; vbTab; count; vbTab; sOut; vbTab;
GetTickCount()
        sMessage = sMessage + IpTrim(sOut)
    End If
Loop Until Asc(sOut) = 13 'sOut = Chr(0)
Debug.Print "Finished reading port:  "; sMessage
End Sub
Sub Close_Port()
ret = IpPortIOControl(COM1, PORTIO_CLOSE)
End Sub
```

IpPortIOGetInt

Syntax **IpPortIOGetInt** *(Attribute, Paramter, Value)*

Description This function gets the current value of a specified attribute or setting.

Parameters

Attribute	**Integer**	The attribute to inquire (see Comments below)
Param	**Integet**	A value needed for some attributes (see Comments below)
Value	**Integer**	An integer to receive the current value for the specified attribute (see Comments below)

Return Value 0 if the attribute can be inquired, a negative error code if not.

See Also IpPortIOSetInt

Comments Note that only three inquiries are supported prior to configuring the ports: PORTIO_NUM_BOARDS, PORTIO_BOARD_DISABLED and PORTIO_DIGITAL_CONFIGURATION. The following attributes are supported:

Attribute	Param value	Description
PORTIO_NUM_BOARDS	Not used, set to 0	Returns the number of parallel ports, each of which is treated as an independent I/O “board”.
PORTIO_NUM_D_INPUTS	Not used, set to 0	Returns the total number of 8-bit digital inputs that are configured. Note that a particular board can only support a single 8-bit input or output – see also PORTIO_DIGITAL_CONFIGURATION. This inquiry will return an error if the ports are not configured.
PORTIO_NUM_D_OUTPUTS	Not used, set to 0.	Returns the total number of 8-bit digital outputs that are configured. Note that a particular board can only support a single 8-bit input or output – see also PORTIO_DIGITAL_CONFIGURATION. This inquiry will return an error if the ports are not configured.
PORTIO_NUM_D_INPUT_PINS	Not used, set to 0	Returns the total number of single-bit digital input pins that are configured. Note that a particular board can support 8 1-bit inputs or outputs – see also PORTIO_DIGITAL_CONFIGURATION. This inquiry will return an error if the ports are not configured.
PORTIO_NUM_D_OUTPUT_PINS	Not used, set to 0	Returns the total number of single -bit digital output pins that are configured. Note that a particular board can only support 8 1-bit inputs or outputs – see also PORTIO_DIGITAL_CONFIGURATION. This inquiry will return an error if the ports are not configured.

Attribute	Param value	Description
PORTIO_D_INPUT_BRD	The index of the input port to inquire	Returns the board containing the specified 8-bit input port.
PORTIO_D_OUTPUT_BRD	The index of the output port to inquire	Returns the board containing the specified 8-bit output port.
PORTIO_D_INPUT_PIN_INDEX	The index of the input pin to inquire	Returns the index of the pin on the port that corresponds to the specified 1-bit input pin. Note that pin indexes range from 0 to 7, which correspond to pins 2-9 of the physical connector.
PORTIO_D_INPUT_PIN_BRD	The index of the input pin to inquire	Returns the board containing the specified 1-bit input pin.
PORTIO_D_OUTPUT_PIN_ INDEX	The index of the output pin to inquire	Returns the index of the pin on the port that corresponds to the specified 1-bit input pin. Note that pin indexes range from 0 to 7, which correspond to pins 2-9 of the physical connector.
PORTIO_D_OUTPUT_PIN_BRD	The index of the output pin to inquire	Returns the board containing the specified 1-bit output pin.
PORTIO_D_INPUT_VALUE	The index of the input port to inquire	Returns the current value on the specified 8-bit input port.
PORTIO_D_INPUT_PIN_VALUE	The index of the input pin to inquire	Returns the current value on the specified single-bit input pin.
PORTIO_BOARD_DISABLED	The index of the board to inquire	Returns whether the specified board is disabled in the current configuration.
PORTIO_DIGITAL_ CONFIGURATION	The index of the board to inquire	Returns the port configuration for the specified board, from the following: PORTIO_D_8BIT_INPUT PORTIO_D_8BIT_OUTPUT PORTIO_D_8_INPUT_PINS PORTIO_D_8_OUTPUT_PINS

PORTIO_SERIAL_BAUD	Value of PORTIO_BAUDRATES	Should be one of the following:
		PORTIO_BAUD_300 = 0,
		PORTIO_BAUD_1200 = 1,

		PORTIO_BAUD_2400 = 2,
		PORTIO_BAUD_9600 = 3,
		PORTIO_BAUD_14400 = 4,
		PORTIO_BAUD_19200 = 5,
		PORTIO_BAUD_38400 = 6,
		PORTIO_BAUD_56000 = 7,
		PORTIO_BAUD_57600 = 8,
		PORTIO_BAUD_115200 = 9,
		PORTIO_BAUD_128000 = 10,
		PORTIO_BAUD_256000 = 11,

Attribute	Param value	Description
PORTIO_SERIAL_DATASIZE	A value between 5 and 8	Sets the byte size for the data transfter to and from the device. Should be one of the following PORTIO_DATASIZE VALUES: PORTIO_DATASIZE_FIVE PORTIO_DATASIZE_SIX PORTIO_DATASIZE_SEVEN PORTIO_DATASIZE_EIGHT

PORTIO_SERIAL_PARITY	Value of PORTIO_PARITYTYPES	Should be one of the following:
		PORTIO_PARITY_NONE = 0,
		PORTIO_PARITY_EVEN = 1,
		PORTIO_PARITY_ODD = 2,

PORTIO_SERIAL_FLOW	Serial port to inquire from 1-8	Returns the currently selected flow control for the specified port

PORTIO_SERIAL_STOPBITS	Value of PORTIO_STOPBITS	Should be one of the following:
		PORTIO_STOP_ONE = 0,
		PORTIO_STOP_ONE_PT_FIVE = 1,
		PORTIO_STOP_TWO = 2,

PORTIO_BLOCK_UPDATE	Not used, set to 0	Returns whether output is currently blocked. Output may be blocked using IpPortIOSetInt in order to assure that a number of pins are set as close to simultaneously as possible.
PORTIO_OPEN_LAST_CONFIG	Not used, set to 0	Returns whether the last saved configuration will automatically be opened.
PORTIO_D_OUTPUT_VALUE	The index of the output port to inquire	Returns the last value that the 8-bit output port was set to.
PORTIO_D_OUTPUT_PIN_ VALUE	The index of the output pin to inquire	Returns the last value that the single-bit output pin was set to.

IpPortIOOpenConfig

Syntax	**IpPortIOOpenConfig** *(FileName)*		
Description	This function opens an existing configuration file		
Parameter	*FileName*	**String**	The name of the selected port.
Return Value	Zero if the file opens successfully and th e ports are configured, or a negative error code if the file is not found or cannot be opened, if the configuration file contains too many or too few ports, or if the configuration fails for some reason.		
Comments	This function will respect template mode and display a *File:Open* dialog if in template mode, or if the FileName string is empty.		

IpPortIORead

Syntax	**IpPortIORead** *(Port, Response, Terminated, Count, TimeOut)*		
Description	This function reads the response from the specified serial port.		
Parameters	*Port*	**Integer**	The serial port to read, from 1-8
	Response	**String**	A fixed-length string to receive the response.
	Terminated	**Integer**	If non-zero, indicates the the read should complete when a terminating zero is received (e.g. for an ASCII response string)
	Count	**Integer**	The maximum number of characters to receive from the serial port (see comments)
	TimeOut	**Long**	The maximum number of milliseconds to wait for the response.
Return Value	The number of characters received if the command can be completed, a negative error code if not.		
Comments	IpPortIORead can only be used after the ports have been configured, and the specified port has been opened using the PORTIO_INIT command to IpPortIOControl. The Response string should be a fixed length string of sufficient length to receive the response. Typically a device returns an ASCII string terminated by a character zero terminator. For this purpose, the Count parameter can be set to the size of the string buffer, and any non-zero value passed into Terminated. Under these conditions, IpPortIORead will read characters until the zero terminator is encountered, or the specified number of characters are read, or the operation times out. IpPortIORead can also be used with devices that do not return an ASCII zero-terminated string, in which case the length of the expected response must be known.		
See Also	IpPortIOControl example code		

IpPortIOSaveConfig

Syntax	**IpPortIOSaveConfig** *(FileName)*
Description	This function saves an existing configuration file
Parameters	*FileName* **String** The name of the selected port.
Return Value	Zero if the file is successfully saved and th e ports are configured; a negative error code if the file cannot be saved, or if the configuration fails for some reason.
Comments	This function will respect template mode and display a *File:Save As* dialog if in template mode, or if the FileName string is empty.

IpPortIOSetInt

Syntax	**IpPortIOSetInt** *(Attribute, Paramter, Value)*
Description	This function sets the current value of a specified attribute or setting.
Parameters	*Attribute* **Integer** The attribute to inquire (see Comments below)
	Param **Integet** A value needed for some attributes (see Comments below)
	Value **Integer** An integer to receive the current value for the specified attribute (see Comments below)
Return Value	0 if the attribute can be inquired, a negative error code if not.
See Also	IpPortIOGetInt, IpPortIOControl sample code
Comments	Note that only three inquiries are supported prior to configuring the ports: PORTIO_NUM_BOARDS, PORTIO_BOARD_DISABLED and PORTIO_DIGITAL_CONFIGURATION. The following attributes are supported:

Attribute	Param value	Description
PORTIO_BOARD_DISABLED	The index of the board to inquire	Set the specified board disabled (if Value is non-zero) or enabled in the current configuration.
PORTIO_DIGITAL_CONFIGURATION	The index of the board to inquire	Sets the port configuration for the specified board, from the following: PORTIO_D_8BIT_INPUT PORTIO_D_8BIT_OUTPUT PORTIO_D_8_INPUT_PINS PORTIO_D_8_OUTPUT_PINS

PORTIO_BLOCK_UPDATE	Not used, set to 0	Sets whether output is currently blocked. Output may be blocked in order to assure that a number of pins are set as close to simultaneously as possible.
PORTIO_OPEN_LAST_CONFIG	Not used, set to 0	Sets whether the last saved configuration will automatically be opened.
PORTIO_D_OUTPUT_VALUE	The index of the output port to inquire	Sets the 8-bit output port to the specified value.
PORTIO_D_OUTPUT_PIN_VALUE	The index of the output pin to inquire	Sets the single-bit output pin to active (if non-zero) or inactive.

PORTIO_SERIAL_BAUD	Value of PORTIO_BAUDRATES	Should be one of the following:
		PORTIO_BAUD_300 = 0,
		PORTIO_BAUD_1200 = 1,
		PORTIO_BAUD_2400 = 2,
		PORTIO_BAUD_9600 = 3,
		PORTIO_BAUD_14400 = 4,
		PORTIO_BAUD_19200 = 5,
		PORTIO_BAUD_38400 = 6,
		PORTIO_BAUD_56000 = 7,
		PORTIO_BAUD_57600 = 8,
		PORTIO_BAUD_115200 = 9,
		PORTIO_BAUD_128000 = 10,
		PORTIO_BAUD_256000 = 11,

PORTIO_SERIAL_DATASIZE	A value between 5 and 8	Sets the byte size for the data transfter to and from the device. Should be one of the following : PORTIO_DATASIZE_FIVE PORTIO_DATASIZE_SIX PORTIO_DATASIZE_SEVEN PORTIO_DATASIZE_EIGHT
PORTIO_SERIAL_FLOW	Serial port to inquire from 1-8	Sets the flow control for the active port PORTIO_FLOW _NONE = 0, PORTIO_FLOW _XONXOFF = 1, PORTIO_FLOW _HARDWARE = 2,

PORTIO_SERIAL_PARITY	Value of PORTIO_PARITYTYPES	Should be one of the following:
		PORTIO_PARITY_NONE = 0,
		PORTIO_PARITY_EVEN = 1,
		PORTIO_PARITY_ODD = 2,

PORTIO_SERIAL_STOPBITS	Value of PORTIO_STOPBITS	Should be one of the following:
		PORTIO_STOP_ONE = 0,
		PORTIO_STOP_ONE_PT_FIVE = 1,
		PORTIO_STOP_TWO = 2,

IpPortIOShowConfig

Syntax **IpPortIOShowConfig** *()*

Description This function shows or hides the port configuration dialog

Return Value Zero if the ports are configured, a negative error code if there are no parallel ports available for configuration, if the configuration is canceled, or if the configuration fails for some reason.

Comments The function will not return until the dialog is exited by clicking OK or the close box.

IpPortIOWrite

Syntax **IpPortIOWrite** *(Port, Command, Terminated, Count)*

Description This function writes a response to he specified serial port.

Parameters

Port	**Integer**	The serial port to write, from 1-8
Command	**String**	The command string to send to the port
Terminated	**Integer**	If non-zero, indicates the the write should be completed by a terminating zero in the command string (e.g. for an ASCII response string)
Count	**Integer**	The maximum number of characters to write to the serial port (see comments)

Return Value The number of characters sent if the command can be completed, a negative error code if not.

Comments IpPortIOWrite can only be used after the ports have been configured, and the specified port has been opened using the PORTIO_INIT command to IpPortIOControl.

Typically a device command should be an ASCII string terminated by a character zero terminator. For this purpose, the Count parameter can be set to -1, and any non-zero value passed into Terminated. Under these conditions, IpPortIOWrite will write all characters in the Command string up to and including the zero terminator.

IpPortIOWrite can also be used with devices that do not take ASCII terminated strings, in which case Terminated should be set to zero, and the Count set to the precise number of characters to send.

IpProfCreate

Syntax

IpProfCreate( )

Description

This function opens the **Line Profile** window for the active image. Equivalent to selecting the **Line Profile** command.

Return Value

This function returns the Profile ID if successful. A negative value is returned if an error occurred.

Comments

An image must be open before calling this function. The newly created profile window becomes the “active” (i.e., selected) line profile as soon as it is created.

See Also

IpProfMove, IpProfDestroy, IpProfSelect

IpProfDestroy

Syntax

IpProfDestroy( )

Description

This function closes the active line profile window and clears any data associated with it. Equivalent to selecting the **Close** command in the **Line Profile** *File* menu.

Comments

Note that this function operates upon the “active” profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfDestroy`.

See Also

IpProfCreate, IpProfSelect

IpProfGet

Syntax

IpProfGet(*Cmd, Param, OutVal*)

Description

Use this function to get information relating to the selected line profile. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which specifies the type of information you want to retrieve. Must be one of the following: GETINDEX GETNUMPTS GETVALUES GETSTATS GETRANGE GETPOINTS See definitions under Comments, below
Param	**Integer**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command
OutVal	*See below*	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Return Value

All commands listed below return 0 if successful. A negative error, otherwise.

Example

The following example calculates the mean value of the active profile.

```
Dim numbins As Integer
Dim ProfArea As Single, Mean as single
Dim i As Integer
ret = IpProfGet(GETNUMPTS, 0, numbins)
Redim profdat(numbins) As Single
ret = IpProfGet(GETVALUES, numbins, profdat(0))
ProfArea = 0#
For i = 0 To numbins - 1
    ProfArea = ProfArea + profdat(i)
Next i
If numbins > 0 Then
    Mean = ProfArea / numbins
End If
  .
  .
  .
```

The following example gets the mean value directly

```
  .
  .
  .
Redim stats(10) As Single
ret = IpProfGet(GETSTATS, 0, stats(0))
Mean = stats(0)
```

The following example shifts the line profile down and to the right.

```
Redim endPts(2) As POINTAPI
ret = IpProfGet(GETPOINTS, 0, endPts(0))
endPts(0).x = endPts(0).x + 20
endPts(0).y = endPts(0).y + 10
endPts(1).x = endPts(1).x + 20
endPts(1).y = endPts(1).y + 10
ret = IpProfLineMove(endPts(0).x, endPts(0).y, endPts(1).x,
endPts(1).y)
```

Comments

Note that this function operates upon the "active" line profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfGet`.

Profiles of RGB images contain 3 times as much data as an equivalent *Gray Scale* profile. The data are organized Red channel first, then Green, then Blue.

When passing an array to *Image-Pro* from a BASIC program, be sure to pass the first element of the array by reference (See GETVALUES statement in example, above).

***Cmd* VALUE**	**DESCRIPTION**
GETINDEX	Use this command to determine the active profile's ID. The ID is written to *OutVal.* This value can be used later to select this profile with `IpProfSelect( )`. <table><tr><th>*Param* VALUE</th><th>*OutVal* TYPE</th></tr><tr><td>Not used by GETINDEX. Must be set to 0.</td><td>BASIC, **Integer** C, **LPSHORT**</td></tr></table>

<table>
<tr><th><em>Cmd</em> VALUE</th><th>DESCRIPTION</th></tr>
<tr><td></td><td></td></tr>
<tr><td>GETNUMPTS</td><td>Use this command to determine the number of points in the profile. The number is written to <em>OutVal</em>.
<table>
<tr><th><em>Param</em> VALUE</th><th><em>OutVal</em> TYPE</th></tr>
<tr><td>Not used by GETNUMPTS. Must be set to 0.</td><td>BASIC, <b>Integer</b>
C, <b>LPSHORT</b></td></tr>
</table></td></tr>
<tr><td>GETVALUES</td><td>Use this command to get the selected profile's values. The values are written to the one-dimensional array specified in <em>OutVal.</em> For a <em>True Color</em> profile the entire Red channel profile is written into the array first, then the Green channel, then the Blue channel.
<em>Note - do not use the keyword</em> <b>Statistics</b> <em>as the name of your OutVal array. This is an Auto-Pro reserved word. Using it as a variable name can cause a GPF.</em></td></tr>
<tr><td>GETVALUES</td><td>
<table>
<tr><th><em>Param</em> VALUE</th><th><em>OutVal</em> TYPE</th></tr>
<tr><td>An integer specifying the length of your <em>OutVal</em> array. If you are getting data from a <em>True Color</em> image, your array must be large enough to hold 3 times the number of points in the profile.
<em>Note - you can use GETNUMPTS to determine the number of elements needed in this array.</em></td><td>BASIC , <b>Single</b>.
C, <b>LPSINGLE</b>
<em>Note - OutVal must specify an array.</em></td></tr>
</table></td></tr>
<tr><td>GETSTATS</td><td>Use this command to get the statistical data associated with the selected profile. For <em>True Color</em> images, information will be obtained for the color channel specified in <em>Param</em> (see below).
The statistics are written to a 10-element array in <em>OutVal</em>, as follows:
<em>OutVal (0)</em> - Mean value
<em>OutVal (1)</em> - Standard Deviation
<em>OutVal (2)</em> - Area under the profile
<em>OutVal (3)</em> - Minimum value in profile
<em>OutVal (4)</em> - Maximum value in profile
<em>OutVal (5)</em> - Not Currently Used
<em>OutVal (6)</em> - Not Currently Used
<em>OutVal (7)</em> - Not Currently Used
<em>OutVal (8)</em> - Not Currently Used
<em>OutVal (9)</em> - Not Currently Used</td></tr>
</table>

<table>
<tr><th><b><i>Cmd</i> VALUE</b></th><th><b>DESCRIPTION</b></th></tr>
<tr><td></td><td>
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>An integer specifying the color channel for which statistics are to be obtained. Where:
0 - Red Channel
1 - Green Channel
2 - Blue Channel
This parameter is ignored if the image is not <i>True Color</i>. When this is the case, just set <i>Param</i> to 0.</td><td>BASIC, <b>Single</b>.
C, <b>LPSINGLE</b>
<i>Note - OutVal must specify a 10-element array.</i></td></tr>
</table>
</td></tr>
<tr><td>GETRANGE</td><td>Use this command to get the range information associated with the selected profile. For <i>True Color</i> images, information will be obtained for the color channel you specify in <i>Param</i> (see below).
The range information is written to a 10-element array in <i>OutVal</i>, as follows:
<i>OutVal (0)</i> - Start range (X1)
<i>OutVal (1)</i> - End range (X2)
<i>OutVal (2)</i> - Area under profile that is inside the range
<i>OutVal (3)</i> - Area, above, as a percent of total area (%)
<i>OutVal (4)</i> - Profile value at start of range (Y1)
<i>OutVal (5)</i> - Profile value at end of range (Y2)
<i>OutVal (6)</i> - Pixel number at start of range (0-based)
<i>OutVal (7)</i> - Pixel number at end of range (0-based)
<i>OutVal (8)</i> - Not Currently Used
<i>OutVal (9)</i> - Not Currently Used
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>An integer specifying the color channel for which range information is to be obtained. Where:</td><td>BASIC, <b>Single</b>.
C, <b>LPSINGLE</b></td></tr>
</table>
</td></tr>
<tr><td></td><td>
<table>
<tr><th><i>Param</i> <b>VALUE</b></th><th><i>OutVal</i> <b>TYPE</b></th></tr>
<tr><td>0 - Red Channel
1 - Green Channel
2 - Blue Channel
This parameter not used when the image is not <i>True Color</i>. Set to 0.</td><td>BASIC, <b>Single</b>.
C, <b>LPSINGLE</b>
<i>Note - OutVal must specify a 10-element array.</i></td></tr>
</table>
</td></tr>
</table>

Cmd **VALUE**	**DESCRIPTION**
GETPOINTS	Use this command to get the image coordinates for the rectangle defining the start and end points of the profile. This command writes the coordinates to the 2-element array specified in *OutVal*. *Param* **VALUE**: Not used by GETPOINTS. Must be 0. *OutVal* **TYPE**: BASIC **, POINTAPI** C, **LPPOINT**

See Also IpProfCreate, IpProfSelect

IpProfLineMove

Syntax **IpProfLineMove**(*x1*, *y1*, *x2*, *y2*)

Description This function defines the position of the line (or rectangle) being profiled. Equivalent to positioning the defining line with the mouse in the image window.

Parameters

x1	**Integer**	An integer specifying the x-coordinate of the first point on the line to be profiled. If a thick profile is being defined, this value specifies the x-coordinate of the upper-left corner of the rectangle to be profiled.
y1	**Integer**	An integer specifying the y-coordinate of the first point on the line to be profiled. If a thick profile is being defined, this value specifies the y-coordinate of the upper-left corner of the rectangle to be profiled.
x2	**Integer**	An integer specifying the x-coordinate of the last point of the line to be profiled. If a thick profile is being defined, this value specifies the x-coordinate of the lower-right corner of the rectangle to be profiled.
y2	**Integer**	An integer specifying the y-coordinate of the last point of the line to be profiled. If a thick profile is being defined, this value specifies the y-coordinate of the lower-right corner of the rectangle to be profiled.

Example

```
ret = IpProfLineMove(0, 0, 100, 216)
```

This statement will define a line that extends from pixel 0, 0 to pixel 100, 216 in the image.

Comments The parameter values must specify pixel positions in uncalibrated form.

Note that this function operates upon the “active” profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfLineMove`.

The position to which the profile is moved becomes the default position for the next Line Profile command.

See Also IpProfSetAttr

IpProfMaximize

Syntax	**IpProfMaximize**( )
Description	This function enlarges the active line profile window to full screen. Equivalent to clicking the maximize button on the **Line Profile** window Control bar.
Comments	Note that this function operates upon the "active" profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfMaximize`.
See Also	IpProfMinimize, IpProfRestore, IpProfSelect

IpProfMinimize

Syntax	**IpProfMinimize**( )
Description	This function reduces the active line profile window to an icon. Equivalent to clicking the minimize button on the **Line Profile** window Control bar.
Comments	Note that this function operates upon the "active" profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfMinimize`.
See Also	IpProfMaximize, IpProfRestore, IpProfSelect

IpProfMove

Syntax **IpProfMove**(*x*, *y*)

Description This function moves the active (i.e., selected) line profile window to the specified location. Equivalent to dragging the **Line Profile** window with the mouse.

Parameters

x	**Integer**	An integer specifying the x-coordinate of the screen position to which the upper-left corner of the **Line Profile** window is to be moved.
y	**Integer**	An integer specifying the y-coordinate of the screen position to which the upper-left corner of the **Line Profile** window is to be moved.

Example

```
ret = IpProfMove(10, 40)
```

This statement will move the active profile window 11 pixels to the right, and 41 pixels down from the upper-left corner of the screen.

Comments

The origin (0, 0) for the coordinate system used by the *x* and *y* parameters is the upper-left corner of the screen.

Note that this function operates upon the "active" profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfSize`.

See Also IpProfRestore, IpProfMaximize, IpProfMinimize, IpProfSelect

IpProfRestore

Syntax **IpProfRestore**( )

Description This function returns the active line profile window to its previous screen position and size. Equivalent to clicking the **Restore** button on a maximized profile window, or double-clicking the icon of a minimized profile window.

Comments Note that this function operates upon the “active” profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfRestore`.

See Also IpProfMinimize, IpProfMaximize, IpProfSelect

IpProfSave

Syntax **IpProfSave**(*FileName*, *SaveMode*)

Description This function saves, or appends, the active line profile data or statistics to the specified file. Equivalent to the **Save Profile, Append Profile, Save Statistics,** and **Append Statistics** commands on the *File* menu in the **Line Profile** window.

Parameters

FileName	**String**	A string specifying the name of the file to which the profile data will be written. This parameter is ignored when the S_CLIPBOARD option in the *SaveMode* parameter is used. When this is the case, set *FileName* to an empty string (i.e., "").
SaveMode	**Integer**	An enumerated integer, or an expression involving the addition of two or more enumerated integers, that specify the kind of profile data to be stored. This parameter also identifies where the data is to be stored. Must contain one or more of the following: S_DATA or S_STATS S_APPEND or S_CLIPBOARD or S_PRINT_TABLEor or S_PRINT_ GRAPH S_HEADER S_LEGEND S_X_AXIS S_COORDS See Comments, below, for a definition of each name. See Example, below, for usage.

Example

```
ret = IpProfSave("C:\IPWIN\PROF.HST", S_DATA)
```

The statement above will save the current profile data to a file called PROF.HST in the \IPWIN directory on the C: drive. If the file already exists, it will be overwritten.

```
ret = IpProfSave("C:\IPWIN\PROF.HST", S_STATS+S_APPEND)
```

The statement above will append the current profile statistics to a file called PROF.HST in the \IPWIN directory on the C: drive.

```
ret = IpProfSave("C:\IPWIN\PROF.HST", S_DATA+S_HEADER+S_LEGEND)
```

The statement above will save the current profile data to a file called PROF.HST in the \IPWIN directory on the C: drive. The header and legend information will be stored with the data. If the file already exists, it will be overwritten.

```
ret = IpProfSave("", S_CLIPBOARD)
```

The statement above will save the current profile data to the Clipboard (the function defaults to S_DATA). Note that the *FileName* parameter specifies a zero-length string.

```
ret = IpProfSave("C:\IPWIN\PROF.HST",S_APPEND+S_DATA+S_X_AXIS)
```

The statement above will append the current profile data to a file called PROF.HST in the \IPWIN directory on the C: drive. The X-axis data will be stored with the statistics.

Comments

Note that this function operates upon the "active" profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfSave`.

The following options can be used in the expression comprising the *SaveMode* parameter.

USAGE	*Save Mode*	**DESCRIPTION**
Use one or none...	S_DATA	Specifies that line profile <u>data</u> is to be stored.
	S_STATS	Specifies that line profile <u>statistics</u> are to be stored. *Note - if neither S_DATA nor S_STATS is included in the expression, S_DATA is assumed.*
Use one or none...	S_APPEND	Specifies that the data/statistics are to be appended to the specified file.
	S_CLIPBOARD	Specifies that the data/statistics are to be saved to the Clipboard. When this option is used, the *FileName* parameter is ignored.

USAGE	*Save Mode*	**DESCRIPTION**
	S_CLIPBOARD *(continued)*	*Note - if neither S_APPEND nor S_CLIPBOARD is included in the expression, line profile data/statistics are saved to a new file (if the file already exists, it will be overwritten).*
	S_PRINT_TABLE S_PRINT_GRAPH	Specifies that the data in the table will be sent to the print. Indicates that the graph displayed in the dialog box will be sent to the printer.
Use any, all or none...	S_HEADER	Specifies that the header is to be stored along with the data/statistics.
	S_LEGEND	Specifies that the legend is to be stored along with the data/statistics.
	S_X_AXIS	Specifies that the X-axis information is to be stored along with the data/statistics.
	S_COORDS	Specifes that the X and Y pixel coordinates are to be stored along with the data

See Also IpProfSelect

IpProfSelect

Syntax **IpProfSelect**(*ProfId*)

Description This function activates the specified line profile window. It selects the profile upon which all subsequent line profile functions will operate. Equivalent to clicking the **Line Profile** window to activate it.

Parameters

ProfId	**Integer**	An integer specifying the ID of the profile that is to be selected. See comments, below, for more information about this ID.

Example

```
ret = IpProfSelect(0)
```

This statement makes Line Profile window 0 the active Line Profile.

Comments A profile “ID” (*ProfId*) is assigned to a profile window when it is created. The window retains this ID for the duration of its existence. A profile window is given the lowest *unused* ID number available at the time it is created. If a profile window is opened while no other profiles are open, it is assigned an ID of “0”. If another profile is created while “0” is open, the new profile is assigned an ID of “1”. If “0” is closed, and another profile is opened (while “1” is still open), the new window is given an ID of “0”, since it is the lowest, unused ID available.

IpProfSetAttr

Syntax **IpProfSetAttr**(*AttrType*, *AttrValue*)

Description This function selects, sets or deselects options relating to the **Line Profile** window.

Parameters

AttrType **Integer** An enumerated integer, which identifies the option to be set. Must be one of the following:

CHANNEL1
CHANNEL2
CHANNEL3
COLORMODEL
FREEZE
GRID
ICAL
LINEGEOMETRY
LINETYPE
SCAL
STATISTICS

See definitions under Comments, below.

AttrValue **Integer** An integer specifying how the option specified by *AttrType* is to be set. See definitions under Comments, below, for the values allowed by each option.

Example

```
ret = IpProfSetAttr(REFERENCE, 1)
```

This statement will set the current defining line as a “reference” line.

Comments *AttrType* options are as follows:

AttrType	**DESCRIPTION**	**ALLOWED VALUES**
CHANNEL1	Enables or disables the profile of the Red, Hue or Y channel, depending upon the color model selected.	0 - Disables Channel. 1 - Enables Channel.
CHANNEL2	Enables or disables the profile of the Green, Saturation or In-Phase channel, depending upon the color model selected.	0 - Disables Channel. 1 - Enables Channel.
CHANNEL3	Enables or disables the profile of the Blue, Intensity, Value or Quadrature channel, depending upon the color model selected.	0 - Disables Channel. 1 - Enables Channel.
COLORMODEL	Selects the color model in which the line profile will be displayed.	CM_RGB CM_HSI CM_HSV

AttrType	**DESCRIPTION**	**ALLOWED VALUES**
COLORMODEL	Equivalent to selecting the color model in the **Line Profile** window's **Color** menu.	CM_YIQ
FREEZE	Sets or releases a frozen profile line. Equivalent to setting the **Freeze** option in the **Line Profile** window's *Report* menu.	0 - Releases frozen line. 1 - Freezes current line.
GRID	Determines whether the profile is displayed in table or graph form. Equivalent to setting the **Table** option in the **Line Profile** window's *Report* menu.	0 - Selects Graph form. 1 - Selects Table form.
ICAL	Specifies whether the intensity calibration is to be	0 - Suppresses calibration of profile.
	applied to the profile. Equivalent to setting the **Intensity Cal** option in the **Line Profile** window *Report* menu.	1 - Applies calibration to profile.
LINEGEOMETRY	Sets the type of line used in the **Line Profile** (line, circle, or freeform) . Equivalent to setting the **Profile Type** in the Line Profile window. The points should be initialized with the freeform line's points using IpListPts prior to calling IpProfSetAtt.	PROFTYPE_LINE PROFTYPE_CIRCLE PROFTYPE_FREEFORM
LINETYPE	Determines whether a line or a rectangle is to be profiled. Also selects the type of statistic that is to be measured when a rectangle is profiled. Equivalent to setting the **Normal, Thick Vert, Thick Horz** or **Thick Options** options in the **Line Profile** window *Report* menu.	THICKHORZ THICKVERT THICKNORMAL THICKAVG THICKSTDDEV

AttrType	DESCRIPTION	ALLOWED VALUES
ORIGIN	Specifies whether the Y-axis will originate at 0, or will be scaled to the range min and max values. Equivalent to setting the **Full Scale** option in the **Line Profile** window *Report* menu.	0 - Scales from range min. 1 - Scales from 0.
REFERENCE	Sets or releases a reference line. Equivalent to setting the **Reference** box in the **Line Profile** window.	0 - Releases reference line. 1 - Sets current line as a reference line.
SCAL	Specifies whether the spatial calibration is to be applied to the profile. Equivalent to setting the **Spatial Cal** option in the **Line Profile** window *Report* menu.	0 - Suppresses calibration of the profile. 1 - Applies calibration to the profile.
STATISTICS	Specifies whether statistics or range information is to be displayed in the profile window. Equivalent to setting the **Statistics** or **Range/Area** option in the **Line Profile** window's *Report* menu.	0 - Suppresses display of statistics and range information. 1 - Displays Statistics. 2 - Displays Range Info.

Note that this function operates upon the "active" profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfSetAttr`.

IpProfSetFreeForm

Syntax **IpProfSetFreeForm** (*NumPoints*, *Points*)

Description This function can be used in place of IpProfSetAttr for freeform line profiles.

Parameters

NumPoints	**Integer**	An integer specifying the number of points for the freeform line profile.
Points	**POINTAPI**	An array of points defining the freeform line profile.

Comments **The function will set the LINETYPE attribute to PROFTYPE_FREEFORM and simultaneously set the free form points. A new line profile must be created using IpProfCreate before you use this function to set the line profile type and shape.**

See Also IpProfCreate, IpProfSetAttr

IpProfSize

Syntax

IpProfSize(*cx, cy*)

Description

This function changes the size of the active line profile window to the specified width and height.

Parameters

cx	**Integer**	An integer specifying the width, in pixels, at which the **Line Profile** window is to be displayed.
cy	**Integer**	An integer specifying the height, in pixels, at which the **Line Profile** window is to be displayed.

Example

```
ret = IpProfSize(400, 175)
```

This statement will resize the **Line Profile** window to dimensions of 400 pixels wide by 175 pixels tall.

Comments

Note that this function operates upon the “active” profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfSize`.

See Also

IpProfSelect

IpProfUpdate

Syntax

IpProfUpdate( )

Description

This function updates the data within the **Line Profile** window. Equivalent to selecting the **Update**command within the **Line Profile** window.

Comments

Note that this function operates upon the “active” profile window (i.e., the one most recently opened or selected). If the currently active profile is not the one you want to use, you must use `IpProfSelect` to explicitly select (make active) the appropriate window before calling `IpProfUpdate`.

See Also

IpProfSelect

IpPrtHalftone

Syntax

IpPrtHalftone(*bUsePrtHalftone*, *bUsePrtScaling*, *HalftoneType*, *HaltoneOption*)

Description

This function sets the halftone and scaling options to be applied when the image is printed. Equivalent to setting the options within the **Halftone** group box in the **Print** dialog box.

Parameters

bUsePrtHalftone	**Integer**	An integer value of 0 or 1 specifying whether the printer's halftone capability is to be utilized. Where: 0 - *Image-Pro* halftones the image before it is sent to the printer using the method specified by the *HalftoneType* and *HalftoneOption* parameters. 1 - the printer halftones the image at print time. When this parameter is set to 1, the *HalftoneType* and *HalftoneOption* parameters are ignored.

bUsePrtScaling	**Integer**	An integer value of 0 or 1 specifying whether the printer's scaling capability is to be utilized. Where: 0 - *Image-Pro* scales the image before it is sent to the printer. 1 - the printer scales the image at print time.
HalftoneType	**Integer**	An integer from 0 to 6 (inclusive) specifying the halftone screen/method to be used. Where: 0 - Angle Dot Screen 1 - Flat Dot Screen 2 - Angle Line Screen 3 - Horz Line Screen 4 - Vert Line Screen 5 - Error Diffusion 6 - Threshold This parameter is ignored when *bUsePrtHalftone* is set to 1. When this is the case, just set *HalftoneType* to 0.
HaltoneOption	**Integer**	An integer from 0 to 4 (inclusive) specifying the screen resolution or halftone option to be used. Where: for *HalftoneType* values of 0 - 4: 0 - largest LPI value 1 - second-largest LPI value 2 - second-smallest LPI value Screen 3 - smallest LPI value for *HalftoneType* values of 5: 0 - 4 Weights 1 - 12 Weights 2 - Fuzzy 3 - Random This parameter is ignored when *bUsePrtHalftone* is set to 1, or when *HalftoneType* is set to 6. When this is the case, just set *HalftoneOption* to 0.

Example

```
ret = IpPrtHalftone(0, 0, 5, 3)
```

This statement will set the halftone type to Error Diffusion using the Random pattern.

See Also IpPrtSize, IpPrtPage

IpPrtPage

Syntax **IpPrtPage**(*PageNo, bPrintOverlay, Copies*)

Description This function prints the active image (with or without an overlay). Equivalent to clicking the **Print** button in the **Print** dialog box.

Parameters

PageNo	**Integer**	An integer specifying the tile number to be printed, or 0 if the entire image is to be printed on a single page. See Comments, below.

bPrintOverlay	**Integer**	An integer value of 0 or 1 specifying whether to print the image with an overlay. Equivalent to enabling the **Print Overlay** checkbox in the **Print** dialog box. Where: 0 - Print the image only. 1 - Print with image with overlay.
Copies	**Integer**	An integer specifying the number of copies to be printed of the specified tile.

Example

```
ret = IpPrtPage(1, 0, 3)
```

This statement will print three copies of the second tile of the image.

Comments

When an image is tiled across several pages, each tile is assigned a page number. This number is the one that you must specify in the *PageNo* parameter. Page numbers are assigned, beginning with “0”, from left to right, beginning with the top row and working down. The examples below illustrate the way in which tiles are numbered:

0	1
2	3

0	1	2
3	4	5

See Also

IpPrtSize

IpPrtScreen

Syntax

IpPrtScreen*(PageNo, bPintOverlay, Copies)*

Description

This function prints the screen capture image.

Parameters

PageNo	**Integer**	An integer specifying the tile number to be printed, or 0 if the entire image is to be printed on a single page. See Comments, below.
bPrintOverlay	**Integer**	An integer value of 0 or 1 specifying whether to print the image with an overlay. Equivalent to enabling the **Print Overlay** checkbox in the **Print** dialog box. Where: 0 - Print the image only. 1 - Print with image with overlay.
Copies	**Integer**	An integer specifying the number of copies to be printed of the specified tile.

Example

```
ret = IpPrtScreen(0, 0, 1)
```

This statement will print one copy of the entire image.

See Also

IpPrtPage

IpPrtSize

Syntax **IpPrtSize**(*Mode*, *bCentered*, *Top*, *Left*, *Width*, *Height*, *Smooth*)

Description This function sets the image size and position for printing purposes. Equivalent to clicking the **Position** button in the **Print** dialog box, and setting the size and position fields.

Parameters	*Mode*	**Integer**	An enumerated integer specifying whether the image is to be printed at actual size, page size, or the size specified by the *Width* and *Height* parameters. Must contain one of the following: PRT_ACTUAL PRT_FIT PRT_DISTORT See definitions under Comments, below.
	bCentered	**Integer**	An integer value of 0 or 1 specifying whether the image is to be centered within the print space, or is to be printed according to the margins specified by the *Top* and *Left* parameters. Where: 0 - Prints the image according to the position specified by the *Top* and *Left* parameters. 1 - Prints the image in the center of the print space. When this parameter is set to 1, the *Top* and *Left* parameters are ignored.
	Top	**Single**	A single point number specifying, in inches, the position of the top edge of the image in the print space. This parameter is ignored when the *bCentered* parameter is set to 1. When this is the case, just set *Top* to 0.
	Left	**Single**	A single point number specifying, in inches, the position of the left edge of the image in the print space. This parameter is ignored when the *bCentered* parameter is set to 1. When this is the case, just set *Left* to 0.
	Width	**Single**	A single point number specifying the width (x-dimension), in inches, to which the printed image is to be scaled. This parameter is used only when the *Mode* parameter is set to PRT_DISTORT. Set it to 0, otherwise.
	Height	**Single**	A single point number specifying the height (y-dimension), in inches, to which the printed image is to be scaled. This parameter is used only when the *Mode* parameter is set to PRT_DISTORT. Set it to 0, otherwise.
Parameters	*Smooth*	**Integer**	An integer value of 0 or 1 specifying whether the image is to be smoothed when it is scaled for print. Where: 0 - Suppresses smoothing. 1 - Applies smoothing.

Example

```
ret = IpPrtSize(PRT_FIT, 0, 1.0, 0.0, 0.0, 0.0, 1)
```

This statement will print the active image to fit the page. The top edge will begin 1 inch down from the top of the print space. Smoothing will be employed. The *Width* and *Height* parameters have been set to 0 because they are not used by PRT_FIT.

Comments

Mode options are as follows:

Mode	**DESCRIPTION**
PRT_ACTUAL	Sets print size to the actual image dimensions, based upon its current DPI value.
PRT_FIT	Sets print size to the largest possible dimensions given the current print space.
PRT_DISTORT	Sets print size to that specified by *Width* and *Height* parameters.

See Also

IpPrtPage

IpRegister

Syntax

IpRegister(*FromPoints, ToPoints, NumPoints, AffCode*)

Description

This function warps the active image to a set of tiepoint, using a projective affine transformation. Equivalent to the **Registration** command.

Parameters

FromPoints	**POINTAPI**	An array containing a list of tiepoint coordinates in the object image (the image to be warped).
ToPoints	**POINTAPI**	An array containing the list of tiepoint coordinates in the reference image. The order of these points must correspond to the order of the points in the *FromPoints* array.
NumPoints	**Integer**	Number of points in *FromPoints* or *ToPoints*.
AffCode	**Integer**	An expression involving the addition of one or more enumerated integers, where the operands specify the options to be used during the transformation process. The expression may include any of the following as operands: AFF_AOI AFF_NOBILINEAR AFF_NOSCALE AFF_NOTILT AFF_SINGLE AFF_CLIP See definitions under Comments, below.

Example

The following example registers one image to another using the image-clip and single-point options. Note that a single array has been used for both sets of points.

```
'the source points
ret = IpListPts(Pts(0), "142 65 480 0 472 421 133 443 ")
'the target points
ret = IpListPts(Pts(4), "133 57 472 18 479 413 153 445 ")
ret = IpRegister(Pts(0), Pts(4), 4, AFF_CLIP + AFF_SINGLE)
```

Comments

AffCode options (flags) are enabled by including them as operands in an additive expression. For example,

An *AffCode* of...	**would specify...**
0	No options.
AFF_CLIP	A single option (in this case, the image-clipping option).
AFF_CLIP+AFF_SINGLE	Two options (in this case, the image-clipping and single-point options).

The following table describes the options that can be added in *AffCode*:

***AffCode* FLAG**	**DESCRIPTION**
AFF_CLIP	This option determines the position of the tiepoints in the new image. When AFF_CLIP is enabled, the tiepoints in the result are located in *exactly* the same spatial positions as the reference image (pixels above and to the left of the new image origin may be clipped to achieve this positioning). If the purpose of the registration is to align two images for comparative analysis, use AFF_CLIP. This produces an image that most closely resembles the reference image in terms of perspective and position. If this option is disabled, the new image will encompass the entire transformed result.
AFF_SINGLE	This option enables the single-point transformation process. This option produces the most accurate results, but will be slow if your system is not equipped with a math co-processor.
AFF_NOBILINEAR	This option disables the bilinear interpolation process during transformation. Enabling this option yields faster processing time, but lower quality results.
AFF_NOSCALE	This option tells the function not to correct for differences in scaling between two images.
AFF_NOTILT	This option tells the function not to correct for differences in perspective or “tilt” between two images.

See Also IpRegShow

IpRegShow

Syntax **IpRegShow**(*bShow*)

Description This function displays or hide the **Registration** dialog box. Equivalent to selecting the **Registration** command to open the window, or clicking its **Close** button to close it.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether the “Registration” window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window.

Example This set of statements will open the “Registration” window, perform a registration, then close the “Registration” window.

```
ret = IpRegShow(1)
ret = IpListPts(Pts(0), "40 121 289 26 301 315 30 256 ")
ret = IpListPts(Pts(4), "50 55 275 55 275 301 50 301 ")
ret = IpRegister(Pts(0), Pts(4), 4,0 )
ret = IpRegShow(0)
```

See Also IpRegister

IpRendAnimation

Syntax **IpRendAnimation** *(Command, sPram, lParam)*

Description This function executes various animation operations

Parameters

Command	**Integer**	See comments and list below.
sParam	**Integer**	See comments and list below.
lParam	**Long**	See comments and list below.

Comments The animation functions take the following parameters:

sCmd	**sParam**	**lParam**	**Description**
ANIM_GET_FRAMES	not used	Pointer to a long variable receving the result	Gets the total number of frames in the current animation.
ANIM_GET_CAMERAS	not used	Pointer to a long variable receving the result	Gets the total number of camera positions in the current animation.
ANIM_GET_CAM_ FRAMES	Camera position (0-based)	Pointer to a long variable receving the result	Gets the number of frames for the specified camera position in the current animation.
ANIM_PLAYFF	Starting camera position	Pointer to a long variable that contains the value of the starting frame for the camera position. If the value is NULL the base camera position is used.	Plays animation forward
ANIM_PLAYRW	Starting camera position	Pointer to a long variable that contains the value of the starting frame for the camera position. If the value is NULL the base camera position is used.	Plays animation in reverse.

sCmd	**sParam**	**lParam**	**Description**

ANIM_STOP	Ending camera position	Pointer to a long variable receving the result	Stop play
ANIM_GOTO	Camera position to display	Pointer to a long variable that contains the value of the intermediate frame for the camera position. If the value is NULL the base camera position is used.	Displays the position of the defined frame in the animation.
ANIM_CREATE used as: CREATE_ANIM_ALL to create a sequence of all animation CREATE_ANIM_CURRENT to create 1-frame animation of the current view	Defines whether to create animation of whole sequence or only the current view.	Not used.	Creates an animation sequence in the IPP workspace.

Return Value The ID of the animation sequence if successful, a negative error code if failed.

Example Please see Appendix A, Sample Macro Code.

See Also IpRendAnimationFile

IpRendAnimationFile

Syntax **IpRendAnimationFile** *(szFileName, bSave)*

Description This function loads or saves the animation file.

Parameters

szFileName	**String**	Indicates the file to load or save.
bSave	**Integer**	Indicates whether to load or save the file: 0 = load file 1 = save file

Return Value 0 if successful, a negative error code if failed.

Example

```
Ret = IpRendAnimationFile(“FlyThrough.anm”,0)
```

See Also IpRendAnimation

IpRendConvertCoord

Syntax	**IpRendConvertCoord** *(sUnFrom, sUnTo, dInCoord, dOutCoord)*		
Description	This function is used to convert the coordinates from one unit of measure to another.		
Parameters	*sUnFrom*	**Integer**	Indicates the units to convert from. See description below
	sUnTo	**Integer**	Indicates the units to convert to. See description below:

	dInCoord	**LPVOID**	Pointer to an array (InArr of 3 doubles) that contains the coordinate to convert. Should be one of the following:
			InArr[0] = X coordinate
			InArr[1] = Y coordinate
			InArr[2] = Z coordinate

	dOutCoord	**LPVOID**	Pointer to an array (OutArr of 3 doubles) that will receive the converted coordinate. Should be one of the following:
			OutArr[0] = X coordinate
			OutArr[1] = Y coordinate
			OutArr[2] = Z coordinate

Parameter	**Name**	**Description**
sUnFrom	UN_IM_COORD	Image coordinates (pixel coordinates)
	UN_VOL_COORD	Volume coordinates (pixel coordinates with sub-sampling)
	UN_CALIBR_ COORD	Calibrated coordinates
	UN_WORLD_ COORD	World coordinates, i.e.the coordinates where the 3D volume is shown in the 3D constructor window.
sUnTo	UN_IM_COORD	Image coordinates (pixel coordinates)
	UN_VOL_COORD	Volume coordinates (pixel coordinates with sub-sampling)
	UN_WORLD_ COORD	World coordinates, i.e.the coordinates where the 3D volume is shown in the 3D constructor window
	UN_CALIBR_ COORD	Calibrated coordinates

IpRendConvertRotation

Syntax	**IpRendConvertRotation** *(ConvType, InRotation, OutRotation)*
Description	This function is used to convert the rotation defined by a quaternion to angles and back.

Parameters

sConvType	**Short**	Indicates the conversion type: CONV_QUAT_TO_ANG converts rotation values defined by quaterions to angles in radians CONV_ANG_TO_QUAT converts rotation values defined by angles in radians to quaternions
InRotation	**LPVOID**	See description below
OutRotation	**LPVOID**	See description below

Comments The InRotation and OutRotation parameters depend on the conversion type, as describe here:

Parameter	**Conversion Type**	**Description**
InRotation	CONV_ QUAT_ TO_ANG	Pointer to array InArr of double[4] that contains the quaternion of the rotation (returned by IpRendElem(ELEM_OBL_SL_PAR_GET, IP_REND_OBLIQUE_SLICE,…) or IpRendElem(ELEM_TRANSFORM_GET, IP_REND_EXT_OBJECT,…)). Note, that the Oblique slice dialog shows A,B and G angles relatively to Y and –Z axes, whereas camera dialog shows angles relatively to –Z and Y axis. InArr[0] – rotation X InArr[1] – rotation Y InArr[2] – rotation Z InArr[3] – rotation W
	CONV_ ANG_TO_Q UAT	Pointer to array InArr of double[3] with rotation as angles in radians (see ***Camera parameters dialog*** for the description of angles) InArr [0] – alpha angle InArr [1] – beta angle InArr [2] – gamma angle

Parameter	**Conversion Type**	**Description**
OutRotation	CONV_ QUAT_ TO_ANG	Pointer to array OutArr of double[3] that will receive the converted rotation as angles in radians (see ***Camera parameters dialog*** for the description of angles) OutArr [0] – alpha angle OutArr [1] – beta angle OutArr [2] – gamma angle
	CONV_ANG _TO_QUAT	Pointer to array OutArr of double[4] that will receive the converted rotation as quaternion (can be used with IpRendElem(ELEM_OBL_SL_PAR, IP_REND_OBLIQUE_SLICE,…) or IpRendElem(ELEM_TRANSFORM, IP_REND_EXT_OBJECT,…)) OutArr [0] – rotation X OutArr [1] – rotation Y OutArr [2] – rotation Z OutArr [3] – rotation W

IpRendElem

Syntax **IpRendElem** *(Command, lOpt1, lOpt2, lParam)*

Description This function sets and gets various parameters of 3D rendering elements.

Parameters

Command	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lOpt2	**Long**	See comments and list below.
lParam	**Any**	See comments and list below.

Comments The animation functions take the following parameters:

sCmd	**lOpt1**	**lOpt2**	**lParam**	**Description**
ELEM_GET_ NUMBER	Not used	Not used	Pointer to a long variable that will receive the value. Use this command to determine the number of elements and allocate the data array	Gets the total number of rendering elements in the current configuration. (The number of elements in the table of rendering lOptions dialog).
ELEM_GET_TYPE_ LIST	Not used	Not used.	Pointer to an array of long variables that will recive the information. The list must be long enough to receive all elements	Gets the list of 3D rendering element types (see list below).
ELEM_GET_ID_ LIST	Not used.	Not used.	Pointer to an array of long variables that will recive the information. The list must be long enough to receive all elements	Gets list of the 3D rendering element IDs. For element types that can be multiple as Ortho-Slice, Oblique Slice or Iso-Surface this value gives the ID. The IDs for elements that can not be duplicated (Volume, Palette…) is 0.

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_GET_HIST_X	IP_REND_ISO_SURF	ID of iso-surface	Pointer to an array of double[100] that will receive the histogram information. Each value represents the number of voxels in the bin	Gets the X values of the mesh histogram of the iso-surface.
ELEM_GET_HIST_Y	IP_REND_ISO_SURF	ID of iso-surface	Pointer to an array of double[100] that will receive the histogram information. Each value represents the intensity value of the left margin of the bin	Gets the Y values of the mesh histogram of the iso-surface.
ELEM_SHOW	Element type. See list below.	Element ID	Pointer to a long variable that that contains the value. If this value is 0 the element will be hidden, otherwise it will be shown	Shows or hides a 3-D rendering element.

Element type	Type Value	Description
IP_REND_VOLUME	0	Volume
IP_REND_ORTHO_SLICE	1	Ortho-Slice
IP_REND_OBLIQUE_SLICE	2	Oblique Slice
IP_REND_ROI	3	Region of Interest
IP_REND_PALETTE	4	Palette
IP_REND_ISO_SURF	5	Iso-Surface
IP_REND_SLICER	6	Slicer
IP_REND_TIME	7	Time
IP_REND_MEASUREMENTS	8	Manual Measurements
IP_REND_EXT_OBJECT	9	External Object
IP_REND_ANIMATION	10	Animation

sCmd	LOpt1	LOpt2	lParam	Description
ELEM_ACTIVATE	Element type. See list below.	Index of the element	Not used, should be IpNULL	Activates the lOptions page of the 3D rendering dialog for the element referenced in lLOpt1, lLOpt2.
ELEM_ADD	Element type. Should be one of the following: IP_REND_ISO_ SURF IP_REND_ ORTHO_SLICE IP_REND_ OBLIQUE_SLICE IP_REND_EXT_ OBJECT	Not used, should be 0	Not used, should be IpNULL	Adds a new 3D rendering element
ELEM_DELETE	Element type. Should be one of the following: IP_REND_ISO_ SURF IP_REND_ ORTHO_SLICE IP_REND_ OBLIQUE_SLICE IP_REND_EXT_ OBJECT	Index of the element	Not used, should be IpNULL	Deletes the 3D rendering element.

sCmd	LOpt1	LOpt2	lParam	Description
ELEM_SET_USER_PALETTE	Palette length (recommended length is 256)	Not used.	Pointer to an array palAr of integer values that contains palette. The palette is saved as an array of RGBA values, shown below: All values must be in range from 0 to 255. Size of the array must be 4*palette length	Sets the user-defined palette.
	lParam		Description	
	palAr[0]		Red value of the first entry	
	palAr[1]		Green value of the first entry	
	palAr[2]		Blue value of the first entry	
	palAr[3]		Transparency value of the first entry	
	palAr[4]		Red value of the second entry	
ELEM_GET_VOI_INFO	Not used.	Not used.	Pointer to an array of double[8] that will receive the VOI information. The structure of the array is the following:	Gets the parameters of the current Volume of Interest in calibrated units

lParam	Description
voiAr[0]	Size of VOI in X direction
voiAr[1]	Size of VOI in Y direction
voiAr[2]	Size of VOI in Z direction
voiAr[3]	Left X coordinate of VOI
voiAr[4]	Left Y coordinate of VOI
voiAr[5]	Left Z coordinate of VOI
voiAr[6]	Volume of VOI
voiAr[7]	Volume fraction of VOI

sCmd	LOpt1	LOpt2	lParam	Description
ELEM_GET_ VOLUME_INFO	Not used.	Not used.	Pointer to an array of double[10] that will receive the volume information. The structure of the array is the following:	Gets the parameters of the current rendered volume loaded into the 3D Contructor

lParam	Description
OutAr[0]	sub-sampling X
OutAr[1]	sub-sampling Y
OutAr[2]	sub-sampling Z
OutAr[3]	voxel size X, in calibrated units
OutAr[4]	voxel size Y, in calibrated units
OutAr[5]	voxel size Z, in calibrated units
OutAr[6]	width, number of slices in X
OutAr[7]	height, number of slices in Y
OutAr[8]	depth, number of slices in Z
OutAr[9]	total volume in calibrated units

sCmd	LOpt1	LOpt2	lParam	Description
ELEM_VOI_PAR_ GET	IP_REND_ROI	0	Pointer to an array of double[6] that will receive the information. The structure of the array is the following:	Gets position and scale parameters of current VOI

lParam	Description
OutAr[0]	Position X of the center of VOI in world coordinates
OutAr[1]	Position Y of the center of VOI in world coordinates
OutAr[2]	Position Z of the center of VOI in world coordinates Range = -1 to +1
OutAr[3]	Scale X Range = 0 to 1
OutAr[4]	Scale Y
OutAr[5]	Scale Z

sCmd	LOpt1	LOpt2	lParam	Description
ELEM_VOI_PAR_SET	IP_REND_ROI	0	Pointer to an array of double[6] that holds the information. The structure of the array is described in ELEM_VOI_PAR_GET	Sets position and scale parameters of current VOI
ELEM_OBL_SL_PAR_GET	IP_REND_OBLIQUE_SLICE	ID of oblique slice	Pointer to an array of double[10] that will receive the information. The structure of the array is described below:	Gets the oblique slice orientation parameters

lParam	Description
OutAr[0]	Position X of the center of slice dragger
OutAr[1]	Position Y of the center of slice dragger
OutAr[2]	Position Z of the center of slice dragger
OutAr[3]	Scale X
OutAr[4]	Scale Y
OutAr[5]	Scale Z
OutAr[6]	Rotation X
OutAr[7]	Rotation Y
OutAr[8]	Rotation Z
OutAr[9]	Rotation W

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_OBL_SL_PAR_SET	IP_REND_OBLIQUE_ SLICE	ID of oblique slice	Pointer to an array of double[10] that holds the information. The structure of the array is described in ELEM_OBL_SL_PAR_GET	Sets the oblique slice orientation parameters
ELEM_LIGHT_GET	IP_REND_VOLUME	0	Pointer to an array of double[8] that will receive the information. The structure of the array is the shown here:	Get directional light volume

lParam	Description
OutAr[0]	X direction of light
OutAr[1]	Y direction of light
OutAr[2]	Z direction of light
OutAr[3]	1= On, 0 = Off This is a read-only parameter. To turn light on/off , use IpRendElemSet
OutAr[4]	Intensity of light in range from 0 to 1.
OutAr[5]	Red component of light color in range from 0 to 1.
OutAr[6]	Green component of light color in range from 0 to 1
OutAr[7]	Blue component of light color in range from 0 to 1.
OutAr[8]	
OutAr[9]	

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_LIGHT_SET	IP_REND_VOLUME	0	Pointer to an array of double[8] that holds the information. The structure of the array is described in ELEM_LIGHT_GET	Set directional light volume
ELEM_COLOR_GET	IP_REND_ISO_SURF or IP_REND_VOLUME	ID of iso-surface	Pointer to an array of double[14] that will receive the information.	Gets the color of the element

lParam	Description
OutAr[0]	Red component of ambient color in range from 0 to 1.
OutAr[1]	Green component of ambient color in range from 0 to 1
OutAr[2]	Blue component of ambient color in range from 0 to 1
OutAr[3]	Red component of diffuse color in range from 0 to 1.
OutAr[4]	Green component of diffuse color in range from 0 to 1.
OutAr[5]	Blue component of diffuse color in range from 0 to 1.
OutAr[6]	Red component of specular color in range from 0 to 1.
OutAr[7]	Green component of specular color in range from 0 to 1
OutAr[8]	Blue component of specular color in range from 0 to 1
OutAr[9]	Red component of emissive color in range from 0 to 1.
OutAr[10]	Green component of emissive color in range from 0 to 1
OutAr[11]	Blue component of emissive color in range from 0 to 1.
OutAr[12]	Shininess in range from 0 to 1
OutAr[13]	Transparency in range from 0 to 1

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_COLOR_SET	IP_REND_ISO_SURF or IP_REND_VOLUME	ID of iso-surface	The structure of the array is described in ELEM_COLOR_GET	Sets color parameters
ELEM_ISO_SUBSAMPLING	IP_REND_ISO_SURF	ID of iso-surface	Pointer to an array of double[3] that will receive the information. The structure of the array is the following:	Sets new subsampling for iso-surface; Setting any element of the array to 0 will turn ON auto-subsampling.
	lParam		**Description**	
	ipDArray [0]		Sub-sampling X	
	ipDArray [1]		Sub-sampling Y	
	ipDArray [2]		Sub-sampling Z	
ELEM_CAM_POSITION_GET	IP_REND_ANIMATION	0	Pointer to an array of double[9] that will receive the information. The structure of the array is shown below	Gets current camera position parametrs
	lParam		**Description**	
	OutAr[0]		camera angle alpha (radians)	
	OutAr[1]		camera angle beta (radians)	
	OutAr[2]		camera angle gamma (radians)	
	OutAr[3]		camera type : 1 – orthographic, 0 - perspective	
	OutAr[4]		(for orthographic), height angle, radians (for perspective)	
	OutAr[5]		focal point X position in world coordinates	

lParam	Description
OutAr[6]	focal point Y position in world coordinates
OutAr[7]	focal point Z position in world coordinates
OutAr[8]	focal distance in world coordinates

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_CAM_ POSITION_SET	IP_REND_ ANIMATION	0	Pointer to an array of double[9] with camera parameters. See ELEM_CAM_ POSITION_GET for the structure of the array	sets camera position parameters
ELEM_GET_VOL_ STATS	IP_REND_ISO_ SURF	ID of iso-surface	Pointer to an array of double[12] that will receive the information. The structure of the array is the shown here	Gets the statistics for the volume mesh and iso-surface

lParam	Description
OutAr[0]	Miniumum value
OutAr[1]	Maximum value
OutAr[2]	Number of bins in the histogram
OutAr[3]	Channel
OutAr[4]	Sub-sampling X
OutAr[5]	Sub-sampling Y
OutAr[6]	Sub-sampling Z
OutAr[7]	Filter

lParam	Description
OutAr[8]	Close edges
OutAr[9]	Simplification
OutAr[10]	Surface value (level)
OutAr[11]	Count flag

sCmd	lOpt1	lOpt2	lParam	Description
ELEM_TRANSFORM_ SET	IP_REND_EXT_OBJECT	ID of external object	Pointer to an array of double[17] that holds the information. The structure of the array is described in ELEM_TRANSFORM_GET	Sets the transform parameters for the external object
ELEM_TRANSFORM_ GET	IP_REND_EXT_OBJECT	ID of external object	Pointer to an array of double[17] that will receive the information. The structure of the array is the following:	Gets the transform parameters for the external object[1]

lParam	Description
OutAr[0]	Rotation X
OutAr[1]	Rotation Y
OutAr[2]	Rotation Z
OutAr[3]	Rotation W
OutAr[4]	Scale orientation X
OutAr[5]	Scale orientation Y
OutAr[6]	Scale orientation Z
OutAr[7]	Scale orientation W

[1] Quaternions always obey: x^2 + y^2 + z^2 + w^2 = 1.0
See the following for more information on quaternions:
- Shoemake, K., *Animating Rotation With Quaternion Curves*, Computer Graphics 19, No 3 (Proc. SIGGRAPH'85), 245-254, 1985.
- Pletinckx, D., *Quaternion Calculus as a Basic Tool in Computer Graphics*, The Visual Computer 5, 2-13, 1989

lParam	Description
OutAr[8]	Position X of the center of the object
OutAr[9]	Position Y of the center of the object
OutAr[10]	Position Z of the center of the object
OutAr[11]	Translation X
OutAr[12]	Translation Y
OutAr[13]	Translation Z
OutAr[14]	Scale X
OutAr[15]	Scale Y
OutAr[16]	Scale Z

See Also IpRendElemGet, IpRendElemSet, IpRendElemSetStr

Return Value 0 if successful, a negative error code if failed.

Example Please see Appendix A, Sample Macro Code

IpRendElemGet

Syntax **IpRendElemGet** *(Command, 1LOpt1, lLOpt2,lParam)*

Description This function gets various parameters of the 3D rendering elements. This function is a version of IpRendElem used to retrieve parameters from 3D Constructor elements

Parameters

Command	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lOpt2	**Long**	See comments and list below.
lParam	**Any**	See comments and list below.

Comments This macro takes the following commands:

Command	**lOpt 1**	**lOpt 2**	**lParam**	**Description**
ELEM_NUM_TIME_ POINTS	IP_REND_TIME	0	Pointer to a long variable that will receive the value.	Gets the total number of time points in the current 4D stack.
ELEM_CURR_ TIME_POINT	IP_REND_TIME	0	Pointer to a long variable that will receive the value	Gets the current time point in the 4D stack

See Also IpRendElem, IpRendElemSet

Example

```
Dim TotalTimePoints As Long
Dim CurrentTimePoint As Long
ret =
IpRendElemGet(ELEM_NUM_TIME_POINTS,IP_REND_TIME,0,TotalTimePoin
ts)
ret =
IpRendElemGet(ELEM_CUR_TIME_POINT,IP_REND_TIME,0,CurrentTimePoi
nt)
Debug.Print TotalTimePoints
Debug.Print CurrentTimePoint
```

IpRendElemSet

Syntax

IpRendElemSet *(Command, lOpt1, lOpt2, dParam)*

Description

This function sets various parameters of the 3D rendering elements.

Parameters

Command	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lOpt2	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments

The animation functions take the following parameters:

lOpt1	**sCmd**	**lOpt2**	**dParam**	**Description**
IP_REND_VOLUME	ELEM_VOL_COMP	0	0 = Blend 1= Sum 2= Max	Volume Composition
	ELEM_LIGHTING	0	1 = On 0 = Off	Lighting
	ELEM_GLOBAL_TRANSP	0	Transparency	Global Transparency
	ELEM_NUM_SLICES	0	Number of Slices	Number of Slices
	ELEM_INTERPOLATION	0	1 = On 0 = Off	Interpolation
	ELEM_GRADUATIONS	0	1 = On 0 = Off	Graduations
	ELEM_GRID_LINES	0	1 = On 0 = Off	Grid Lines
	ELEM_DRAW_AXES	0	1 = On 0 = Off	Draw Axes
	ELEM_BBOX	0	1 = On 0 = Off	Volume bounding box
	ELEM_SHOW_PROJ	0	1 = On 0 = Off	Toggle projections on volume
	ELEM_SHOW_PROJ_X	0	1 = On 0 = Off	When ELEM_SHOW_PROJ is on, show projection along X
	ELEM_SHOW_PROJ_Y	0	1 = On 0 = Off	When ELEM_SHOW_PROJ is on, show projection along Y

LOpt1	sCmd	lOpt2	dParam	Description
IP_REND_VOLUME	ELEM_SHOW_PROJ_Z	0	1 = On 0 = Off	When ELEM_SHOW_PROJ is on, show projection along Z
	ELEM_PROJ_OFFSET	0	% value	Projection offset in percent of size
	ELEM_SHOW_SHADOW_PROJ	0	1 = Shadow projection 0 = Volume projection	When ELEM_SHOW_PROJ is on, show shadow projection
	ELEM_GRAD_FONTSIZE	0	% value	Graduations in font size in percent of default
	ELEM_GRAD_TICKSIZE	0	% value	Graduations in tick size in percent of default
	ELEM_AUTO_RELOAD	0	1 = Auto Reload on 0 = Auto Reload off	Turns the Auto-Reload option on or off

Example

```
‘switch On volume projections
ret = IpRendElemSet(ELEM_SHOW_PROJ,IP_REND_VOLUME,0,1)
‘switch off Y projection
ret = IpRendElemSet(ELEM_SHOW_PROJ_Y,IP_REND_VOLUME,0,0)
‘switch on Z projection
ret = IpRendElemSet(ELEM_SHOW_PROJ_Z,IP_REND_VOLUME,0,1)
‘set projection offset to 30 %
ret = IpRendElemSet(ELEM_PROJ_OFFSET,IP_REND_VOLUME,0,30)
‘set shadow projection mode
ret=IpRendElemSet(ELEM_SHOW_SHADOW_PROJ,IP_REND_VOLUME,0,1)
```

See also: ELEM_COLOR_GET, ELEM-COLOR_SET, ELEM_LIGHT_GET and ELEM_LIGHT_SET in IpRendElem

Lopt1	sCmd	lOpt2	dParam	Description
IP_REND_PALETTE	ELEM_PAL_RED	0	1 = On 0 = Off	Red channel
	ELEM_PAL_GREEN	0	1 = On 0 = Off	Green channel
	ELEM_PAL_BLUE	0	1 = On 0 = Off	Blue channel

Lopt1	sCmd	lOpt2	dParam	Description
IP_REND_PALETTE	ELEM_PAL_ID	0	Palette ID: 0 = Gray 1 = Temperature 2 = Physics 3 = Standard 4 = Glow 5 = Seismic 6 = Blue/Red 7 = From Image 8 = User defined 9 = Red 10 = Green 11 = Blue	Set palette by ID
	ELEM_PAL_COL_ MIN	0	Minimum value for palette color spread	
	ELEM_PAL_OPAQ_ MAX	0	Maximum value for opaque palette	
	ELEM_PAL_COL_MA X	0	Maximum value for palette color spread	
	ELEM_PAL_BRIGHT NESS	0	A value in the range 0 – 100. Default = 50	Set volume brightness for all channels
	ELEM_PAL_BRIGHT NESS_R	0	A value in the range 0 – 100. Default = 50	Set volume brightness for red channel.
	ELEM_PAL_BRIGHT NESS_G	0	A value in the range 0 – 100. Default = 50	Set volume brightness for green channel
	ELEM_PAL_BRIGHT NESS_B	0	A value in the range 0 – 100. Default = 50	Set volume brightness for blue channel

lOpt1	sCmd	lOpt2	dParam	Description
IP_REND_ PALETTE	ELEM_PAL_ CONTRAST	0	A value in the range 0 – 100. Default = 50	Set volume contrast for all channels.
	ELEM_PAL_ CONTRAST_R	0	A value in the range 0 – 100. Default = 50	Set volume contrast for red channel
	ELEM_PAL_ CONTRAST_B	0	A value in the range 0 – 100. Default = 50	Set volume contrast for blue channel
	ELEM_PAL_ CONTRAST_G	0	A value in the range 0 – 100. Default = 50	Set volume contrast for green channel
	ELEM_PAL_GAMMA	0	A value in the range 10 – 1000. Default = 100	Set gamma for all volume channels, muliplied by 100; i.e. use 200 to set gamma = 2
	ELEM_PAL_GAMMA_R	0	A value in the range 10 – 1000. Default = 100	Set volume gamma for red channel, muliplied by 100; i.e. use 200 to set gamma = 2
	ELEM_PAL_GAMMA_B	0	A value in the range 10 – 1000. Default = 100	Set volume gamma for blue channel, muliplied by 100; i.e. use 200 to set gamma = 2
	ELEM_PAL_GAMMA_G	0	A value in the range 10 – 1000. Default = 100	Set volume gamma for green channel, muliplied by 100; i.e. use 200 to set gamma = 2

lOpt1	sCmd	lOpt2	dParam	Description
IP_REND_ ANIMATION	ELEM_GO_FIRST	Not Used	Not Used	Go to first position in Animation sequence
	ELEM_PLAY_RW	Not Used	Start frame no.	Play sequence back once
	ELEM_GO_PREV	Not Used	Not Used	Go to previous position
	ELEM_GO_NEXT	Not Used	Not Used	Go to next position
	ELEM_PLAY_FF	Not Used	Start frame no.	Play sequence forward once
	ELEM_GO_LAST	Not Used	Not Used	Go to last position
	ELEM_GO_TO	Not Used	Frame no.	Go to position specified by dParam.
	ELEM_CLOSE_ENDS	Not Used	1 = On 0 = Off	Close start/end frames (create a loop)
	ELEM_FRAMES_PER_ CAM	Not Used	Value	No. of intermediate frames between start and end
	ELEM_AUTO_ANIM_SI ZE	Not Used	1 = On 0 = Off	Auto animation image size
	ELEM_ ANIM_WIDTH	Not Used	Value	Animation width in pixels
	ELEM_FRAMES_CIRC ULAR	Not Used	Value	No. of frames in circular path
	ELEM_INTERVAL_MS	Not Used.	Value in milliseconds	Interval between frames in milliseconds
	ELE_TIME_SYNC	Not Used.	1 = On 0 = Off	Synchronize with time
	ELEM_ ANIM_HEIGHT	Not Used	Value	Animation height in pixels

lOpt1	sCmd	lOpt2	dParam	Description
IP_REND_ANIMATION	ELEM_ANIM_ANTIALIAS	Not Used	1 = On 0 = Off	Turns anti-aliasing of image on or off
	ELEM_ANIM_ANTIALIAS_N	Not Used	Value	Number of anti-aliasing passes creating animation
	ELEM_REND_IN_ANIMATION	Not Used	1 = On 0 = Off	Turns rendering settings in animation on or off
	ELEM_RECORD_FRAME	Not Used	1 = On 0 = Off	Records current camera position to animation
	ELEM_DEL_CUR_FRAME	Not Used	Not Used	Delete current frame from animation
	ELEM_DEL_ALL	Not Used	Not Used	Delete all frames from animation
IP_REND_TIME	ELEM_GO_FIRST	Not Used	Not Used	Go to first position in Animation sequence
0	ELEM_PLAY_RW	Not Used	Start frame no.	Play sequence back once
	ELEM_GO_PREV	Not Used	Not Used	Go to previous position
	ELEM_GO_NEXT	Not Used	Not Used	Go to next position
	ELEM_PLAY_FF	Not Used	Start frame no.	Play sequence forward once
	ELEM_GO_LAST	Not Used	Not Used	Go to last position
	ELEM_GO_TO	Not Used	Frame no.	Go to position specified by dParam.
	ELEM_INTERVAL_MS	Not Used.	Value in milliseconds	Interval between frames in milliseconds
	ELEM_TIME_PLAY_TYPE	Not Used.	0 = Wrap around 1 = Auto reverse	Time play type
	ELEM_REND_DUPL_ISO	Not Used	Not Used.	Creates duplicates of volume measurement for every time point.

lOpt1	sCmd	lOpt2	dParam	Description
	ELEM_REND_REMOVE_ DUPL	Not Used	Not Used.	Removes duplicates of volume measurement for all time points except 0.
	ELEM_REND_SHOW_ CUR TIME_ISO	Not Used	1 = On 0 = Off	Sets Show Iso-Surface for current time only option
IP_REND_ROI	ELEM_VOI_SHAPE	Not Used	0 = Sub-Volume 1 = Cross 2 = Slicer 3 = Exclusion box	VOI shape
0	ELEM_SHOW_ HANDLES	Not Used	1 = On 0 = Off	Show handles on Volume of Interest
	ELEM_VOI_RESET	Not Used	Not Used	Reset VOI
IP_REND_ SLICER	ELEM_SLR_VIEW_ TYPE	Not Used.	0 = thin 1 = thick 2 = projections	Slicer view type
0	ELEM_ TRANSPARENCY	Not Used.	0 = Off 1 = On	Transparency mode
	ELEM_ INTERPOLATION	Not Used.	0 = Off 1 = On	Interpolation
	ELEM_SLR_CROSS	Not Used.	0 = Off 1 = On	Show cross section?

lOpt1	sCmd	lOpt2	dParam	Description
IP_REND_ SLICER	ELEM_SL_X	Not Used	Value	Position of slice X
	ELEM_SL_Y	Not Used	Value	Position of slice Y
	ELEM_SL_Z	Not Used	Value	Position of slice Z
	ELEM_THICK_X	Not Used	Value	Thickness of slice X
	ELEM_THICK_Y	Not Used	Value	Thickness of slice Y
	ELEM_THICK_Z	Not Used	Value	Thickness of slice Z
	ELEM_ RESET	Not Used	Not Used	Reset slicer view
	ELEM_CREATE_ SLICE	Not Used	0 = XY 1 = ZY 2 = XZ	Create slice image
IP_REND_ORTHO_ SLICE ID number of the slice	ELEM_SL_ ORIENTATION	Element ID	0 = X 1 = Y 2 = Z	Slice orientation
	ELEM_ TRANSPARENCY	Element ID	0 = Off 1 = On	Transparency mode
	ELEM_ INTERPOLATION	Element ID	0 = Off 1 = On	Interpolation
	ELEM_CLIPPING	Element ID	0 = Off 1 = On	Clipping
	ELEM_CLIPPING_ SIDE	Element ID	0 = Front 1 = Back	Clipping Side
	ELEM_SLICE_ NUMBER	Element ID	Value	Slice number
	ELEM_SHOW_ HANDLES	Element ID	1 = On 0 = Off	Show handles

lOpt1	**sCmd**	**lOpt2**	**dParam**	**Description**
IP_REND_OBLIQUE_SLICE	ELEM_TRANSPARENCY	Element ID	0 = Off 1 = On	Transparency mode
ID number of the slice	ELEM_INTERPOLATION	Element ID	0 = Off 1 = On	Interpolation
	ELEM_CLIPPING	Element ID	0 = Off 1 = On	Clipping
	ELEM_SLICE_NUMBER	Element ID	Value of the position from -1 to 1	Slice position in range from -1 to 1
	ELEM_SHOW_HANDLES	Element ID	1 = On 0 = Off	Show handles
See also: ELEM_OBL_SL_PAR_GET and ELEM_OBL_SL_PAR SET in IpRendElem				
IP_REND_ISO_SURF	ELEM_ISO_SIMPL	Element ID	0 = none 1= Med 2 = Max	Simplification level
ID number iso-surface or volume measurements	ELEM_ISO_LEVEL	Element ID	Value	Iso-surface threshold level
	ELEM_ISO_COUNT	Element ID	1 = On 0 = Off	Count lOption
IP_REND_ISO_SURF	ELEM_SO_CLOSE_EDGES	Element ID	1 = On 0 = Off	Close edges
	ELEM_ISO_FILTER	Element ID	0 = None 1 = LoPass 3x3 2 = LoPass 5x5x5 3 = LoPass 7x7x7 4 = LoPass 9x9x9 5 = Gauss 5x5x5 6 = Gauss 7x7x7 7 = Gauss 9x9x9	Filter type
	ELEM_FREEZE	Not Used	1 = On 0 = Off	Turns freeze state of iso-surface elements on or off
	ELEM_DUPLICATE	Not Used	Not Used	Duplicates iso-surfaces

lOpt1	**sCmd**	**lOpt2**	**dParam**	**Description**
	ELEM_AUTO_HIST_RNG	Not Used	1 = On 0 = Off	Describes the auto-histogram range of the iso-surface
IP_REND_MEASUREMENTS 0	ELEM_DECIMAL_PL	0	Value	Number of decimal places in data

See Also IpRendElem, IpRendElemGet, IpRendElemSetStr

Example Please see Appendix A, Sample Macro Code

IpRendElemSetStr

Syntax

IpRendElemSetStr *(Command, 1Opt1, lOpt2,FileName)*

Description

This function sets string parameters of the 3D rendering elements. This function is a version of IpRendElem used to pass string elements into 3D Constructor elements

Parameters

Command	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lOpt2	**Long**	See comments and list below.
File Name	**LPSTR**	See comments and list below.

Comments

This macro takes the following commands:

Command	**lOpt 1**	**lOpt 2**	**File Name**
ELEM_EXT_FILE_NAME	Not Used	Not Used.	File Name of the External Element
ELEM_EXPORT	IP_REND_ISO_SURF	ID of Iso-Surface	File Name of Exported Object
ELEM_ISO_OUTL	Not Used	Not Used	File Name of 3D outline file
REND_IMAGE_BACK_ NAME	Not Used	Not Used	FileName including path of the background image

See Also

IpRendElem, IpRendElemSet

Example

```
‘add external element
ret =
IpRendElemSetStr(ELEM_EXT_FILE_NAME,0,0,"C:\models\x29.iv")
ret = IpRendElem(ELEM_ADD,IP_REND_EXT_OBJECT,0,IpNULL)
ret = IpRendElemSetStr(ELEM_EXPORT,
IP_REND_ISO_SURF,0,"C:\Surface1.iv")
```

IpRendSaveData

Syntax **IpRendSaveData**(*sSrcFlags, sDstFlags, szDest)*

Description This function saves the data from the 3D Constructor windows.

Parameters

sSrcFlags	**Integer**	Combination of data source flags and data type flags that specify the source and type of data to be saved. See comments and list below.
sDestFlags	**Integer**	Combination of data destination flags and (lOptional) file lOption flags that specify the destination and format for the saved data. See comments and list below.
szDest	**LPSTR**	Indicates the destination file name. Used with RNDF_FILE only.

The data source, type, destination, and file lOption flags are described here:

Flag Type	**Name**	**Description**
Data source flags	RN_MM_DATA	Save manual measurements data table contents to selected destination (default if source is not supplied).
	RN_MM_STATS	Save manual measurements statistics contents to selected destination
	RN_MM_ACTIVE	Save manual measurements data and statistics if it is shown to selected destination
	RN_VM_DATA	Save volume measurements data table contents to selected destination
	RN_DATAGRAPH	Saves data graph information to the selected destination
	RN_VM_STATS	Save volume measurements statistics contents to selected destination
	RN_VM_ACTIVE	Save volume measurements data and statistics if it is shown to selected destination
	RN_HISTOGRAM	Saves volume histogram data to selected destination.

Flag Type	Name	Description
Data type flags	RNTF_GRAPH	Save the information as a picture. This flag is valid only for RN_HISTOGRAM with destination RNDF_CLIPBOARD
Data destination flags	RNDF_FILE	Copy data to tab-delimited file (default if destination is not supplied). Not valid with RNTF_GRAPH.
	RNDF_CLIPBOARD	Copy data to clipboard. Valid only for RN_HISTOGRAM with RNTF_GRAPH.

Flag Type	Name	Description
Data destination flags	RNDF_OUTPUT	Send contents to output file
	RNDF_DDE	Send contents to Excel via COM. Not valid with RNTF_GRAPH
	RNDF_PRINTER	Send contents of file to printer
File lOption flags	RNDF_CSV	The default format of the data file is a tab-delimited table of values, with one line per row. RNDF_CSV is used in conjunction with the RNDF_FILE command to modify the tab-delimited file format and save it as a comma-delimited variable file (usually compatible with import into spreadsheets and databases). Cannot be combined with RNDF_HTML
	RNDF_HTML	Used to specify that the data file should be written as a HTML file containing an HTML TABLE. Cannot be combined with RNDF_CSV

Return Value

0 if successful, a negative error code if failed.

Example

```
save volume measurements data table

ret = IpRendSaveData(RN_VM_ACTIVE,RNDF_FILE +RNDF_CSV,
"D:\cs.csv")

‘copy histogram graph to clipboard

ret = IpRendSaveData(RN_HISTOGRAM + RNTF_GRAPH,
RNDF_CLIPBOARD,"")
```

IpRendLoad

Syntax

IpRendLoad *()*

Description

This function loads the active sequence into the 3D Constructor volume renderer

Comments

Color channel, voxel size and sub-sampling for the loaded sequence must be set prior calling this function using **IpRendSet** commands.

Return Value

0 if successful, a negative error code if failed.

Example

```
‘load active sequence into the renderer
ret = IpRendLoad()
```

IpRendManualMeasurementsFile

Syntax

IpRendManualMeasurementsFile*(szFileName,bSave)*

Description

This function loads or saves a manual measurement file.

Parameters

szFileName	**String**	Indicates the file to load or save.
bSave	**Integer**	Indicates whether to load or save the file: 0 = load file 1 = save file

Return Value

0 if successful, a negative error code if failed.

Example

```
Ret = IpRendManualMeasurementFile
(“C:\Template\TestMeas1.m3d”,0)
```

IpRendMeasGraphSet

Syntax	**IpRendMeasGraphSet** *(sCommand, 1Opt1, dParam)*
Description	This function gets and sets various parameters of the 3D data graph.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments This macro takes the following commands:

Command	**1Opt1**	**dParam**	**Description**

GRAPH_MEASUREMENT	Indicates the type of measurement. Should be one of the following: MANUAL_MEAS_TYPE or VOLUME_MEAS_TYPE	Measurement ID. Should be one of the following:
		IVM_SurfVolume = 0
		IVM_SurfArea = 1
		IVM_SizeX = 2
		IVM_SizeY = 3
		IVM_SizeZ = 4
		IVM_CenterX = 5
		IVM_CenterY = 6
		IVM_CenterZ = 7
		IVM_VolumeBox = 8
		IVM_BoxRatio =9
			Selects the measurments to be displayed in the data graph

Command	1Opt1	dParam	Description

GRAPH_MEASUREMENT, con't		IVM_VolumeFraction
		= 10
		IVM_Diameter = 11
		IVM_Sphericity = 12
		IVM_MeanDensity = 13
		IVM_IOD = 14
		IVM_DensityStDev = 15
		IVM_RadiusMax = 16
		IVM_RadiusMin = 17
		IVM_RadiusRatio = 18
		IVM_Class = 19
		IVM_FeretMax = 20
		IVM_FeretMin = 21
		IVM_FeretRatio = 22
		IVM_SurfAngleA = 23
		IVM_SurfAngleG = 24
		IVM_SurfNormDev
		= 25	

GRAPH_RANGE_AUTO	Not used, should be 0	0 = off 1 = on	Sets the auto-range flag for the graph
GRAPH_RANGE_MIN	Not used, should be 0	Value	Sets the minimum value for the range
GRAPH_RANGE_MAX	Not used, should be 0	Value	Sets the maximum value for the range
GRAPH_X_LABELS	Not used, should be 0	Should be one of the following: rnxlFrameNumber rnxlRelTime rnxlAbsTime	Indicates the type of label to display on the graph
GRAPH_SHOW_TRACKS	Not used, should be 0	0 = off 1 = on	Turns the tracking mode for the graph on or off

Example

```
'select SurfaceArea measurement in Data Graph

ret=IpRendMeasGraphSet(GRAPH_MEASUREMENT,VOLUME_MEAS_TYPE,
IVM_SurfArea)
```

Return Value

0 if successful, a negative error code if failed

IpRendMMeas

Syntax **IpRendMMeas***(sCommand, 1Opt1, dParam)*

Description This function gets and sets various parameters of the 3D manual measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments This macro takes the following commands:

Command	**1Opt1**	**dParam**	**Description**
M_MEAS_GET	Manual measurement element, should be one of the following: IMM_POS_X IMM_POS_Y IMM_POS_Z IMM_LENGTH IMM_START_POS_X IMM_START_POS_Y IMM_START_POS_Z IMM_END_POS_X IMM_END_POS_Y IMM_END_POS_Z IMM_ANGLE IMM_AREA	Pointer to an array of doubles, large enough to receive all values. The size of the array must be not less than NumObj, where NumObj is the number of objects in the manual measurements list (see M_NUM_OBJECTS_GET)	Gets the values of manual measurement elements.
M_STATS_GET	Manual measurement. See M_MEAS_GET for available constants	Pointer to an array of double[10] that will receive the information. The structure of the array is the following:	Gets manual measurement statistics.

dParam	**Description**
Stats [0]	Mean value (DST mean)
Stats[1]	Standard deviation (DSTStDev)
Stats[2]	Minimum value (DSTMin)
Stats[3]	Maximum value (DSTMax)
Stats[4]	Range (DST range)

dParam	Description
Stats[5]	Sum (DST Sum)
Stats[6]	Index of minimum (DSTIndMin)
Stats[7]	Index of maximum (DSTIndMax)
Stats[8]	Number of shown objects (DSTNShown)
Stats[9]	Total number of objects (DSTNObj)

Command	1Opt	dParam	Description
M_ADD_MM_ POINT	Number of points in the element. For POINT, LINE and ANGLE this field must be 1,2 and 3 correspondingly	Pointer to an array of doubles that contain point coordinates in Image coordinates (see IpRendConvertCoord for coordinate conversion if necessary). Each point is represented by 3 double values with X,Y and Z coordinates. Example of the structure: ipDArray(0) – X coordinate of 1-st point ipDArray(1) – Y coordinate of 1-st point ipDArray(2) – Z coordinate of 1-st point	Adds new point manual measurement element. Note that in Template mode the prompt is displayed and the macro continues only after creating the requested measurement or closing the Prompt dialog. If the Prompt is closed by the user, the function returns -1, otherwise, the ID of new measurement object is returned.
M_ADD_MM_LINE	See above	See above	Adds new line manual measurement element
M_ADD_MM_ POLY_LINE	See above	See above	Adds new polyline manual measurement element
M_ADD_MM_ ANGLE	See above	See above	Adds new angle manual measurement element

Command	1Opt	dParam	Description
M_ADD_MAN_ TRACK	Number of points in the track	Pointer to an array of doubles, with object IDs and time points for the track. The structure of the array is following: ipDArray(0) – 1st volume object ID ipDArray(1) – 1st time point ipDArray(2) – 2nd volume object ID ipDArray(3) – 2nd time point ipDArray(4) – 3rd volume object ID	Adds a manual 4D track
M_ADD_AUTO_ TRACK	Number of points in the track; should be 1, because all auto-tracking starts with 1 object	Pointer to an array of doubles of size 2, with starting object ID and time point (0-based)	Adds an automatic 4D track
M_TYPE_GET	Index of the measurement element (zero-based)	Pointer to a double, that will receive the value. The value can be one of the following: 0 = IP_REND_MM_POINT 1 = IP_REND_MM_LINE 2 = IP_REND_MM_POLY_LINE 3 = IP_REND_MM_ANGLE	Gets the type of manual measurement
M_NUM_OBJECTS_ GET	Not used	Pointer to a double that will receive the value	Gets the number of manual measurement elements.

Command	**1Opt**	**dParam**	**Description**
M_NUM_POINTS_ GET	Index of the measurement element (zero-based)	Pointer to a double that will receive the value	Gets the number of points in the of manual measurement element
M_ POINTS_GET	Index of the measurement element (zero-based)	Pointer to an array of doubles, large enough to receive to receive all coordinates. The size of the array must be not less than 3*NumPoints, where NumPoints is the number of points in the element (see M_NUM_POINTS_G ET)	Gets the coordinates of the points in the manual measurement element
M_NUM_MEAS_ GET	Not used	Pointer to a double that will receive the value	Gets the number of active manual measurements
M_SEL_GET	Index of the measurement element (zero-based)	Pointer to a double that will receive the value	Gets the selection status of the manual measurement element.
M_SEL_SET	Index of the measurement element (zero-based) Use M_ALL to select or deselect all objects	Double value: 0 = Deselect 1 = Select	Sets the selection status of the manual measurement element. Note that in Template mode the prompt is displayed and the macro continues only after selecting/deselecting a manual measurement element or closing the Prompt dialog. If the Prompt is closed by user, the function returns -1, in other case the ID of selected/unselected object is returned
M_SHOW_GET	Index of the measurement element (zero-based)	Pointer to a double that will receive the value	Gets the visibility status of the manual measurement element
M_SHOW_SET	Index of the measurement element (zero-based) Use M_ALL to select or deselect all objects	Double value: 0 = Deselect 1 = Select	Sets the visibility status of the manual measurement element

Command	1LOpt	dParam	Description
M_MEAS_LIST_GET	Not used	Pointer to an array of doubles, large enough to receive to receive all coordinates. The size of the array must be not less than 3*NumPoints, where NumPoints is the number of points in the element. The points are in image coordinates. Should be one of the following: 0 = IMM_POS_X 1 = IMM_POS_Y 2 = IMM_POS_Z 3 = IMM_LENGTH 4 = IMM_START_POS_X 5 = IMM_START_POS_Y 6 = IMM_START_POS_Z 7 = IMM_END_POS_X 8 = IMM_END_POS_Y 9 = IMM_END_POS_Z 10 = IMM_ANGLE 11 = IMM_AREA	Gets the list of active manual measurements

Return Value	0 if successful, a negative error code if failed.
Example	Please see Appendix A, Sample Macro Code

IpRendMMeasGetStr

Syntax

IpRendMMeaseGetStr*(sCommand, 1Opt1, lpszDest)*

Description

This function gets various string parameters for the 3D manual measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lpszDest	**LPSTR**	See comments and list below.

Comments

This macro takes the following commands:

Command	**lOpt 1**	**lpszDest**	**Description**
M_MEAS_PREF_GET	Type of manual measurement, should be one of the following: IP_REND_MM_ POINT IP_REND_MM_LINE IP_REND_MM_ POLY_LINE IP_REND_MM_ ANGLE	String that will receive the measurement prefix, the string must be a fixed length string long enough to receive the value	Gets manual measurement prefix
M_NAME _GET	Index of the measurement element (zero-based)	String that will receive the measurement name, the string must be a fixed length string long enough to receive the value	Gets the name of the manual measurement element

Return Value

0 if successful, a negative error code if failed.

See Also

IpRendMeasSetStr

Example

```
Dim Pref As String*100
ret = IpRendMMeasGetStr(M_MEAS_PREF_GET,IP_REND_MM_LINE,Pref)
Dim MName As String*100
ret = IpRendMMeasGetStr(M_NAME_GET,0,MName)
```

IpRendMMeasSet

Syntax

IpRendMMeaseSet*(sCommand, 1Opt1, dParam)*

Description

This function sets various parameters of the 3D manual measurements. This function is a version of IpRendMMease used to pass parameters into the manual measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments

This macro takes the following commands:

Command	**lOpt 1**	**dParam**	**Description**
M_UPDATE	Not used, should be 0	Not used, should be 0	Updates the manual measurement data tables and objects. Applies new settings, should be called after changing any manual measurement lOptions from a macro.
M_LINE_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color.	Sets the line color for manual measurements.
M_SEL_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color	Selects color for manual measurements
M_TEXT_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color	Sets label color for manual measurements
M_EL_SIZE	Not used, should be 0	Value	Manual measurement element size (point, arrow)
M_FONT_SIZE	Not used, should be 0	Value	Sets font size for manual measurement labels.

Command	LOpt 1	dParam	Description
M_LABEL_TYPE	Not used, should be 0	one of the following: mmLabelsShowName, mmLabelsShowMeasurement, mmLabelsShowNone	Sets label type of measurements (name,first measurement,none)
M_RESET_MEAS	Not used, should be 0	Not used, should be 0	Resets the list of selected measurements
M_ADD_MEAS	Should be one of the following: IMM_POS_X IMM_POS_Y IMM_POS_Z IMM_LENGTH IMM_START_POS_X IMM_START_POS_Y IMM_START_POS_Z IMM_END_POS_X IMM_END_POS_Y IMM_END_POS_Z IMM_ANGLE IMM_AREA IMM_NPOINTS	Not used, should be 1	Adds a measurement to the list of selected measurements
M_SHOW_STATS	Not used, should be 0	0 = Hide statistics 1 = Show statistics	Shows or hides the statistics pane of the Manual Measurements window.
M_ACTION	Not used, should be 0	Action type. Must be one of the following: mmActionSelect mmActionAddPoint mmActionAddLine mmActionAddPolyLine mmActionAddAngle mmActionSplitObject mmActionAddOutline mmActionAddCurve	Sets measurement action
M_CREATE_MEAS	Not used, should be 0	Type of new measurement, must be one of the following:	Creates a new derived measurement based on the selected objects

Command	**LOpt 1**	**dParam**	**Description**
		IMM_ADD_PP_DIST = distance between centers of 2 objects IMM_ADD_PL_DIST = distance between point and line IMM_ADD_LL_ANGLE = angle between lines IMM_ADD_CENTER = center point of the object IMM_ADD_MIN_DIST = min distance between point and surface IMM_ADD_POLYLINE = merge object points to a poly-line IMM_SPLIT_POLYLINE = creates a new line measurement from every segment of the selected track/polyline IMM_GET_POINTS = creates a new point measurement for every coordinate of the selected track/polyline	
M_SHOW_ALL	Not used, should be 0	Not used, should be 0	Shows all objects
M_SHOW_SELECTED	Not used, should be 0	0 = Hide objects 1 = Show objects	Shows or hides the selected objects
M_DELETE_ALL	Not used, should be 0	Not used, should be 0	Deletes all objects
M_DELETE_SELECTED	Not used, should be 0	0 = Hide objects 1 = Show objects	Deletes the selected objects
M_ALLOW_EDIT	Not used, should be 0	0 = Off 1 = On	Enables point position editing
M_ENABLE_UPDATE	Not used, should be 0	0 = Disable update 1 = Enable update	Enables/disables updating of manual and volume measurements data tables
M_SPH_SIZE	Not used, should be 0	The size value	Sets the size of spheres used to display manual point measurements
M_LINE_WIDTH	Not used, should be 0	The width value	Sets the wideth of lines connecting the manual measurement points
M_EL_COLOR	Index of the manual measurement element (o-based)	The color value as long 0xrrggbb	Sets the color of a manual measurement element.
M_RESET_ALL_USR_MEAS	Not used, should be	Not used, should be	Resets all added user-defined measurements

Command	LOpt 1	dParam	Description
M_USR_MEAS_DATA_SET	Measurement/element index. The index is combined according to the following formula: MeasID+M_USR_MEAS_MULT*MeasElIndex, where MeasID is the measurement index returned by M_ADD_USR_MEAS and MeasElIndex is the index of the manual measurement element (line, point,…), 0-based.	The selected value	Sets the value for user-defined measurements

Return Value	0 if successful, a negative error code if failed.
See Also	M_MEAS_PREF_SET in IpRendMMeasSetStr and IpRendMeasGetStr
Example	Please see Appendix A, Sample Macro Code

IpRendMMeasSetStr

Syntax **IpRendMMeasSetStr***(sCommand, 1Opt1, lpszDest)*

Description This function sets various string parameters for the 3D manual measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lLOpt1	**Long**	See comments and list below.
lpszDest	**LPSTR**	See comments and list below.

Comments This macro takes the following commands:

Command	lOpt 1	lpszDest	Description
M_MEAS_PREF_SET	Type of manual measurement, should be one of the following: IP_REND_MM_POINT IP_REND_MM_LINE IP_REND_MM_POLY_LINE IP_REND_MM_ANGLE	String with prefix	Sets manual measurement prefix

Command	lOpt 1	lpszDest	Description
M_NAME _SET	Index of the measurement element (zero-based)	String with new name	Sets the name of the manual measurement element
M_TEMPLATE_ PROMPT	Not used	String with text	Sets the user prompt for template mode
M_ADD_USR_MEAS	Icon ID. The value can be from 0 to 4	Measurement name	Adds new user-defined measurement to the manual measurements list. If the measurement already exists, it is not added. The function just returns the ID of the measurement. The measurement values can be then set from macro using M_USR_MEAS_DATA_SET constant (see IpRendMMeasSet)

Comments

The example macro prompts the user to select 2 manual measurement elements from within the measurements table.

Return Value

Id of the measurement if successful, a negative error code if failed.

See Also

IpRendMeasGetStr

Example

```
ret = IpTemplateMode(1)
ret = IpRendMMeasSetStr(M_TEMPLATE_PROMPT,0,"Please select
first point")
ret = IpRendMMeasSet(M_SEL_SET,1,1)
ret = IpRendMMeasSetStr(M_TEMPLATE_PROMPT,0,"Please select
second point")
ret = IpRendMMeasSet(M_SEL_SET,2,1)
ret = IpTemplateMode(0)
```

IpRendMove

Syntax

IpRendMove*(Dialog, xPos, yPos)*

Description

This function moves windows and dialogs

Parameters

sDialog	**Integer**	Indicates the dialog to move.
xPos	**Integer**	Indicates the X window position
yPos	**Long**	Indicates the Y window position

Return Value

0 if successful, a negative error code if failed.

Example

```
ret = IpRendMove(REND_VIEWER, 632, 161)
```

IpRendReload

Syntax **IpRendReload***()*

Description This function reloads the active volume into 3D Constructor. Use this function to reload volumes after they have been modificed

IpRendPaletteFile

Syntax **IpRendPaletteFile** *(FileName,bSave)*

Description This function loads or saves 3D palette files

Parameters

szFileName	**String**	Indicates the name of the file
bSave	**Integer**	Indicates if the file should be loaded or saved: 0 = load file 1 = save file

Return Value 0 if successful, a negative error code if failed.

Example

```
'load palette
ret = IpRendPaletteFile("C:\Mediacy\Blue-RedBl.psc", 0)
'save palette
ret = IpRendPaletteFile("C:\Mediacy\NewPal.p3d", 1)
```

IpRendSet

Syntax **IpRendSet** *(sCommand, dParam1, dParam2,dParam3)*

Description This function sets various rendering commands

Parameters

sCommand	**Integer**	See comments and list below.
dParam1	**Double**	See comments and list below.
dParam2	**Double**	See comments and list below.
dParam3	**double**	See comments and list below.

Comments See list below.

sCommand	dParam1	dParam2	dParam3	Description
REND_CHANNEL	dParam1: is one of the following REND_CH_COLOR load image as color REND_CH_RED load red channel REND_CH_GREEN load green channel REND_CH_BLUE load blue channel	Not used	Not used	Sets the channel which will be used to load new volume into 3D Constructor volume renderer using IpRendLoad() function. Note that if the image is gray REND_CHANNEL is ignored.
REND_VOXEL_SIZE	Width of voxel in calibrated units	Height of voxel in calibrated units	Depth of voxel in calibrated units	Sets voxel size for the volume which will be used to load new volume into 3D Constructor volume renderer using IpRendLoad() function.Default values 1,1,1 will be used with IpRendLoad if voxel size is not set.
REND_SPIN	XSpeed = rotation about X axis	YSpeed = rotation about Y axis	ZSpeed = rotation about Z axis	Sets the Spin animation for the volume in revolutions per second
REND_VIEWING_MODE	0 = Viewer off 1 = Viewer on	Not used.	Not used.	Turns 3D Viewer off or on.
REND_VIEW_ALL	Not used	Not used.	Not Used	View all actions.

sCommand	dParam1	dParam2	dParam3	Description
REND_ACTIVE_PORTION	Defines whether to load an active portion of the sequence or the stack. 1 – to load active portion, 0 – to load stack.	Not used.	Not used	Sets an lOption to load an active portion of the sequence or the stack, which will be used to load new volume into 3D Constructor volume renderer using IpRendLoad() function.
REND_HI_COLOR	1 = Hi-color 2 = 256 colors	Not used.	Not used.	Sets the Hi-Color mode for the new image.
REND_BACK_COLOR	Color in bbggrr format where rr, gg,bb are Red, Green and Blue components of color.	Not used.	Not used.	Sets the background color mode for the Viewer.
REND_RESET_LOPTIONS	1 = Reset lOptions 0 = Do not reset	Not used.	Not used.	Resets all the rendering lOptions before loading a new volume. Removes all added elements.
REND_SUBSAMPLING	Sub-sampling in X direction	Sub-sampling in Y direction.	Sub-sampling in Z direction	Sets sub-sampling for the volume which will be used to load new volume into 3D Constructor volume renderer using IpRendLoad() function. Default values 1,1,1 will be used with IpRendLoad if sub-sampling is not set.

sCommand	dParam1	dParam2	dParam3	Description
REND_ISO_ CHANNEL	dParam1: is one of the following REND_CH_GRAY = -1 load gray channel as weighted combinations of red, blue, and green REND_CH_RED = 1 load red channel REND_CH_GREEN = 2 load green channel REND_CH_BLUE = 3 load blue channel REND_RED_GREEN = 4 red-green colocalization REND_BLUE_GREEN =5 blue-green colocalization REND_RED_BLUE =6 red-blue colocalization REND_RED_GREEN_ BLUE = 7 red-green-blue colocalization	Not used	Not used	Sets the channel which will be used to create new volume measurements Note that if the image is gray, IPRendElement ignores this parameter.
REND_ISO_SUB SAMPLING	Sub-sampling in X direction	Sub-sampling in Y direction.	Sub-sampling in Z direction	Sets sub-sampling for new volume measurements. Default values 1,1,1 will be used with IpRendLoad if sub-sampling is not set.

sCommand	dParam1	dParam2	dParam3	Description
REND_ISO_ FILTER	FLT_3D_None FLT_3D_LoPass_3x 3x3 FLT_3D_LoPass_5x 5x5 FLT_3D_LoPass_7x 7x7 FLT_3D_LoPass_9x 9x9 FLT_3D_Gauss_5x5 x5 FLT_3D_Gauss_7x7 x7 FLT_3D_Gauss_9x9 x9	Not used	Not used	Sets the filter type which will be used to create new volume measurements
REND_ISO_ SIMPL	ISO_SIMPL_NONE no simplification ISO_SIMPL_MED medium simplification ISO_SIMPL_MAX maximum simplification	Not used	Not used	Sets the simplification mode which will be used to create new volume measurements.
REND_ISO_ CLOSE_EDGES	0 = Close edges off 1= Close edges on	Not used	Not used	Sets the Close edges mode which will be used to create new volume measurements

sCommand	dParam1	dParam2	dParam3	Description
REND_ISO_COUNT	0 = Count off 1= Count on	Not used	Not used	Sets the Count mode which will be used to create new volume measurements
REND_BACK_COLOR2	Color in bbggrr format where rr, gg,bb are Red, Green and Blue components of color.	Not used.	Not used.	Sets the gradient background color for the Viewer.
REND_GRADIENT_BACK	0 = Gradient off 1= Gradient on	Not used.	Not used.	Turns the gradient background color on or off.
REND_IMAGE_BACK	0 = Image off 1= Image on	Not used.	Not used.	Turns the image background on or off.
REND_IMAGE_BACK_ STYLE	Must be one of the following: value: 0 = None 1 = Center 2 = Lower left 3 = Upper left 4 = Upper right, 5 = Lower right 6 = Stretch 7 = Tile	Not used.	Not used.	Sets the position of the background image

Return Value 0 if successful, a negative error code if failed, ICERR_INVARG if out of range.

Example Please see Appendix A, Sample Macro Code

IpRendSettingsFile

Syntax **IpRendSettingsFile***(szSettings, bSave)*

Description This function loads or saves a set of 3D rendering options, including 3D Constructor files and 3D experiment sets.

Parameters

szSettings	**String**	Indicates the file name. The file type is determined by the extension: *.REN = settings file *.S3D = experiment set
bSave	**Long**	Indicates whether to load or save the file: 0 = load file 1 = save file

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpRendSettingsFile(“def.ren”,0)
```

IpRendSize

Syntax **IpRendSize** *(sDialog, xSize, ySize)*

Description This function resizes the toolbar and dialogs

Parameters

sDialog	**Integer**	Indicates the dialog to resize. The REND_LOPTIONS dialog cannot be resized.
xSize	**Integer**	Indicates the dialog width
ySize	**Long**	Indicates the dialog height

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpRendSize(REND_VIEWER,451,541)
```

IpRendShow

Syntax **IpRendShow** *(sDialog, sShow)*

Description This function hides or shows the dialog and viewer.

Parameters

sDialog	**Integer**	A constant indicating what to show or hide. Must be one of the following: REND_VIEWER indicates the 3D Viewer window REND_LOPTIONS indicates the rendering lOptions dialog. REND_MEAS_DATA_TABLE indicates the manual measurements data table REND_VMEAS_DATA_TABLE indicates the volume measurements data table REND_HISTOGRAM indicates the measurements histogram REND_CAMERA_DLG indicates the camera parameters dialog REND_BCG_DLG indicates the brightness, contrast and gamma dialog.
sShow	**Integer**	A constant indicating whether to show or hide the dialog or window: REND_HIDE = hide the window or dialog REND_SHOW = show the window or dialog

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpRendShow(REND_VIEWER,REND_SHOW)
ret = IpRendShow(REND_LOPTIONS,REND_SHOW)
```

IpRendVMeas

Syntax	**IpRendVMeas***(sCommand, 1Opt1, dParam)*
Description	This function gets and sets various parameters of the 3D volume measurements.

Parameters

sCommand	**Integer**	See comments and list below.
IOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments This macro takes the following commands:

sCommand	**IOpt1**	**dParam**	**Description**
M_MEAS_GET	Manual measurement element, should be one of the following: Should be one of the following: IVM_SurfVolume IVM_SurfArea IVM_SizeX IVM_SizeY IVM_SizeZ IVM_CenterX IVM_CenterY IVM_CenterZ IVM_VolumeBox IVM_BoxRatio IVM_VolumeFraction IVM_Diameter IVM_Sphericity IVM_MeanDensity IVM_IOD IVM_DensityStDev IVM_RadiusMax IVM_RadiusMin IVM_RadiusRatio IVM_Class IVM_FeretMax IVM_FeretMin IVM_FeretRatio IVM_SurfAngleA IVM_SurfAngleG IVM_SurfNormDev	Pointer to an array of doubles, large enough to receive all values. The size of the array must be not less than NumObj, where NumObj is the number of objects in the volume measurements list see M_NUM_OBJECTS_GET	Gets the values of volume measurement elements.
M_FILTER_RANGES_ GET	Measurement ID	Pointer to an array of doubles that will receive the value	Gets volume measurement filter ranges
M_FILTER_RANGES_ SET	Measurement ID	Pointer to an array of a double [2] with min and max values	Sets volume measurement filter ranges

sCommand	1Opt1	dParam	Description
M_ADD_SPLIT	ID of the object to split	Pointer to an array of doubles [9] that contain point coordinates in world coordinates (see IpRendConvertCoord for coordinate conversion if necessary). Each point is represented by 3 double values with X,Y and Z coordinates. Example of the structure: ipDArray(0) – X coordinate of 1-st point ipDArray(1) – Y coordinate of 1-st point ipDArray(2) – Z coordinate of 1-st point …	Adds split by the plane defined by 3 points (?). Note that in Template mode the prompt is displayed and the macro continues only after splitting an object or closing the Prompt dialog. If the Prompt is closed by the user, the function returns -1, otherwise, the ID of new measurement object is returned.
M_ADD_OUT LINE	Object ID	Pointer to an array of doubles [9] that contain point coordinates in world coordinates	Adds an outline crossing the surface of the object in the plane defined by 3 points (?).Note that in Template mode the prompt is displayed and the macro continues only after creating an outline or closing the Prompt dialog. If the Prompt is closed by the user, the function returns -1, otherwise, the ID of new measurement object is returned.
M_ADD_CURVE	Object ID	Pointer to an array of doubles [9] that contain point coordinates in world coordinates	Adds a curve crossing the surface of the object the plane defined by 3 points (?).Note that in Template mode the prompt is displayed and the macro continues only after creating a curve or closing the Prompt dialog. If the Prompt is closed by the user, the function returns -1, otherwise, the ID of new measurement object is returned.
M_SHOW_GET	Object ID	Pointer to a double that will receive the value	Gets the visibility status of the volume measurement element
M_SHOW_SET	Object ID	Double value: 0 = Deselect 1 = Select	Sets the visibility status of the volume measurement element

sCommand	**lOpt1**	**dParam**	**Description**
M_REF_VECT_GET	Not used, should be 0	Pointer to an array of doubles that will receive the vector values. The structure of the array is: IpDArray(0) = x coordinate IpDArray(1) = y coordinate IpDArray(2) = z coordinate	Gets the reference vector
M_DIR_VECT_GET	Not used, should be 0	Pointer to an array of doubles that will receive the vector values. The structure of the array is: IpDArray(0) = x coordinate IpDArray(1) = y coordinate IpDArray(2) = z coordinate	Gets the direction vector
M_OBJ_NORMAL_GET	Index of the measurement element	Pointer to an array of doubles that will recive the vector values	Gets the coordinates of the volume measurement element.
M_REF_VECT_SET	Not used, should be 0	Pointer to an array of doubles that will receive the vector values. The structure of the array is: IpDArray(0) = x coordinate IpDArray(1) = y coordinate IpDArray(2) = z coordinate	Sets the reference vector
M_DIR_VECT_SET	Not used, should be 0	Pointer to an array of doubles that will receive the vector values. The structure of the array is: IpDArray(0) = x coordinate IpDArray(1) = y coordinate IpDArray(2) = z coordinate	Sets the direction vector

sCommand	**lOpt1**	**dParam**	**Description**
ELEM_COLOR_GET	IP_REND_ISO_SURF or IP_REND_VOLUME	ID of iso-surface	Gets the color of the element

lParam	**Description**
OutAr[0]	Red component of ambient color in range from 0 to 1.
OutAr[1]	Green component of ambient color in range from 0 to 1
OutAr[2]	Blue component of ambient color in range from 0 to 1
OutAr[3]	Red component of diffuse color in range from 0 to 1.
OutAr[4]	Green component of diffuse color in range from 0 to 1.
OutAr[5]	Blue component of diffuse color in range from 0 to 1.
OutAr[6]	Red component of specular color in range from 0 to 1.
OutAr[7]	Green component of specular color in range from 0 to 1
OutAr[8]	Blue component of specular color in range from 0 to 1
OutAr[9]	Red component of emissive color in range from 0 to 1.
OutAr[10]	Green component of emissive color in range from 0 to 1

	OutAr[11]		Blue component of emissive color in range from 0 to 1.	
	OutAr[12]		Shininess in range from 0 to 1	
	OutAr[13]		Transparency in range from 0 to 1	
ELEM_COLOR_SET	IP_REND_ISO_ SURF or IP_REND_ VOLUME	ID of iso-surface	Pointer to an array of double[14] that will receive the information.	Sets color parameters
TR_SEARCH_RADIUS_ GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets search radius for auto-tracking	
TR_USE_FROZEN_GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets use frozen measurements	
TR_ACCEL_LIMIT_GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets acceleration limit for auto-tracking	
TR_AUTO_ACCEL_ LIMIT _GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets auto acceleration limit for auto-tracking	
TR_PARTIAL_TRACKS_ GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets partial tracks	
TR_MIN_TRACK_ LENGTH_GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets minium track length	
TR_MOTION_TYPE_GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets motion type for auto-tracking	
TR_TRACK_ PREDICTION_GET	Not used, should be 0	Pointer to a double that will receive the value.	Gets tracking prediction depth	
TR_START_FIRST_GET	Not used, should be 0	Pointer to a double that will receive the value	Gets start time from the first time point	

Return Value 0 if successful, a negative error code if failed.

Example Please see Appendix A, Sample Macro Code

IpRendVMeasGetStr

Syntax

IpRendVMeasGetStr*(sCommand, 1Opt1, lpszDest)*

Description

This function gets various string parameters for the 3D volume measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lLOpt1	**Long**	See comments and list below.
lpszDest	**LPSTR**	See comments and list below.

Comments

This macro takes the following commands:

sCommand	**lOpt 1**	**lpszDest**	**Description**
M_NAME _GET	Index of the measurement element (zero-based)	String that will receive the measurement name, the string must be a fixed length string long enough to receive the value	Gets the name of the volume measurement element

Return Value

0 if successful, a negative error code if failed.

See Also

IpRendMeasSetStr

Example

```
Dim MName As String*100
ret = IpRendVMeasGetStr(M_NAME_GET,0,MName)
```

IpRendVMeasHist

Syntax

IpRendVMeasHist *(sCommand, 1Opt1 dParam)*

Description

This function gets and sets various parameters for the 3D volume measurements histogram.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments

This macro takes the following commands:

sCommand	**lOpt 1**	**dParam**	**Description**
HIST_RANGE_GET	Not used, should be 0	Pointer to an array of doubles [2] that will receive the values.	Gets the range of the histogram
HIST_RANGE_SET	Not used, should be 0	Pointer to an array of doubles [2] that holds the values	Sets the range of the histogram

Return Value

0 if successful, a negative error code if failed.

See Also

IpRendVMeasHistSet

Example

```
ipDArray(0)=1.000000
ipDArray(1)=100.000000
ret = IpRendVMeasHist(HIST_RANGE_SET,0,ipDArray(0))
```

IpRendVMeasHistSet

Syntax **IpRendVMeasHistSet***(sCommand, 1Opt1, dParam)*

Description This function sets various parameters of the 3D measurements histogram**.**

Parameters

sCommand	**Integer**	HIST_MEASUREMENT – sets the histogram measurement
lOpt1	**Long**	Defines the type of measurement. Must be one of the following: VOLUME_MEAS_TYPE MANUAL_MEAS_TYPE
dParam	**Double**	Volume measurement ID. See list in M_MEAS_GET of IpRendVMeas.

Comments This macro takes the following commands:

Return Value 0 if successful, a negative error code if failed.

See Also IpRendVMeasHist, IpRendVMeas

Example

```
‘select volume measurement Surface Area
ret =
IpRendVMeasHistSet(HIST_MEASUREMENT,VOLUME_MEAS_TYPE,IVM_SurfAr
ea)
‘select manual measurement Length
ret =
IpRendVMeasHistSet(HIST_MEASUREMENT,MANUAL_MEAS_TYPE,IMM_LENGTH
)
```

IpRendVMeasSet

Syntax	**IpRendVMeasSet***(sCommand, 1Opt1, dParam)*		
Description	This function sets various parameters of the 3D volume measurements. This function is a version of IpRendVMeas used to pass parameters into the volume measurements.		
Parameters	*sCommand*	**Integer**	See comments and list below.
	lOpt1	**Long**	See comments and list below.
	dParam	**Double**	See comments and list below.
Comments	This macro takes the following commands:		

sCommand	**lOpt 1**	**dParam**	**Description**
M_UPDATE	Not used, should be 0	0 = filter objects with new filter ranges 1 = recreate iso-surfaces with parameters	Updates the volume measurement data tables and objects. Applies new settings, should be called after changing any manual measurement lOptions from a macro.
M_SEL_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color	Selects color for volume measurements
M_TEXT_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color	Sets label color for volume measurements
M_FONT_SIZE	Not used, should be 0	Value	Sets font size for volume measurement labels.
M_LABEL_TYPE	Not used, should be 0	one of the following: mmLabelsShowName, mmLabelsShowMeasurement, mmLabelsShowNone	Sets label type of measurements (name,first measurement,none)
M_RESET_MEAS	Not used, should be 0	Not used, should be 0	Resets the list of selected measurements
M_ANGLE_RANGE	Not used, should be 0	Angle value in degrees	Sets angle range for orientation measurements

sCommand	lOpt 1	dParam	Description
M_NORM_CALC_ METHOD	Not used, should be 0	0 = off 1 = on	Sets method of calculating normal surface
M_SHOW_NORMALS	Not used, should be 0	0 = off 1 = on	Turns display of normal surface vectors on or off

M_ADD_MEAS	Should be one of the following:
	IVM_SurfVolume = 0
	IVM_SurfArea = 1
	IVM_SizeX = 2
	IVM_SizeY = 3
	IVM_SizeZ = 4
	IVM_CenterX = 5
	IVM_CenterY = 6
	IVM_CenterZ = 7
	IVM_VolumeBox = 8
	IVM_BoxRatio =9
	IVM_VolumeFraction = 10
	IVM_Diameter = 11
	IVM_Sphericity = 12
	IVM_MeanDensity = 13
	IVM_IOD = 14
	IVM_DensityStDev = 15
	IVM_RadiusMax =16
	IVM_RadiusMin = 17
	IVM_RadiusRatio = 18
	IVM_Class = 19
	IVM_FeretMax = 20
	IVM_FeretMin = 21
	IVM_FeretRatio = 22
	IVM_SurfAngleA = 23
	IVM_SurfAngleG = 24
	IVM_SurfNormDev = 25
	IVM_Surf_Angle_T =26
		Not used, should be 1	Adds a volume measurement to the list of selected (or available?) measurements

M_PREV_SHOW_HIST	Not used, should be 0	0 = Hide histogram 1 = Show histogram	Shows or hides volume histogram at threshold preview
M_PREV_SHOW_ PSEUDOCOL	Not used, should be 0	0 = Hide pseudocolor 1 = Show pseudocolor	Shows or hides pseudo-colored volume during threshold preview
M_VOL_PRECISION	Not used, should be 0	Should be either; M_PR_SUBVOXEL or M_ORE_VOXEL	Shows or hides volume measurements precision
M_COMPL_LIMIT	Not used, should be 0	Value (default = 50)	Complexity limit for iso-surfaces

sCommand	lOpt 1	dParam	Description
M_OBJ_COLORING	Not used, should be 0	Should be either: M_COLOR_MODE_SURF or M_COLOR_MODE_RANDOM	Object coloring mode
M_CLEAN_BORDERS	Not used, should be 0	Should be either: M_CL_BORDERS_NONE or M_CL_BORDERS_ALL	Clean borders flag
M_APPLY_FILTER_RANGES	Not used, should be 0	0 = Filter range off 1 = Filter range on	Apply filter range flag
M_SHOW_STATS	Not used, should be 0	0 = Hide statistics 1 = Show statistics	Shows or hides the statistics pane of the Volume Measurements window
M_ACTION	Not used, should be 0	Action type. Must be one of the following: mmActionSelect mmActionSplitObject	Sets measurement action
M_UNDO	Not used, should be 0	Not used, should be 0	Undoes last split or merge function
M_CREATE_MEAS	Not used, should be 0	Type of new measurement, must be one of the following:	Creates a new derived measurement based on the selected objects
		IMM_ADD_PP_DIST IMM_ADD_CENTER IMM_ADD_MIN_DIST IMM_MERGE_OBEJCTS	distance between centers of 2 objects center point of the object min distance between point and surface merge selected objects
M_SHOW_ALL	Not used, should be 0	Not used, should be 0	Shows all objects
M_SHOW_SELECTED	Not used, should be 0	0 = Hide objects 1 = Show objects	Shows or hides the selected objects
TR_SEARCH_RADIUS	Not used, should be 0	Value in calibrated units	Sets search radius for auto-tracking

sCommand	lOpt 1	dParam	Description
TR_USE_FROZEN	Not used, should be 0	0 = Off 1 = On	Use frozen measurements in tracking lOptions
TR_ACCEL_LIMIT	Not used, should be 0	Value in calibrated units	Sets acceleration limit for auto-tracking
TR_AUTO_ACCEL_ LIMIT	Not used, should be 0	0 = Off 1 = On	Sets auto acceleration limit for auto-tracking
TR_PARTIAL_TRACKS	Not used, should be 0	0 = Off 1 = On	Sets partial tracks lOption
TR_MIN_TRACK_ LENGTH	Not used, should be 0	0 = Off 1 = On	Sets minium track length lOption
TR_MOTION_TYPE	Not used, should be 0	0 = Chaotic 1 = Directional 2 = Straight	Sets motion type for auto-tracking
TR_TRACK_ PREDICTION	Not used, should be 0	Depth in time points	Sets tracking prediction depth
TR_START_FIRST	Not used, should be 0	0 = Off 1 = On	Sets start time from the first time point lOption

Return Value 0 if successful, a negative error code if failed.

Example Please see Appendix A, Sample Macro Code

IpRendVMeasSetStr

Syntax **IpRendVMeasSetStr***(sCommand, 1Opt1, lpszDest)*

Description This function sets various string parameters for the 3D volume measurements.

Parameters

sCommand	**Integer**	See comments and list below.
lOpt1	**Long**	See comments and list below.
lpszDest	**LPSTR**	See comments and list below.

Comments This macro takes the following commands:

sCommand	lOpt 1	lpszDest	Description
M_NAME _SET	Index of the measurement element (zero-based)	String with new name	Sets the name of the volume measurement element
M_TEMPLATE_PROMPT	Not used	String with text	Sets the user prompt for template mode

Return Value 0 if successful, a negative error code if failed.

See Also IpRendMeasGetStr

Example

```
ret = IpRendVMeasSetStr(M_NAME_SET,1,"Max distance")
ret = IpTemplateMode(1)
ret = IpRendVeasSetStr(M_TEMPLATE_PROMPT,0,"Please select trace
       object")
ret = IpRendVMeasSet(M_SEL_SET,1,1)
ret = IpTemplateMode(0)
```

IpRptClose

Syntax IpRptClose *()*

Description This function closes the open report.

See Also IpRptNew, IpRptOpen, IpRptShow, IpRptSave, IpRptPrint

IpRptNew

Syntax IpRptNew*(szFileName)*

Description This function opens a new report based on the specified template.

Parameters *szFileName* **String** Name of the template on which to base the new report.

Comments This command launches the report generator, if necessary. If FileName specifies a template file (*.tpl) a new report (*.rpt) is opened from that template, and any placeholders are automatically filled with current data. If FileName specifies a report (*.rpt), that report is opened and any empty placeholders are automatically updated with current data. Failure will be reported if specified file cannot be opened.

Example

```
ret = IpRptNew("C:\IPWIN\Template\SAMPLE.tpl")
```

See Also IpRptClose, IpRptShow, IpRptOpen, ,IpRptSave, IpRptPrint,

IpRptOpen

Syntax IpRptOpen*(szFileName)*

Description This function opens a report.

Parameters *szFileName* **String** Name of the report to open.

Example

```
ret = IpRptOpen("C:\IPWIN\Template\TEST1.tpl")
```

Comments This command launches the report generator, if necessary. If FileName specifies a template file (*.tpl) a new report (*.rpt) is opened from that template, and any placeholders are automatically filled with current data. If FileName specifies a report (*.rpt), that report is opened and any empty placeholders are automatically filled with current data. Note that objects containing saved data will **not** be updated. Failure will be reported if specified file cannot be opened.

See Also IpRptShow, IpRptOpen, IpRptClose, IpRptSave, IpRptPrint

IpRptPrint

Syntax IpRptPrint *()*

Description This function prints the current report to the default printer.

See Also IpRptNew, IpRptOpen, IpRptShow, IpRptSave, IpRptClose

IpRptSave

Syntax IpRptSave *(szFileName)*

Description This function saves the current report.

Parameters

szFileName	**String**	Name of the report to be saved.

Comments The current document is saved as a report, including all current data (if any).

See Also IpRptNew, IpRptOpen, IpRptShow, IpRptClose, IpRptPrint

IpRptShow

Syntax IpRptShow *()*

Description This function launches the report generator and/or brings the report generator to the top.

See Also IpRptNew, IpRptOpen, IpRptClose, IpRptSave, IpRptPrint

IpSCalCalibValues

Syntax **IpSCalCalibValues** *(Calibration, NumPoints, PointlList, ValueList)*

Description This function can be used to retrieve calibrated point locations.

Parameters

Calibration	**Long**	The ID of the calibration of interest
NumPoints	**Integer**	The number of points supplied in the PointList. See comments.
PointList	**Double**	Point locations or X/Y distances to calibrate.
ValueList	**Double**	Calibrated points. See comments.

Comments The NumPoints parameter indicates the length of the PointList array. The ValueList array must have NumPoints * 2 elements to receive the X and Y calibrated locations or distances. This function can calibrate point locations, or distances. The point locations, or the X and Y distances, are supplied in the PointList array. The calibrated values will be returned in the ValueList array, with the first element being the X value for the first point, the second value the Y value for the first point, etc.

IpSCalCreate

Syntax **IpSCalCreate**( )

Description This function creates a new spatial calibration set. Equivalent to clicking **New** in the **Spatial Calibration** dialog box.

Return Value The calibration ID of the new calibration if successful, a negative value if failed.

Comments The new calibration will be used as the current calibration.

See Also IpSCalSelect, IpSCalDestroy

IpSCalDestroy

Syntax **IpSCalDestroy**()

Description This function deletes the current spatial calibration set. Equivalent to clicking **Delete**in the **Spatial Calibration** dialog box.

See Also IpSCalCreate, IpSCalSelect

IpSCalDestroyEx

Syntax **IpSCalDestroyEx***(Calibration)*

Description This function deletes the specified calibration. Equivalent to clicking **Delete** in the **Spatial Calibration** dialog box.

Parameters

Calibration	**Long**	The ID of the calibration to delete, or one of the following constants: SCAL_CURRENT_CAL = Save the attributes of the current calibration SCAL_SYSTEM_CAL = Use to save theattributes of the current system calibration SCAL_ALL = Save all active calibrations SCAL_ALL_REF = Save all reference calibrations

Return Value A negative value if the calibration file cannot be written.

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong**. The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

See Also IpSCalGetLong, IpSCalCreate, IpSCalLoad

IpSCalGetLong

Syntax **IpSCalGetLong***(Calibration, Attribute, Value)*

Description This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	This parameter is only used by SCAL_GET_ALL and SCAL_GET_REF. For these attributes, the command is the index of the calibration of interest
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_NUM_ALL = The number of active calibrations SCAL_NUM_REF = The number of reference calibrations SCAL_GET_ALL = Return the calibration ID of an active calibration SCAL_GET_REF = Return the calibration ID of a reference calibration SCAL_ONIMAGE_COLOR = Get the color used for interactive lines and non-destructive calibration markers SCAL_CURRENT = Return the calibration ID of the current calibration SCAL_SYSTEM = Return the calibration ID of the system calibration. SCAL_IS_REFERENCE = Indicates a reference calibration. SCAL_IS_SYSTEM = Indicates a system calibration. SCAL_MARKER_STYLE = Return the selected marker style. See comments below. SCAL_UNIT_CONVERT = When non-zero, indicates that when the units are changed (see IpSCalSetUnitName and IpSCalSetStr (SCAL_UNITS...)) the scaling factors should be converted from the original absolute units to the new units. For instance, if the original units were "mm" and the new units are "cm", the scaling will be adjusted so there will be 10 times as many pixels per unit. This conversion can only be done if the units are recognized as one of the set of absolute units.
Value	**Long**	A long variable that will receive the requested attribute's value

Comments

The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong**. The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

Marker styles include the following:

SCAL_MARKER_BONW	Black text on white box, pasted on image
SCAL_MARKER_BONWB	Black text on white box with black border, pasted on image
SCAL_MARKER_WONB	White text on black box, pasted on image
SCAL_MARKER_WONBB	White text on black box with white border, pasted on image
SCAL_MARKER_ND_X	Non-destructive horizontal marker
SCAL_MARKER_ND_XY	Non-destructive horizontal and vertical marker
SCAL_MARKER_ND_Y	Non-destructive vertical marker

Return Value

0 if successful, a negative value if failed. If the active image is not calibrated, SCAL_CURRENT will not return an error. Instead, it will return a Calibration ID of zero. This indicates that there is no current calibration.

See Also

IpSCalSetLong

IpSCalGetSng

Syntax **IpSCalGetSng***(Calibration, Attribute,Value)*

Description This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to SCAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_SCALE_X - The number of horizontal pixels per calibration unit SCAL_SCALE_Y = The number of vertical pixels per calibration unit SCAL_ORIGIN_X = The horizontal coordinate of the reference origin SCAL_ORIGIN_Y = The vertical coordinate of the reference origin SCAL_ANGLE = The angle of the reference angle SCAL_ASPECT = The aspect ratio of the scaling. This attribute is read-only - set by ratio of SCALE_X / SCALE_Y. SCAL_SYSTEM_MODIFIER = Use this to adjust the system calibration both horizontally and vertically for the effects of an optovar or anything else that affects the overall magnification of the optical system. SCAL_MARKER_WIDTH = The width of the marker in calibration units. SCAL_CONVERSION_TO_MM = Returns a value that can be used to convert values expressed in the calibration's native units to millimeters. The native value should be multiplied by the conversion value. The IPCERR_EMPTY error code will be returned if the specified calibration is not expressed in absolute units.
Value	**Single**	A Single (single point) variable that will receive the requested attribute's value

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong**. The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if SCAL_CURRENT_CAL was specified and there is no calibration active.

See Also IpSCalSetSng

IpSCalGetStr

Syntax **IpSCalGetStr***(Calibration, Attribute,Value)*

Description This function retrieves the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to SCAL_CURRENT_CAL to get the current calibration's attributes, or to SCAL_SYSTEM_CAL to get the current system calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_NAME = The name of the calibration SCAL_UNITS = The name of the calibration units SCAL_FIND_BY_NAME = see comments below
Value	**String**	A fixed-length string variable that will receive the requested attribute's value

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using IpSCalGetLong. The calibration ID is also returned by functions such as IpSCalCreate and IpSCalLoad which create new calibrations.
The SCAL_FIND_BY_NAME command is handled different from the two inquiry functions. This command can be used to locate a specific calibration from the list of reference calibrations, or from the list of all calibrations (which includes any reference calibrations). The Value string does not need to be a fixed length string and could even be a string constant. The Calibration parameter is used to specify the list to search and should be set to SCAL_ALL or SCAL_ALL_REF. The return value is the calibration ID for the first calibration of that name in the specified list, or zero if none is found.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if SCAL_CURRENT_CAL was specified and there is no calibration active

See Also IpSCalSetStr

IpSCalLoad

Syntax **IpSCalLoad** *(Filename, Ref)*

Description This function loads one or more calibration from a file to the list of available calibrations.

Parameters

Filename	**String**	A string specifying the name of the file from which the calibration values will be read. The filename must include the path, such as C:\IPWIN|IpRef.cal
Ref	**Integer**	A non-zero value indicates that the calibration should be read into the list of reference calibrations. Otherwise the calibration is only added to the list of active calibrations.

Comments All of the calibrations found in the specified file will be added to the list specified by the Ref parameter. None of the calibrations will be applied to the active image, or made the active calibration. If the file contains a system calibration and is loaded into the reference calibration list, it may replace the current system calibration.

Return Value Zero if successful, an error code if unsuccessful.

See Also IpSCalSetLong

IpSCalMove

Syntax **IpSCalMove**(*x*, *y*)

Description This function moves the **Spatial Calibration** dialog box to the specified screen position. Equivalent to dragging the dialog box to a new position with the mouse.

Parameters

x	**Integer**	An integer specifying the x-coordinate of the pixel to which the upper-left corner of the **Spatial Calibration** dialog box is to be moved.
y	**Integer**	An integer specifying the y-coordinate of the pixel to which the upper-left corner of the **Spatial Calibration** dialog box is to be moved.

Example

```
ret = IpSCalMove(6, 26)
```

This statement will move the **Spatial Calibration** window to screen position 6, 26 (near the upper-left corner of the screen).

IpSCalReset

Syntax **IpSCalReset**( )

Description This function resets the current calibration to default values. Equivalent to clicking **Defaults** in the **Spatial Calibration** dialog box.

IpSCalSave

Syntax **IpSCalSave***(Calibration, FileName)*

Description This function saves the specified calibration to a file.

Parameters

Calibration	**Long**	The ID of the calibration of interest. May also be one of the following constants: SCAL_CURRENT_CAL = Save the attributes of the current calibration SCAL_SYSTEM_CAL = Use to save the attributes of the current system calibration SCAL_ALL = Save all active calibrations SCAL_ALL_REF = Save all reference calibrations
FileName	**String**	A string specifying the name of the file where the calibration will be saved.

Return Value A negative value if the calibration file cannot be written.

IpSCalSelect

Syntax

IpSCalSelect(*szSCal*)

Description

This function activates the selected calibration set. Equivalent to selecting a set in the **Name** field in the **Spatial Calibration** dialog box.

Parameters

szSCal	**String**	A string specifying the name of the calibration set that is to be made active.

Example

```
ret = IpSCalSelect("Microns")
```

This statement will activate a spatial calibration set called “Microns”

Comments

The activated calibration set becomes the calibration for the active image (if there is one), and all image windows opened thereafter.

IpSCalSetAngle

Syntax

IpSCalSetAngle(*Angle*)

Description

This function defines the angle offset value. Equivalent to setting the **Angle Offset** value in the **Spatial Calibration** dialog box.

Parameters

Angle	**Single**	A single point number specifying the offset, in degrees, from the vertical axis.

Example

```
ret = IpSCalSetAngle(11.15466)
```

This statement will establish the angle offset at 11.15466 degrees from the vertical axis.

IpSCalSetAspect

Syntax

IpSCalSetAspect(*AspectRatio*)

Description

This function defines the spatial relationship between the horizontal and vertical axes. Equivalent to setting the **Aspect Ratio** value in the **Spatial Calibration** dialog box.

Parameters

AspectRatio	**Single**	A single point number representing the ratio between the X and Y axes (as defined by X/Y).

Example

```
ret = IpSCalSetAspect(1.50)
```

This statement will set the aspect ratio to 1.5.

IpSCalSetLong

Syntax **IpSCalSetLong***(Calibration, Attribute, Value)*

Description This function sets the current or system calibration

Parameters

Calibration	**Long**	The calibration ID of the calibration of interest, not used for SCAL_ONIMAGE_COLOR. Calibration may also be set to SCAL_CURRENT_CAL to get the current calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_APPLY = Applies the specified calibration to the active image. SCAL_APPLY_RESOLUTION = This command will create a spatial calibration from the active image's resolution information and apply the new calibration to the image. SCAL_CURRENT =Set the current calibration to the specified calibration SCAL_SYSTEM = Set the system calibration to the specified calibration SCAL_ONIMAGE_COLOR = Set the color of interactive lines and non-destructive calibration markers. SCAL_MARKER_STYLE = Sets the selected marker style. SCAL_ADD_TO_REF = Add the specified calibration to the list of reference calibrations. SCAL_REMOVE_FROM_REF = Remove the specified calibration from the list of reference calibrations. SCAL_UNIT_CONVERT = When non-zero, indicates that when the units are changed (see IpSCalSetUnitName and IpSCalSetStr (SCAL_UNITS...)) the scaling factors should be converted from the original absolute units to the new units. For instance, if the original units were "mm" and the new units are "cm", the scaling will be adjusted so there will be 10 times as many pixels per unit. This conversion can only be done if the units are recognized as one of the set of absolute units.
Value	**Long**	The new value for the specified attribute.

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong**. The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if SCAL_CURRENT_CAL was specified and there is no calibration active.
If SCAL_APPLY_RESOLUTION was specified, the return value is the calibration ID of the calibration that is created and attached to the image. A positive value indicates success, a negative value is returned if there is an error.

See Also IpSCalGetLong, IpSCalCreate

IpSCalSetSng

Syntax **IpSCalSetSng***(Calibration, Attribute,Value)*

Description This function sets the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to SCAL_CURRENT_CAL to get the current calibration's attributes, or to SCAL_SYSTEM_CAL to set the current system calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_SCALE_X - The number of horizontal pixels per calibration unit SCAL_SCALE_Y = The number of vertical pixels per calibration unit SCAL_ORIGIN_X = The horizontal coordinate of the reference origin SCAL_ORIGIN_Y = The vertical coordinate of the reference origin SCAL_ANGLE = The angle of the reference angle SCAL_SYSTEM_MODIFIER = Use this command to adjust the system calibration either vertically or horizontally for the effects of an optovar or anything else that affects the overall magnification of the optical system. SCAL_MARKER_WIDTH = The width of the marker in calibration units.
Value	**Single**	The new value for the specified attribute

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong**. The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if SCAL_CURRENT_CAL was specified and there is no calibration active.

See Also IpSCalGetSng

IpSCalSetStr

Syntax **IpSCalSetStr***(Calibration, Attribute,Value)*

Description This function sets the attributes of the specified calibration.

Parameters

Calibration	**Long**	The ID of the calibration of interest. Calibration may also be set to SCAL_CURRENT_CAL to get the current calibration's attributes or to SCAL_SYSTEM_CAL to set the current system calibration's attributes.
Attribute	**Integer**	The attribute of interest, which must be one of the following: SCAL_NAME = The name of the calibration SCAL_UNITS = The name of the calibration units
Value	**String**	The string containing the new value for the specified attribute.

Comments The calibration ID of the active calibration or a list of calibration IDs for the calibrations currently in the active or reference lists can be retrieved using **IpSCalGetLong.** The calibration ID is also returned by functions such as **IpSCalCreate** and **IpSCalLoad** which create new calibrations.

Return Value 0 if successful, IPCERR_NODOC if the specified calibration does not exist, or IPCERR_EMPTY if SCAL_CURRENT_CAL was specified and there is no calibration active

See Also IpSCalGetStr

IpSCalSetName

Syntax **IpSCalSetName**(*szSCal*)

Description This function changes the name of the selected calibration set. Equivalent to retyping the name in the **Name** field of the **Spatial Calibration** dialog box.

Parameters

szSCal	**String**	A string specifying the new name of the selected calibration set.

Example

```
ret = IpSCalSetName("5000x Magnification")
```

This statement will change the name of the current calibration set to “5000x Magnification”.

IpSCalSetOrigin

Syntax

IpSCalSetOrigin(*x*, *y*)

Description

This function calibrates the horizontal and vertical origin. Equivalent to setting the **Origin** value in the **Spatial Calibration** dialog box.

Parameters

x	**Single**	A single point number representing the offset to the X-axis.
y	**Single**	A single point number representing the offset to the Y-axis.

Example

```
ret = IpSCalSetOrigin(49, 40)
```

This statement will set the origin at position 49,40.

IpSCalSetUnit

Syntax

IpSCalSetUnit(*x*, *y*)

Description

This function calibrates the spatial unit in both the horizontal and vertical directions. Equivalent to setting the **Pixels/Unit** value in the **Spatial Calibration** dialog box.

Parameters

x	**Single**	A single point number specifying the number of pixels representing a single unit in the horizontal direction.
y	**Single**	A single point number specifying the number of pixels representing a single unit in the vertical direction.

Example

```
ret = IpSCalSetUnit(65.0, 75.0)
```

This statement will set the horizontal calibration to 65 pixels, and the vertical calibration to 75 pixels.

IpSCalSetUnitName

Syntax

IpSCalSetUnitName(*UnitName*)

Description

This function changes the name of the spatial unit. Equivalent to typing a name in **the Unit Name** field within the **Spatial Calibration** dialog box.

Parameters

UnitName	**String**	A string specifying the unit name.

Example

```
ret = IpSCalSetUnitName("Microns")
```

This statement will set the spatial unit name to “Microns”.

IpSCalShow

Syntax

IpSCalShow(*bShow*)

Description

This function displays the **Spatial Calibration** dialog box. It is also used to close the dialog box if it is open.

Parameters

bShow	**Integer**	An integer value of 0 or 1 specifying whether to open or close the **Spatial Calibration** dialog box. Where: 0 - Closes the **Spatial Calibration** dialog box if it is open. 1 - Opens the **Spatial Calibration** dialog box.
		Must be one of the following: SCAL_HIDE = Hides the first visible calibration dialog SCAL_DLG_MAIN = Shows the main calibration dialog SCAL_DLG_SELECT = Shows the calibration Select dialog SCAL_ADD_MARKER = Adds a marker to the main image SCAL_MINIMIZE = Minimizes the main calibration dialog SCAL_DLG_WIZARD = Shows the calibration wizard SCAL_DLG_SYSTEM = Shows the spatial calibration system dialog.

Example

```
ret = IpSCalShow(1)
```

This statement will display the **Spatial Calibration** dialog box.

Comments

The dialog box must be opened before assigning and selecting spatial calibration values.

See Also

IpSCalShowEx

IpSCalShowEx

Syntax

IpSCalShowEx(*Dialog*, *Show*)

Description

This function shows or hides the **Spatial Calibration** dialog box.

Parameters

Dialog	**Integer**	The calibration dialog to be shown or hidden, using one of the following constants:
		SCAL_DLG_MAIN = The main calibration dialog
		SCAL_DLG_SELECT = The spatial calibration Select dialog
		SCAL_DLG_WIZARD = The spatial calibration Wizard
		SCAL_DLG_SYSTEM = The System Settings dialog

Show	**Integer**	A value indicating how the dialog should be shown, using one of the following constants: SCAL_SHOW = Shows the specified calibration dialog SCAL_HIDE = Hides the specified calibration dialog SCAL_HIDEALL = Hides all the calibration dialogs SCAL_MINIMIZE = Minimizes the specified calibration dialog

Comments

This function is an improved version of **IpSCalShow** that provides more control over which dialog is to be shown, hidden, or minimized. The SCAL_HIDEALL constant will hide all open calibration dialogs, and the Dialog parameter may be zero or null for this command. The system calibration dialog cannot be minimized.

IpScanSelect

Syntax **IpScanSelect**( )

Description This function invokes the TWAIN source-selection dialog box.

See Also IpScanShow

IpScanShow

Syntax **IpScanShow**( )

Description This function is used to open the **Scan** dialog box. Equivalent to selecting the **Scan** command.

Comments When this function is executed in a macro, the **Scan** dialog box is presented, and the system waits for user input. At this point the user may select scanner settings and acquire images interactively. Macro execution will resume once an image is acquired or the **Cancel** button is clicked.

IpScopeAcquire

Syntax **IpScopeAcquire*(iDest)***

Description This function is used to acquire an image.

Parameters

iDest	**Integer**	Indicates the snap destination (new or current image). An enumerated integer specifying the window into which the image will be captured. Must be one of the following:
		`ACQ_CURRENT`
		`ACQ_NEW`
		where, `ACQ_NEW` saves the captured image to a new image window and `ACQ_CURRENT` saves it to the active image window.

Return Value This function returns the Document ID of the new image, which will be an integer greater than or equal to 0. A negative return value indicates an error.

Example

```
ret = IpScopeAcquire(ACQ_NEW)
```

Comments This function uses the ACQ_NEW and ACQ_CURRENT destinations that are also used with the IpAcqSnap function. ACQ_FILE and ACQ_SEQUENCE are not supported. (For a full discussion of IpAcqSnap, ACQ_NEW, and ACQ_CURRENT, please refer to the *Auto-Pro Programming Guide*.)

There is **no** communication between the ***Acquire*** tab page in *Scope-Pro* and the ***Acquire*** tab page in *Stage-Pro*. Using IpScopeAcquire will not affect or respect any of the settings in the *Stage-Pro* ***Acquire*** tab page.

IpScopeComponentPresent

Syntax **IpScopeComponentPresent(** ***iComponent, lpValue*****)**

Description This function is used to specify a variety of *Scope-Pro* commands.

Parameters

iComponent **Integer** An enumerated integer used to read and set *Scope-Pro* options. Indicates the components by ID. Must be one of the following:

SCP_ZFOCUSSCP_SLIDER1
SCP_OBJECTIVE SCP_SLIDER2
SCP_CONDENSER SCP_LAMP1
SCP_CURRSHUTTER SCP_LAMP2
SCP_SHUTTER1 SCP_FWHEEL1
SCP_SHUTTER2 SCP_FWHEEL2
SCP_SHUTTER3 SCP_FWHEEL3
SCP_SHUTTER4 SCP_FWHEEL4
SCP_SHUTTER5 SCP_FWHEEL5
SCP_SHUTTER6 SCP_FWHEEL6
SCP_SHUTTER7 SCP_FWHEEL7
SCP_SHUTTER8 SCP_FWHEEL8
SCP_SHUTTER9 SCP_FWHEEL9
SCP_SHUTTER10 SCP_FWHEEL10
SCP_SHUTTER11 SCP_FWHEEL11
SCP_SHUTTER12 SCP_FWHEEL12
SCP_SHUTTER13 SCP_FWHEEL13
SCP_SHUTTER14 SCP_FWHEEL14
SCP_SHUTTER15 SCP_FWHEEL15
SCP_APERTURE1
SCP_APERTURE2
SCP_ZOOM

lpValue **LPVOID** A integer value used to return
0 = not present or
1 = present

Return Value 0 if successful, a negative error code otherwise.

Comments In Scope-Pro 7.0, you may have up to 15 shutters and 15 filter wheels configured.

IpScopeControl

Syntax **IpScopeControl(iCmd, iComponent, iPos, lpName, lpValue)**

Description This function is used to specify a variety of *Scope-Pro* commands.

Parameters

iCmd	**Integer**	The *iCmd* used determines the usage of the other IpScopeControl parameters. See definitions under **Comments**, below.
iComponent	**Integer**	An enumerated integer used to read and set *Scope-Pro* options. Indicates the components by ID. See definitions under **Comments**, below.
iPos	**Integer**	The use of this parameter with SCP_GETNAME is explained for each component above. When *iPos* is set to SCP_COMPONENTNAME, the name of the component will be returned. Otherwise, the name of the specified component position will be returned. This parameter is also used to define settings for the various SET commands.
lpName	**String**	String to receive the component or position name when used with SCP_GETNAME. The string should be allocated to receive SCP_MAXNAMELEN characters (currently 60). This parameter is not used with any other commands.
lpValue	**Any**	A pointer to an integer variable when used with the various GET commands. Usage is explained under *iCmd*.

Example

```
Example of SCP_GETNAME command:

  Dim CompName as string *60
  Dim PosName as string *60

  ret = IpScopeControl(SCP_GETNAME, SCP_FWHEEL1,
  SCP_COMPONENTNAME, CompName, IPNULL)

  ret = IpScopeControl(SCP_GETNAME, SCP_FWHEEL1, 0, PosName,
  IPNULL)

  Example of a SET command to select control of the shutter
  during acquisition:

  ret = IpScopeControl(SCP_ACQSETSHUTTER, 0, 1, “”, IPNULL)

  Example of a GET command to inquire whether Scope-Pro will
  auto-focus before acquisition:

  Dim autofocus as integer

  ret = IpScopeControl(SCP_ACQGETAUTOFOCUS, 0, 0, “”, autofocus)
```

```
"The following code will set the z-travel limits for a multi-
plane acquisition.

Sub SetLimits()

     Dim ZTop As Single

     Dim ZBot As Single

     Dim iPos As Integer

     Dim Str As String*256

     ZTop = 0.5    'NOTE: This is in mm

     ZBot = -0.5

     iPos = 0

     ret = IpScopeControl(SCP_ACQSETZTOP, 0, 0, Str, ZTop)

     Debug.Print ret

     ret = IpScopeControl(SCP_ACQSETZBOT, 0, iPos, Str, ZBot)

     Debug.Print ret

End Sub

"
```

Comments The following commands are used with the ***iCmd*** parameter:

`SCP_GETNAME` Return the specified component's name (specified by *iComponent*), or the name of the specified position (specified by *iPos*). Refer to the **Additional Notes** section below, detailing *iComponent*. *LpName* should point to a string that is allocated to receive at least `MAX_SCPNAME_LEN` characters (currently 60).

`SCP_AUTOFOCUS` Requests *Scope-Pro* to auto-focus.

`SCP_ACQMPFSETLIMITS` Requests *Scope-Pro* to have the user set the limits for the extended depth of field.

`SCP_ACQGETSHUTTER` Inquire whether *Scope-Pro* will control the shutter during acquisition. *LpValue* must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETSHUTTER` Set whether *Scope-Pro* will control the shutter during acquisition, where *iPos* of 0 indicates not to control the shutter, and any non-zero value indicates to control the shutter.

`SCP_ACQGETAUTOFOCUS` Inquire *whether Scope-Pro* will hardware auto-focus during acquisition. *LpValue* must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETAUTOFOCUS` Set whether *Scope-Pro* will hardware auto-focus during acquisition; where *iPos* of 0 indicates not to auto-focus, and any non-zero value indicates to auto-focus.

`SCP_ACQGETSWAUTOFOCUS` Inquire whether *Scope-Pro* will software autofocus during acquisition. *LpValue* must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETSWAUTOFOCUS` Set whether *Scope-Pro* will software auto-focus during acquisition, where *iPos* of 0 indicates not to extended depth of field, and any non-zero value indicates to extended depth of field.

`SCP_ACQGETMPFPLANES` Inquire the number of planes used for extended depth of field. *LpValue* must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETMPFPLANES` Set the number of planes used for extended depth of field, where *iPos* indicates the number of planes, which must be between 2 and 100.

`SCP_GETCURRSHUTTER` Inquire which shutter is currently the active shutter. *LpValue* must be a pointer to an integer variable to receive the current setting.

`SCP_SETCURRSHUTTER` Set which shutter is currently the active shutter, where *iPos* indicates the shutter to become the active shutter, which must be between 0 and the number of shutters installed.

iCmd, continued:

`SCP_ACQGETMPFNORMAL` Inquire whether Scope-Pro will normalize illumination during a multi-plane or software autofocus.

`SCP_ACQSETMPFNORMAL` Set whether Scope-Pro will normalize illumination during a multi-plane or software autofocus; iPos of 1 is normalized and 0 is not normalized.

`SCP_ACQGETMPACQUIRE` Inquire whether Scope-Pro will acquire a Z stack.

`SCP_ACQSETMPACQUIRE` Set whether Scope-Pro will acquire a Z stack. Use iPos = 1 for stack, iPos = 0 for no stack.

`SCP_ACQGETMPSEQACQ` Inquire whether Scope-Pro will acquire the Z stack as a sequence.

`SCP_ACQSETMPSEQACQ` Set whether Scope-Pro will acquire the Z stack as a sequence. Use iPos = 1 for sequence, iPos = 0 for no sequence. **Note:** This is valid only if Scope-Pro is set to acquire EDFs.

`SCP_ACQGETMPFOCUS` Inquire whether Scope-Pro will use the extended depth of field during acquisition. LpValue must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETMPFOCUS` Set whether Scope-Pro will use the extended depth of field during acquisition, where iPos of 0 indicates not to extended depth of field, and any non-zero value indicates to extended depth of field.

`SCP_ACQGETMPFTYPE` Inquire the type of focus analysis used for extended depth of field. LpValue must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETMPFTYPE` Set the type of focus analysis used for extended depth of field, where iPos indicates the type, which must be `EDF_MAX_LOCALCONTRAST` (maximum texture`), EDF_MAX_INTENSITY`, `EDF_MIN_INTENSITY`, or `EDF_MAX_DEPTHCONTRAST`.

`SCP_ACQGETAFTYPE` Inquire the range of auto-focus used. LpValue must be a pointer to an integer variable to receive the current setting.

`SCP_ACQSETAFTYPE` Set the range of auto-focus analysis used, where iPos indicates the range, which must be 0 (for low-power lenses), 1 (medium-power), or 2 (high-power).

`SCP_ACQGETSLICESIZE` Gets the current Z stack slice size. This is defined as
`(Z top - Z bottom)/(number of planes – 1)`

`SCP_ACQGETZTOP` Gets the position of the top Z plane in mm.

`SCP_ACQGETZBOT` Gets the position of the bottom Z plane in mm.

`SCP_GETOBJCALIB` Gets the name and calibration ID of the objective calibration. iPos should be set to indicate the object that you want. LpName returns the calibration name, and LpValue returns the handle to the calibration.

`SCP_DUMP_SETTINGS` Gets the current Scope-Pro settings and dumps them to the output window.

`SCP_SETALLSHUTTERS` Opens or closes all the shutters

`SCP_SAVE_IN_SETTINGS` Sets the flags on the Save Settings dialog box.

`SCP_ZOOM` Indicates the Zoom function

Example

```
Dim szName As String * 255

Dim fCalID As Single
Dim iPos As Integer
iPos = 0   'to num objectives - 1
IpScopeControl(SCP_GETOBJCALIB, 0, iPos, szName, fCalID)

IpScopeShow(bShow)

  // constants for IpScopeShow
  #define SCP_HIDE 0
  #define SCP_SHOW 1
  #define SCP_CONFIG_TAB 2
  #define SCP_SCOPE_TAB 3
  #define SCP_ACQ_TAB 4

Sub dumptest()
IpScopeControl(SCP_DUMP_SETTINGS, 0, 0, "", IPNULL)
  End Sub
Sub dumptest2()
IpScopeControl(SCP_DUMP_SETTINGS, 0, 0, "test", IPNULL)
IpScopeControl(SCP_DUMP_SETTINGS, 0, 0, "test.scp", IPNULL)
IpScopeControl(SCP_DUMP_SETTINGS, 0, 0, "L:\Documents and
Settings\test.scp", IPNULL)
  End Sub
```

```
Sub ShtrTest()
Dim bOpen As Integer
bOpen = 0
IpScopeControl(SCP_SETALLSHUTTERS, 0, bOpen, "", IPNULL)
bOpen = 1
IpScopeControl(SCP_SETALLSHUTTERS, 0, bOpen, "", IPNULL)
 End Sub

 Sub SetFlagTest()
Dim bSave As Integer
bSave = 0
IpScopeControl(SCP_SAVE_IN_SETTINGS, SCP_OBJECTIVE, bSave, "",
IPNULL)
bSave = 1
IpScopeControl(SCP_SAVE_IN_SETTINGS, SCP_OBJECTIVE, bSave, "",
IPNULL)
 End Sub
```

Additional Notes

The ***iComponent*** parameter is used only with `SCP_GETNAME` or `SCP_SAVE_IN_SETTINGS` and will be one of the following:

SCP_ZFOCUS Indicates the name of the Focus component should be returned. *iPos* is not used and should be set to 0.

SCP_OBJECTIVE With an *iPos* of SCP_COMPONENTNAME, indicates the name of the Objective set should be returned. An *iPos* of between 0 and one fewer than the number of objectives will return the name of the objective in that position.

SCP_CONDENSER With an *iPos* of SCP_COMPONENTNAME, indicates the name of the Condenser set should be returned. An *iPos* of between 0 and one fewer than the number of condenser positions will return the name of the condenser in that position.

SCP_CURRSHUTTER With an *iPos* of SCP_COMPONENTNAME, indicates the name of the current and returns current position of shutter. An *iPos* of 0 or 1 will return the name of the shutter position.

SCP_SHUTTER1 See SCP_CURRSHUTTER, except that the name of shutter number 1 (or its positions) is returned.

SCP_SHUTTER2 As with SCP_SHUTTER1, but for Shutter number 2.

SCP_SHUTTER3 As with SCP_SHUTTER1, but for Shutter number 3.

SCP_SHUTTER4 As with SCP_SHUTTER1, but for Shutter number 4.

SCP_SHUTTER5 As with SCP_SHUTTER1, but for Shutter number 5.

Note that you may have up to 15 shutters….

SCP_SHUTTER15 As with SCP_SHUTTER1, but for Shutter number 15.

SCP_SLIDER1 With an *iPos* of SCP_COMPONENTNAME, indicates the name of Slider number 1 should be returned. An *iPos* of 0 or 1 will return the name of the slider position.

SCP_SLIDER2 As with SCP_SLIDER1, but for Slider number 2.

SCP_LAMP1 With an *iPos* of SCP_COMPONENTNAME, indicates the name of Lamp number 1 should be returned. An *iPos* between 0 and 1000 will return the name of that lamp intensity.

SCP_LAMP2 As with SCP_LAMP1, but for Lamp number 2.

SCP_APERTURE1 With an *iPos* of SCP_COMPONENTNAME, indicates the name of Aperture 1 should be returned. An *iPos* between 0 and 1000 will return the name of that lamp intensity

SCP_APERTURE2 As with SCP_APERTURE1, but for Aperture number 2.

SCP_FWHEEL1 With an *iPos* of SCP_COMPONENTNAME, indicates the name of Filter set should be returned. An *iPos* of between 0 and one fewer than the number of filter wheel positions will return the name of the filter in that position.

SCP_FWHEEL2 As with SCP_FWHEEL1, but for filter wheel number 2.

SCP_FWHEEL3 As with SCP_FWHEEL1, but for filter wheel number 3.

SCP_FWHEEL4 As with SCP_FWHEEL1, but for filter wheel number 4.

SCP_FWHEEL5 As with SCP_FWHEEL1, but for filter wheel number 5.

Note that you may have up to 15 filter wheels:

SCP_FWHEEL15 As with SCP_FWHEEL1, but for filter wheel number 15.

```
The following commands have been added for Scope-Pro 7.0
SCP_CONTINUOUSFOCUS = 65
SCP_GET_CONTFOC_POS = 39
SCP_SET_CONTFOC_POS = 40
SCP_OFFSET_MEMORIZE = 1
SCP_OFFSET_RECALL = 2
GSCP_OFFSET_MOVE_MEMORIZE = 3
SCP_OFFSET_MOVE = 4
```

Use in macros are defined as follows:

```
    ret = IpScopeSetPosition(SCP_CONTINUOUSFOCUS, 0)
```

The above macro will turn the PFS off.

```
    ret = IpScopeSetPosition(SCP_CONTINUOUSFOCUS, 0)
```

The above macro will turn the PFS on.

```
    ret = IpScopeControl(SCP_GET_CONTFOC_POS, SCP_CONTINUOUSFOCUS, 0, "",
    IpStgVal)
```

The above macro will get the current position of the offset lens and return it in the single IpStgVal.

```
    ret = IpScopeControl(SCP_SET_CONTFOC_POS, SCP_CONTINUOUSFOCUS,
    SCP_OFFSET_MEMORIZE, "", IPNULL)
```

The above macro will “Memorize” the current offset lens position. The value will also be stored in a local array in the driver.

```
    ret = IpScopeControl(SCP_SET_CONTFOC_POS, SCP_CONTINUOUSFOCUS,
    SCP_OFFSET_RECALL, "", IPNULL)
```

The above macro will “Recall” the currently memorized offset position.

```
    ret = IpScopeControl(SCP_SET_CONTFOC_POS, SCP_CONTINUOUSFOCUS,
    SCP_OFFSET_MOVE_MEMORIZE, "", IpVal)
```

The above macro will move the offset lens to the absolute position passed in, in the single IpStgVal. The position will then be “Memorized” and also stored in the drivers local array.

```
    ret = IpScopeControl(SCP_SET_CONTFOC_POS, SCP_CONTINUOUSFOCUS,
    SCP_OFFSET_MOVE, "", IpStgVal)
```

The above macro will move the offset lens to the absolute position passed in, in the single IpStgVal. The position will NOT be “Memorized” and will NOT be stored in the drivers local array.

IpScopeDocGet

Syntax **IpScopeDocGet(Setting, DocID, Value)**

Description This function gets information on an image captured by *Scope-Pro*. This is similar to the position information displayed by right clicking on the image.

Parameters

Setting	**Integer**	Must be one of the following: `STGINF_Z_POS` returns the Z position of the image from the Z origin. `SCPINF_Z_FIELD` returns the number of the plane. `SCPINF_Z_NUMPLANES` returns the number of planes in the Z stack. `SCPINF_Z_MIN` returns the Z position of the lowest plane with in-focus material. Will return 0 if the image was not captured using either Extended depth of field or Software Auto-Focus. `STGINF_Z_MAX` returns the Z position of the highest plane with in-focus material. Will return 0 if the image was not captured using either Extended depth of field or Software Auto-Focus. `SCPINF_Z_DIST` returns the distance between the lowest and highest planes with in-focus material. Will return 0 if the image was not captured using either Extended depth of field or Software Auto-Focus. `SCPINF_Z_BEST` returns the Z position of the plane with the most in-focus material. Will return 0 if the image was not captured using Software Auto-Focus.
DocID	**Integer**	Document ID of the image to get information on. Can use `DOCSEL_ACTIVE` for current active image.
Value	**Single**	Variable where the parameter value will be returned.

Example The following statement retrieves the Z field of the current active workspace.

```
DIM ZDist AS SINGLE

ret =IpScopeDocGet (SCPINF_Z_FIELD, DOCSEL_ACTIVE,
ZDist)
```

Comments This information will only be attached to an image captured through *Scope-Pro* or *Stage-Pro*.

IpScopeEnumSettings

Syntax **IpScopeEnumSettings(lpSzDirectory, bFirst, lpSzSettingsFile)**

Description This function lists the *Scope-Pro* settings files found in a given directory

Parameters

lpSzDirectory	**String**	Indicates where to look for the settings files.

bFirst	**Integer**	Initializes the list and returns the first file found (if 1) or the next file (if 0).
lpSzSettingsFile	**String**	Receives the name of the specified settings file (file name only, no path).

Return Value Returns the length of the settings file name, if found; or returns 0, if there are no more in the list.

Example

```
Sub EnumAll()
dim settings as string*255
 ret = IpScopeEnumSettings("c:\ipwin7\", 1,
 settings)
 if (ret = 0) then
       ret = IpMacroStop("No settings found.",
   MS_MODAL)
 end if
      while ret > 0
       ret = IpMacroStop(settings, MS_MODAL)
       ret = IpScopeEnumSettings("c:\ipwin7\",
   0, settings)
      wend
End Sub
```

Comments Use this macro with *bFirst TRUE* to initialize the list, then loop while the return value is greater than 0. The directory must include the trailing backslash (\).

IpScopeGetCount

Syntax **IpScopeGetCount(iComponent, iCnt)**

Description This function gets the number of component positions

Parameters

iComponent	**Integer**	Specifies the component by ID.
iCnt	**Integer**	Returns the number of component position(s).

Example

```
dim count as integer
ret = IpScopeGetCount (SCP_FWHEEL1, Count)
```

Comments This function uses the component identifiers described under IpScopeControl.

IpScopeGetPosition

Syntax **IpScopeGetPosition(iComponent, iPos)**

Description This function gets the index of the current component position

Parameters

iComponent	**Integer**	Indicates the component by ID.
iPos	**Integer**	Returns the index of the current component position.

Example

```
dim position as integer
ret = IpScopeGetPosition (SCP_FWHEEL1, Position 1)
```

Comments This function uses the component identifiers described under IpScopeControl.

IpScopeRead

Syntax	**IpScopeRead(iComponent, lpString, iNumChar, iTimeout)**		
Description	This function allows your application to receive characters from the specified component's controller.		
Parameters	*iComponent*	**Integer**	Indicates the component by ID.
	lpString	**String**	String that receives characters from the controller.
	iNumCharacters	**Integer**	The number of characters to attempt to read from the controller.
	iTimeout	**Integer**	The maximum time in seconds to wait for the string to be read.
Return Value	Returns the number of characters read if successful; returns a negative value if failed. A return of 0 (zero) means no characters were read.		
Comments	This function uses the component identifiers described under IpScopeControl. The existing XY stage function, IpStgXYWrite, will be used to access that component; and where the *Stage-Pro* interface is installed, the Z Focus function, IpStgZWrite, can also be used. The Z Focus component will also be identified by ID and accessible through this function as well. When the *Scope-Pro* interface is installed, this function must be used to access the Z Focus controller.		
See Also	IpScopeWrite		

IpScopeSettings

Syntax	**IpScopeSettings(*lpName, iSave*)**		
Description	This loads or saves a *Scope-Pro* settings file (`*.scp`).		
Parameters	*lpName*	**String**	The name of the *Scope-Pro* settings file.
	iSave	**Integer**	Constants will be defined for the following: SCP_LOAD SCP_SAVE
Example	The following statement will save the current stage settings: `ret = IpScopeSettings("c:\Ipwin7\test.scp", SCP_SAVE)`		

IpScopeSetPosition

Syntax	**IpScopeSetPosition*(iComponent, iPos)***		
Description	This function moves the specified component to the desired position		
Parameters	*iComponent*	**Integer**	Indicates the component by ID.
	iPos	**Integer**	Indicates the desired component position.

Example

```
ret = IpScopeSetPosition(SCP_FWHEEL1, 2).
This will move the filter wheel to position 3.
```

Comments

This function uses the component identifiers described under IpScopeControl.

IpScopeShow

Syntax

IpScopeShow(*bShow*)

Description

This function displays or hides the *Scope-Pro* user interface.

Parameters

bShow	**Integer**	An integer value specifying whether the *Scope-Pro* dialog should be shown or hidden. Must be one of the following:
		`SCP_HIDE = 0`
		`SCP_SHOW = 1`
		`SCP_CONFIG_TAB = 2`
		`SCP_SCOPE_TAB = 3`
		`SCP_ACQ_TAB = 4`

Example

The following statement will open the *Scope-Pro* window.

```
ret = IpScopeShow(SCP_SHOW)
```

Comments

It is not necessary to display the *Scope-Pro* dialog when executing any of the microscope controller functions from a macro. Its disposition, shown or hidden, is entirely up to you. You will want to display the dialog if your program requires the user to make choices within it, however, if your purpose is merely to move the microscope hardware in a predefined manner, there is no need to display the dialog.

Previous versions of *Scope-Pro* allowed only 0 or 1 in the *bShow* parameter. Version 7.0 now allows you to display a specific tab within the dialog using the values indicated above.

IpScopeWrite

Syntax **IpScopeWrite(iComponent, lpString,iTimeout)**

Description This function allows your application to send a string to the specified component's controller.

Parameters

iComponent	**Integer**	Indicates the component that should receive the string by ID.
lpString	**String**	Identifies the ASCII Z string that should be sent to the controller.
iTimeout	**Integer**	The maximum time in seconds to wait for the string to be sent.

Return Value Returns the number of characters read, if successful; returns a negative value, if failed.

Comments Use IpScopeRead to receive the results of the command. This macro command should be followed by a pause or IpMacroStop to give the Write macro time to communicate with the controller and for the controller to process the command.

This function uses the component identifiers described under IpScopeControl. The existing XY stage function, IpStgXYWrite, will be used to access that component; and where the *Stage-Pro* interface is installed, the Z Focus function, IpStgZWrite, can also be used. The Z Focus component will also be identified by ID and accessible through this function as well. When the *Scope-Pro* interface is installed, the function must be used to access the Z Focus controller.

Note: Success of this function does not assure that *Scope-Pro* can communicate with the component's controller.

See Also IpScopeRead

IpSegCreateMask

Syntax **IpSegCreateMask**(*MaskType, MaskMethod, MaskClass*)

Description This function creates the specified mask from the current color list. Equivalent to clicking the **New Mask** button in the **Segmentation** dialog box.

Parameters

MaskType	**Integer**	An enumerated integer specifying how the color list is to be applied against the active image. Must be one of the following: MASK_BILEVELNEW MASK_BILEVELINPLACE MASK_COLORNEW See definitions under Comments, below.
MaskMethod	**Integer**	Not used in IPP 4.0 OR HIGHER. Retained for backward compatiblity. Program will load current selection in segmentation data structure.
MaskClass	**Integer**	Not used in IPP 4.0 OR HIGHER. Retained for backward compatiblity.

Example

```
        Dim i As Integer
        Dim DocId As Integer

        For i = 0 To 2
               ret = IpSegSetAttr(SETCURSEL, i)
               ret = IpSegSetAttr(CHANNEL, 0)
               ret = IpSegPreview(CURRENT_W_B)
               DocId = IpSegCreateMask(MASK_COLORNEW,
                 0, 0)
               ret = IpWsConvertToGray()
               ret = IpDocCloseEx(DocId)
        Next i
```

These statements will iterate through 3 segmentation classes, creating a mask of each class and converting the mask to grayscale. Once the gray scale conversion is complete, the RGB version of the mask is destroyed.

Comments

Image-Pro 4.0 or higher does not use the MaskMethod and MaskClass paremeters. MaskType options are as follows:

VALUE	**DESCRIPTION**
MASK_BILEVELNEW	Applies the class list such that all pixels contained in a class are set to white (255) and all others are set to black (0). Writes the result to a new image window. This is the same as pressing the **New Mask** button.
MASK_BILEVELINPLACE	Applies the color list such that all pixels contained in a classs are set to white (255) and all others are set to black (0). Writes the results to the original image window. This is the same as pressing the **Apply Mask** button.

VALUE	DESCRIPTION
MASK_COLORNEW	Applies the class list in the method selected for Preview and writes the image to a new image window. Identical to pressing the **Create Preview Image** button in the Segmentation dialog.

See Also IpSegSelectArea, IpSegPreview

IpSegDelete

Syntax **IpSegDelete**(*ClassName, nIndex*)

Description This function deletes the specified class.

Parameters

ClassName	**String**	A string specifying the name of the class to be deleted. This takes precedence over the *nIndex* parameter.
nIndex	**Integer**	Index of the class to be deleted. Ignored unless *ClassName* is an empty string.

Example

```
ret = IpSegDelete ("Green Object", 0)
ret = IpSegDelete ("", 1)
```

Comments The last class can’t be deleted.

See Also IpSegNew, IpSegRename

IpSegGetRange

Syntax **IpSegGetRange**(*nChannel, FromVal, To Val)*

Description This function returns the starting and ending values of the specified channel of the current class in the histogram-based segmentation.

Parameters

nChannel	**Integer**	The channel index.
FromVal	**Single**	The name of the variable that will receive the starting value.
ToVal	**Single**	The name of the variable that will receive the ending value.

Comments Use the `IpSegSetAttr` function with the `SETCURSEL` command to set the current range.

See Also IpSegSetRange, IpSegSetAttr

IpSegLoad

Syntax

IpSegLoad(*ColorRangesFile*)

Description

This function loads a class list file to the active image. Equivalent to selecting the **File: Load File** button in the **Segmentation** window.

Parameters

ColorRangesFile	**String**	A string specifying the name of the file from which the color-range list will be read.

Example

```
ret = IpSegLoad("C:\IPWIN\HSIREDS.RGE")
```

This statement will load the class list list from the file HSIREDS.RGE in the \IPWIN directory on the C: drive.

Comments

The loaded class list list will replace the current list. If you want to add the contents of a class list file to the current list, use the `IpSegMerge` function.

See Also

IpSegMerge, IpSegSave

IpSegMerge

Syntax

IpSegMerge(*ColorRangesFile*)

Description

This function adds the class list file to the current class list.

Parameters

ColorRangesFile	**String**	A string specifying the name of the file from which the class list will be read.

Example

```
ret = IpSegMerge("C:\IPWIN\HSIREDS.RGE")
```

This statement will combine the contents of the HSIREDS.RGE file with the current class list.

Comments

The loaded class list will be *added to* the current list. If you want to *replace* the current list with the contents of a class list file, use the `IpSegLoad` function. This function will not work with 8-bit grayscale images.

See Also

IpSegLoad, IpSegSave

IpSegNew

Syntax

IpSegNew(*ClassName*)

Description

This function adds a new class to the current list. All channel values for the new class will be set to default values.

Parameters

ClassName	**String**	A string specifying the name of the class to be added. A null string will allow program to set a default name to the new class.

Example

```
ret = IpSegPreview (0) // no preview while adding new class
ret = IpSegNew("Green Objects")
ret = IpSegSetRange(0, 0, 255)
ret = IpSegSetRange(1, 128, 255)
ret = IpSegSetRange(2, 0, 255)
ret = IpSegPreview (1) // turn on preview
```

Comments

The new class will become current class. Use IpSegSetRange or IpSegSelectArea to set the value for this class.

See Also

IpSegSetRange, IpSegDelete, IpSegSelectArea

IpSegPreview

Syntax **IpSegPreview**(*bShow*)

Description This function indicates how the class list is previewed on the active image.

Parameters

bShow	**Integer**	An integer value of 0 through 16 specifying how the image is to be rendered. See table below:

Predefined Constant	Value	Apply Range	Meaning
PREVIEW_NONE	0	N/A	No preview, shows original image
CURRENT_C_T	1	Current	Preview class color on transparent
ALL_C_T	2	All	Preview class colors on transparent
ALL_T_W	3	All	Preview transparent on white
CURRENT_W_B	4	Current	Preview white on black
CURRENT_B_W	5	Current	Preview black on white
CURRENT_C_B	6	Current	Preview class color on black
CURRENT_C_W	7	Current	Preview class color on white
CURRENT_B_T	8	Current	Preview black on transparent
CURRENT_T_B	9	Current	Preview transparent on black
CURRENT_T_W	10	Current	Preview transparent on white
ALL_W_B	11	All	Preview white on black
ALL_B_W	12	All	Preview black on white
ALL_C_B	13	All	Preview class colors on black
ALL_C_W	14	All	Preview class colors on white
ALL_B_T	15	All	Preview black on transparent
ALL_T_B	16	All	Preview transparent on black

Example

```
ret = IpSegPreview(2)
```

This statement will display the active image in segmentation-preview mode using class colors, thereby de-emphasizing any colors that are not contained in the current color list.

IpSegRename

Syntax	**IpSegRename**(*nIndex, ClassName*)		
Description	This function renames a class.		
Parameters	*nIndex*	**Integer**	Index of the class to be renamed.
	ClassName	**String**	A string specifying the new name of the class to be renamed.
Example	`ret = IpSegRename (0,"Green Object").`		
Comments	If index is incorrect, it will return IPCERR_INVARG. Class names cannot be longer than 15 characters.		
See Also	IpSegNew, IpSegDelete		

IpSegReset

Syntax	**IpSegReset**( )
Description	This function clears the current color list of current class. Equivalent to clicking the **Remove Color** button in the **Segmentation** dialog box.
See Also	IpSegSelectArea, IpSegLoad

IpSegSave

Syntax	**IpSegSave**(*ColorRangesFile*, *bUnused*)		
Description	This function saves the current color-range list to a file. Equivalent pressing the **File:Save File** buttons in the **Segmentation** dialog.		
Parameters	*ColorRangesFile*	**String**	A string specifying the name of the file to which the color-range list will be written.
	bUnused	**Integer**	Unused. Provided for backward compatibility.
Example	`ret = IpSegSave("C:\IPWIN\HSIREDS.RGE",0)` This statement will save the current color-range list, to a file called HSIREDS.RGE in the \IPWIN directory on the C: drive.		
See Also	IpSegLoad, IpSegMerge		

IpSegSelect

Syntax **IpSegSelect**(*SelectionType, Sensitivity*)

Comments **This function is not supported in IPP 4.0 OR HIGHER. Use IpSegSelectArea instead.**

See Also IpSegSelectArea, IpSegPreview, IpSegCreateMask

IpSegSelectArea

Syntax **IpSegSelect**(*SelectionType, Sensitivity, xPos, yPos, nSize*)

Description This function adds or deletes the colors encompassed by the area to/from the current color range list. Equivalent to clicking the **Eyedropper** or **Eraser** button in the **Color Segmentation** dialog box.

Parameters

SelectionType	**Integer**	An enumerated integer specifying how the colors in the active AOI are to be applied to the color list. Must be one of the following: SEG_SELADD SEG_SEGSUBTRACT See definitions under Comments, below.
Sensitivity	**Integer**	An integer from 1 to 5 (inclusive) specifying how much deviation from the selected colors is to be allowed. 5 indicates that no deviation from the specified colors will be allowed, and 1 indicates that the maximum amount of deviation will be tolerated. **Changing this value will reset Segmentation and reset the class list.**
xPos	**Integer**	Central x coordinate of the area where colors should be selected from the image.
yPos	**Integer**	Central y coordinate of the area where colors should be selected from the image.
nSize	**Integer**	Size of rectangle from which colors are selected. Should be 1, 3, 5 or 7.

Example

```
ret = IpSegSelectArea(SEG_SELSUBTRACT, 5, 100, 100, 5)
```

This set of statements will remove from the color list, just the colors contained in the image rectangle (98, 98, 102, 102). No deviation from these colors will be permitted.

Comments

SelectionType options are as follows:

VALUE	DESCRIPTION
SEG_SELADD	Adds the colors in the specified region to the current color list. Equivalent to using the eyedropper tool.
SEG_SEGSUBTRACT	Removes the colors in the specified region from the current color list. Equivalent to using the eraser tool.

This function only works if the data structure is using the color cube model.

See Also

IpSegPreview, IpSegCreateMask

IpSegSetAttr

Syntax

IpSegSetAttr(*AttrType, AttrValue*)

Description

This function set the channel's range values of current class in the histogram-based segmentation.

Parameters

AttrType	**Integer**	An enumerated integer specifying the option to be set. Must be one of the following: CHANNEL COLORMODEL SEGCLR_RED SEGCLR_GREEN SEGCLR_BLUE CURSORSIZE DEGREE INVERT SETCURSEL SEGMETHOD THRESHOLD See definitions under Comments, below.
AttrValue	**Integer**	An integer specifying how the AttrType option is to be set. See definitions under Comments, below, for the values allowed by each option.

Example

ret = IpSegSetAttr (COLORMODEL, CM_HSI).

This statement changes the color model used in histogram-based segmentation to HSI.

Comments

AttrType options as follows:

AttrType	**DESCRIPTION**	**ALLOWED VALUES**
CHANNEL	Select the active channel for display purpose in the histogram-based segmentation historgram mode. This only applies to RGB image.	0 - Channel 1 (Red/Hue) 1 - Channel 2(Green/Saturation) 2 - Channel 3 (Blue/Intensity) 3 - All channels will be previewed. 4 - Only the current channel. All others will be hidden.
COLORMODEL	Select the color model in which the histogram-based segmentation is based on.	CM_RGB CM_HSI
SEGCLR_RED	Records the red color level for the current channel.	0 -255
SEGCLR_GREEN	Records the green color level for the current channel.	0-255
SEGCLR_BLUE	Records the blue color level for the current channel.	0-255
CURSORSIZE	Sets the eyedropper and eraser cursor size in pixels	1,3,5,or 7
DEGREE	Sets the degree of variance for the eyedropper and eraser.	0 -1 0
INVERT	Indicates if channel is inverted or not	Channel 1 - 1 = inverted 0 = not inverted Channel 2 - 3 = inverted 2 = not inverted Channel 3 - 5 = inverted 4 = not inverted
SETCURSEL	Set the current selected class.	0-based index (0 to NumOfClasses - 1)
SEGMETHOD	Method used to do the segmentation. This only applies to RGB images.	0 - Histogram-based 1 - Color Cube-based
THRESHOLD	Sets the threshold value for dropping extraneous (noise) pixels	1 -100

See Also IpSegPreview, IpSegCreateMask, IpSegGetRange, IpSegSetRange

IpSegSetRange

Syntax

IpSegSetRange(*nChannel, FromVal, ToVal*)

Description

This function sets the channel values of the current class in the histogram-based segmentation.

Parameters

nChannel	**Integer**	The channel index. If equal to -1, use autoselect.
FromVal	**Single**	The starting point of the range.
ToVal	**Single**	The ending point of the range.

Comments

Turn off and on the preview before and after you set all values to avoid unnecessary overlay class redraw. Class ranges may not overlap on gray images. Use the `IpSegSetAttr` function with the `SETCURSEL` command to set the current range.

See Also

IpSegSelectArea, IpSetGetRange, IpSegSetAttr

IpSegShow

Syntax

IpSegShow(*bShow*)

Description

This function is used to open or close the **Segmentation** command window. Equivalent to selecting the **Segmentation** command to open the window, and clicking the **Close** button within it to close it.

Parameters

bShow	**Integer**	An integer value of 0, 1, or 2 specifying how the **Segmentation** command window is to be shown. Where: 0 - Closes the window if it is already open. 1 - Opens the window to the Histogram tab. 2 - Opens the window to the Color Cube tab.

Example

```
ret = IpSegShow(1)
```

This statement will make the **Segmentation** command window Histogram tab visible during execution of the macro.

Comments

The **Color Segmentation** command window does not have to be open during execution of the segmentation functions. Its disposition, visible or hidden, is entirely your choice. You will want to display the window if your users will be required to make choices within it, but if your objective is simply to obtain a mask, you may want to run without opening it.

IpSeqAverage

Syntax

IpSeqAverage *(lStart, lNumber)*

Description

This function averages the frames of a sequence into a single image.

Parameters

lStart	**Long**	Indicates the first frame to average.
lNumber	**Long**	Indicates the number of frames to analyze, -1 indicates the entire sequence

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

ret = IpSeqAverage(4,7)
This statement averages 7 frames in the sequence, starting with frame #4.

Comments

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqDifference, IpSeqRunning Average

IpSeqDifference

Syntax

IpSeqDifference*(lStart, lNumber)*

Description

This function creates a new sequence, where each frame represents the difference between two adjacent frames.

Parameters

lStart	**Long**	Indicates the first frame to analyze.
lNumber	**Long**	Indicates the number of frames to analyze, -1 indicates the entire sequence

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqDifference(4,7)
```

This statement analyzes 7 frames in the sequence, starting with frame #4.

Comments

Note that **IpSeq** and **IpWs** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqAverage, IpSeqRunning Average

IpSeqDifferenceEx

Syntax

IpSeqDifferenceEx*(lStart, lNumber,DiffType)*

Description

This function creates a new sequence, where each frame represents the difference between two adjacent frames.

Parameters

lStart	**Long**	Indicates the first frame to analyze.
lNumber	**Long**	Indicates the number of frames to analyze, -1 indicates the entire sequence
DiffType	**Long**	Calculates the sequence differing options, as follows: SEQDIFF_WRAP - The last frame is calculated as the difference between last frame and first frame (previous behavior) SEQDIFF_DIFFONLY - The new sequence is one frame shorter than original, returning only difference frames SEQDIFF_PADFIRST - The first frame of result is zero difference frame (filled with the median intensity for the image type) SEQDIFF_PADLAST - The last frame of result is zero difference frame.

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqDifference(4,7)
```

This statement analyzes 7 frames in the sequence, starting with frame #4.

Comments

Note that **IpSeq** and **IpWs** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqAverage, IpSeqRunning Average

IpSeqExtractFrames

Syntax

IpSeqExtractFrames *(lStart, lNumber)*

Description

This function extracts the specified number of frames from the sequence.

Parameters

lStart	**Long**	indicates the first frame to extract.
lNumber	**Long**	Indicates the number of frames to extract, -1 to extract all.

Return Value

Returns the Document ID of the first workspace if successful, -1 if failed.

Example

This statement will extract 5 frames, starting with frame #10:

```
ret = IpSeqExtractFrames (10,5)
```

Comments

This function creates a new workspace for each frame extracted from the sequence. The sequence itself remains unchanged.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

If -1 is used for lNUMBER, lSTART is ignored.

IpSeqGet

Syntax

IpSeqGet (s*Attr, lpValue)*

Description

This function retrieves information about the sequence.

Parameters

sAttr	**Integer**	Determines the sequence attribute to get. Must be one of the following: SEQ_NUMFRAMES = number of frames SEQ_ACTIVEFRAME = current active frame SEQ_FRAMETIME = current delay time SEQ_SKIP = number of frames to skip SEQ_START = current starting frame SEQ_END = current ending frame SEQ_PLAYTYPE = current play type, where 1 = wrap around at end, 2 = play to end, 3 = autoreverse SEQ_PLAYUPDATE = determines if the current frame controls are updated, where 0 = no update, 1 = update SEQ_APPLY = determines if operations will apply to entire sequence, where 0 = apply to current frame, 1 = apply to entire sequence SEQ_ADJUST_RATE = determines whether to automatically adjust the Sequence play rate, where 0 = do not adjust, 1 = adjust rate

Parameters	*sAttr*	**Integer**	SEQ_EDIT_PROMPT = Determines whether to display prompts while editing sequences (e.g. Cut/Copy/Paste Frames) SEQ_AVG_PROMPT - Determines whether to display prompting dialog when running the Sequence Running Average operation. If the dialog is not displayed, the operation will use the last-used settings. See also SEQ_AVG_FRAMES and SEQ_AVG_DROP_INCOMPLETE. SEQ_AVG_FRAMES = Determines the default value for the number of frames to average for the Running Average operation. SEQ_AVG_DROP_INCOMPLETE = Determines whether to drop the incomplete frames at the start of the sequence. SEQ_DIFF_PROMPT = Determines whether to display prompting dialog when running the Sequence Difference operation. If the dialog (illustrated in Interface/Functionality) is not displayed, the operation will use the last-used settings. See also SEQ_DIFF_TYPE. SEQ_DIFF_TYPE = Determines whether/how to calculate the difference. The value can be one of the SEQDIFF constants described above for use with IpSeqDifferenceEx.
			SEQ_FRAMES_DISPLAYED - This read-only value reports the number of frames displayed the last time a sequence was displayed. Not supported for use with IpSeqSet. SEQ_FRAMES_DROPPED = This read-only value reports the number of frames dropped (not displayed) the last time a sequence was displayed. Not supported for use with IpSeqSet. SEQ_CURRENT_FRAMETIME = gets the duration that each frame is displayed when playing a sequence. This time may be different from the nominal frame rate if the SEQ_ADJUST_RATE (auto-adjust) is active.
	lpValue	**LONG**	Pointer to a long variable to receive the attribute's current setting.

Example

This code will get the active frame number and report it to the output window:

```
Dim seqinfo as Long
ret = IpSeqGet(SEQ_ACTIVEFRAME, seqinfo)
ret = IpOutPut(str$ (seqinfo))
```

Comments

Note that **IpSeq** and **IpWs** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqSet

IpSeqMerge

Syntax

IpSeqMerge(*lpszFileName, lpszLibrary, lStartNumber, lNumFrames)*

Description

This function appends one or more images in an image sequence into the currently active sequence.

Parameters

lpszFileName	**String**	Indicates the name of the file containing the image sequence to be merged.
lpszLibrary	**String**	Specifices the file format library used to open the specified file.
lStartNumber	**Long**	An integer specifying the first frame in the sequence that will be merged i.e. 0, 1, 2, etc.
lNumFrames	**Long**	An integer specifying the total number of frames that will be merged.

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqMerge ("Heart.seq", “SEQ” 0,3)
```

This statement merges 3 frames from the sequence file “Heart.seq” starting with frame 0, into the current sequence. If a workspace is not open, a new one will be opened.

Comments

IpSeqMerge always appends the new frames to the end of the existing sequence.

Note that **IpSeq** and **IpWs** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqOpen, IpSeqPlay, IpSeqSave

IpSeqOpen

Syntax

IpSeqOpen *(lpszFileName, lpszFileFormt, lStartFrame, lNumFrames)*

Description

This function opens an image sequence.

Parameters

lpszFileName	**String**	Indicates the name of the file holding the image sequence to be opened.
lpszFileFormat	**String**	Specifices the file format library used to open the specified file.
lStartFrame	**Long**	An integer specifying the first frame in the sequence that will be opened i.e. 0, 1, 2, etc.
lNumFrames	**Long**	An integer specifying the total number of frames to read in.

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqOpen ("Heart.seq", "SEQ",10,10)
```

This statement opens 10 frames from the sequence file “Heart.seq” starting with frame 10.

Comments

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

The file format must be either TIF or SEQ.

See Also

IpSeqMerge, IpSeqPlay, IpSeqSave

IpSeqOpenEx

Syntax

IpSeqOpenEx*(lpszFileName, lpszFileFormt, lStartFrame, lNumFrames, Interval)*

Description

This function opens and subsamples an image sequence.

Parameters

lpszFileName	**String**	Indicates the name of the file holding the image sequence to be opened.
lpszFileFormat	**String**	Specifices the file format library used to open the specified file.
lStartFrame	**Long**	An integer specifying the first frame in the sequence that will be opened i.e. 0, 1, 2, etc.
lNumFrames	**Long**	An integer specifying the total number of frames to read in.
Interval	**Integer**	An integer indicating if the sequence should be subsampled while opening. If the interval = 1, then all frames are opened; 2 = every other frame, and so on.

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqOpen ("Heart.seq", "SEQ",10,10)
```

This statement opens 10 frames from the sequence file “Heart.seq” starting with frame 10.

Comments

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

The file format must be either TIF or SEQ.

See Also

IpSeqMerge, IpSeqPlay, IpSeqSave

IpSeqOptions

Syntax

IpSeqOptions ()

Description

This function displays the Sequence Options dialog, which allows you to change any of the sequence settings.

Example

ret = IpSeqOptions

IpSeqPlay

Syntax **IpSeqPlay** *(sPlayCommand)*

Description This function plays an image sequence, or displays a frame in that sequence.

Parameters

sPlayCommand	**Integer**	An integer specifying how to play the specified sequence. May be the frame to display, or one of the following: SEQ_STOP - stop play SEQ_FOR - play sequence forward SEQ_REV - play sequence in reverse SEQ_FFOR - play sequence in fast forward SEQ_FREV - play sequence in fast reverse SEQ_FFRA - jump to first frame SEQ_LFRA - jump to last frame SEQ_PREV - step to previous frame SEQ_NEXT - step to next frame

Return Value This function returns the current frame after the operation, if successful, -1 if failed.

Example

```
ret = IpSeqPlay(SEQ_FOR)
```

This statement starts a sequence playing forward.

```
ret = IpSeqPlay(10)
```

This statement displays frame #10 of the sequence.

Comments SEQ_PREV and SEQ_NEXT do not wrap around at the end of a sequence.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also IpSeqOpen, IpSeqMerge, IpSeqSave

IpSeqReslice

Syntax	**IpSeqReslice***(Start, Number, SliceType,Resample)*		
Description	This function creates a new sequence,resampled along the X, Y, or Z axis.		
Parameters	*Start*	**Long**	Indicates the first frame to use in the resampling process, or use -1 to use the starting frame of the currently-selected portion of the sequence.
	Number	**Long**	Indicates the number of frames to use for resampling,or -1 To use the number of frames in the currently-selected portion of the sequence.
	SliceType	**Integer**	The type of resampling, must be one of the following: SEQSLICE_XZ: This resampling creates an X/Z axis view of the original sequence, with the new sequence having one frame for each pixel along the Y axis. SEQSLICE_YZ:This resampling creates a Y/Z axis view of the original sequence, with the new sequence having one frame for each pixel along the Z axis. SEQSLICE_REVERSEZ: This resampling creates a new sequence with the same X/Y dimensions as the original sequence, but with the frame order reversed
	Resample	**Double**	A scaling factor for resampling the Z axis. See comments.
Comments	The Z axis is often sampled at a much lower resolution than the X/Y sampling (the pixel size along these dimensions). An X/Z or Y/Z view will end up quite thin in relation to the original sequence size, and pixels in the view will not be square. A scaling factor > 1 can be provided to resize the new view along the Z axis.		

IpSeqRunningAvg

Syntax	**IpSeqRunningAvg** *(lStart, lNumber, lAvgWindow, bDropFrames)*		
Description	This function creates a new sequence where each frame represents an average of a specified number of frames from the original sequence.		
Parameters	*lStart*	**Long**	Indicates the first frame to average.
	lNumber	**Long**	Indicates the number of frames to analyze, -1 indicates the entire sequence.
	lAvgWindow	**Long**	Indicates the number of frames to use to calculate the running average. Must be a number greater than 1. -1 opens the sequence image selection dialog.

bDropFrames	**Integer**	Indicates whether or not to include partial averages at the beginning and end of the new sequence.

Return Value

This function returns the workspace Document ID if successful, -1 if failed.

Example

```
ret = IpSeqRunningAvg (0,-1, 3, 0)
```

This example calculates the running average of the entire sequence, averaged over 3 frames. Since the partial frames are dropped (2 at the beginning), the resulting sequence will be 2 frames shorter than the original sequence.

```
ret = IpSeqRunningAvg (2, 10, 2, 1)
```

This example uses only frames 2 through 12 and retains the partial frames so the resulting sequence will be 10 frames long.

Comments

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqDifference, IpSeqAverage

IpSeqSave

Syntax

IpSeqSave*(lpszFileName, lpszLibrary, lStartNumber, lNumFrames)*

Description

This function saves an image sequence to a file.

Parameters

lpszFileName	**String**	Indicates the name of the file holding the image sequence to be saved
lpszLibrary	**String**	Indicates the format of the image sequence. Must be a SEQ, TIF, or IPW file.
lStartNumber	**LONG**	An integer specifying the first frame in the sequence that will be saved, i.e. 0, 1, 2, etc.
lNumFrames	**LONG**	An integer specifying the number of frames to save, -1 indicates the entire sequence.

Example

```
ret = IpSeqSave("TestSequence.seq", "SEQ", 0,4)
```

This statement saves the current sequence as `TestSequence.seq`, starting from frame 0 and saving 4 frames.

Comments

Note that **IpSeq** and **IpWs** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpSeqOpen, IpSeqPlay, IpSeqMerge

IpSeqSet

Syntax **IpSeqSet *(sAttr, lNewAttr)***

Description This function determines the sequence attribute to set.

Parameters

sAttr	**Integer**	Determines the sequence attribute to set. Must be one of the following: SEQ_ACTIVEFRAME = current active frame SEQ_FRAMETIME = current delay time SEQ_SKIP = number of frames to skip SEQ_START = current starting frame SEQ_END = current ending frame SEQ_PLAYTYPE = current play type SEQ_PLAYUPDATE = determines if the current controls are updated where 0 = no update, 1 = update SEQ_APPLY = = determines if operations will apply to the active portion of the sequence, where 0 = apply to current frame, 1 = apply to active portion. When the attribute is SEQ_PLAYTYPE, the attribute should be one of the following: SEQ_PLAYWRAP = wraps sequence around at end SEQ_PLAYTOEND = plays the sequence to the end SEQ_PLAYAUTOREV = autoreverses the sequence. SEQ_ADJUST_RATE = determines whether to automatically adjust the Sequence play rate, where 0 = do not adjust, 1 = adjust rate. SEQ_EDIT_PROMPT = Determines whether to display prompts while editing sequences (e.g. Cut/Copy/Paste Frames) SEQ_AVG_PROMPT - Determines whether to display prompting dialog when running the Sequence Running Average operation. If the dialog is not displayed, the operation will use the last-used settings. See also SEQ_AVG_FRAMES and SEQ_AVG_DROP_INCOMPLETE. SEQ_AVG_FRAMES = Determines the default value for the number of frames to average for the Running Average operation. SEQ_AVG_DROP_INCOMPLETE = Determines whether to drop the incomplete frames at the start of the sequence.

		SEQ_DIFF_PROMPT = Determines whether to display prompting dialog when running the Sequence Difference operation. If the dialog (illustrated in Interface/Functionality) is not displayed, the operation will use the last-used settings. See also SEQ_DIFF_TYPE. SEQ_DIFF_TYPE = Determines whether/how to calculate the difference. The value can be one of the SEQDIFF constants described above for use with IpSeqDifferenceEx. SEQ_CURRENT_FRAMETIME = sets the duration that each frame is displayed when playing a sequence. This time may be different from the nominal frame rate if the SEQ_ADJUST_RATE (auto-adjust) is active.
LNewAttr	**Long**	The attribute's new setting.

Example

This statement will set the "play to end" option:

```
ret = IpSeqSet(SEQ_PLAYTYPE, SEQ_PLAYTOEND)
```

This statement will turn off the "Update Frame Slider" option"

```
ret = IpSeqSet(SEQ_PLAYUPDATE, 0)
```

This statement will turn on the "Update Frame Slider" option"

```
ret = IpSeqSet(SEQ_PLAYUPDATE, 1)
```

Comments

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

SEQ_START and SEQ_END are used to set the active portion of the sequence. When SEQ_APPLY is TRUE, the active portion determines the portion of the sequence that will be played. Many *Image-Pro* operations such as conversion, filtering, and image operations will alos respect the active portion of the sequence.

IpSeqShow

Syntax **IpSeqShow(*bShow*)**

Description This function displays or hides the sequence tool bar.

Parameters

bShow	**Integer**	A value of 0 or 1 specifying whether the toolbar is to be displayed or suppressed. 0 = hide the toolbar 1 = show the toolbar

Example

```
ret = IpSeqShow(1)
```

This statement opens the Sequencer tool bar.

```
ret = IpSeqShow(0)
```

This statement closes the Sequencer tool bar.

IpSeqGCreate

Syntax **IpSeqGCreate**()

Description This function creates a sequence gallery for the active image.

Return Value Document ID of the new sequence gallery if successful, a negative error code if failed

Comments The sequence galleries themselves are *Image-Pro* workspaces, and can be manipulated with the normal set of `IpDoc` and `IpWs` Auto-Pro functions.

IpSeqGGet

Syntax **IpSeqGGet**(*Attribute, DocID, Value*)

Description This function gets a sequence gallery attribute.

Parameters

Attribute	**Integer**	Attribute indicates the sequence gallery attribute to get, from the following: SEQG_TRACKENABLE Indicates whether the gallery will track changes in the sequence SEQG_ISTRACKED Indicates whether the specified workspace is a sequence and is tracked by a sequence gallery SEQG_ISGALLERYIndicates whether the specified workspace is a sequence gallery
DocID	**Integer**	DocId is ignored for SEQG_TRACKENABLE. For SEQG_ISTRACKED and SEQG_ISGALLERY, DocId indicates the document ID of the workspace to inquire about. DOCSEL_ACTIVE can be used to inquire about the active workspace.

Value	**Integer**	Value is an integer variable in your script to receive the attribute's value.

Return Value 0 if successful, a negative error code if failed

See Also IpSeqGUpdate

IpSeqGSet

Syntax **IpSeqGSet**(*Attribute, Value*)

Description This function sets a sequence gallery attribute.

Parameters

Attribute	**Integer**	Attribute indicates the sequence gallery attribute to set, from the following: SEQG_TRACKENABLE Indicates whether the gallery will track changes in the sequence.
Value	**Integer**	Value is the value to set the attribute to, where 1 indicates to track sequences changes, and 0 indicates that the function should wait for a call to IpSeqGUpdate.

Return Value 0 if successful, a negative error code if failed

See Also IpSeqGUpdate

IpSeqGShow

Syntax **IpSeqGShow**(*Show*)

Description This function displays or hides the sequence gallery dialog.

Parameters

Show	**Integer**	A value of 0 or 1 specifying whether the sequence gallery dialog is to be displayed or hidden. 0 = hide the dialog 1 = show the dialog

Example

```
ret = IpSeqGShow(1)
```

This statement opens the Sequence Gallery dialog

```
ret = IpSeqGShow(0)
```

This statement closes the Sequence Gallery dialog.

Return Value 0 if successful, a negative error code if failed

IpSeqGUpdate

Syntax **IpSeqGUpdate**(*DocId)*

Description This function updates the sequence gallery to reflect any changes to the sequence itself.

Parameters

DocId	**Integer**	Indicates the document ID of the sequence gallery to update.

Return Value 0 if successful, a negative error code if failed

IpSmAdd

Syntax **IpSmAdd** *(SetId, DocId,DimCount, Dim Type, PosCount, Position)*

Description This function adds all the frames of the specified image to an existing set.

Parameters

SetId	**Integer**	Indicates the set where the frames will be added.
DocId	**Integer**	Indicates the document to add to the set.
DimCount	**Integer**	Indicates the number of dimensions in the *DimType* array. *DimCount* may be 0 in a single-frame image. See Comments, below.
DimType	**Integer**	Array that indicates the dimensions that the image contains. New dimensions will be added to the set if necessary. See Comments, below.
PosCount	**Integer**	Indicates the number of set positions in the *Position* array.See Comments, below
Position	**Long**	Array that indicates the position along each dimension where the image should be added.See Comments, below

Return Value 0 if successful, a negative error code if failed.

Comments This function will respect Apply to Sequence, so the portion of the image that is added will depend on the Apply to Sequence status and either the active frame of the sequence (if Apply to Sequence is not selected) or the active portion of the sequence. The **IpSMAddFrame** function can be used to guarantee that a given frame is added to the set.

Comments

For multi-frame images, *DimType* must be used and *DimCount* must be greater than or equal to one. *DimType* is used to describe the matrix structure of the multi-frame image. For each dimension contained in the image, there should be two elements in the *DimTyp*e array. The first is the dimension type and the second is the number of elements along that direction. The Dimension ID should be one of the following:

SMDIM_C The image contains the specified number of channels
SMDIM_G The image contains the specified number sampling positions (of wells or slides in a *Stage-Pro* sample pattern, or user-defined positions)
SMDIM_The image contains the specified number of time points
SMDIM_XY The image contains the specified number of X/Y scan area positions
SMDIM_Z The image contains the specified number of Z stage positions

If all of the frames will be added to a single dimension, the *DimType* array can specify the type from this list and a length of SMDIM_ALL (–1), but if more than one dimension is specified, the lengths along each dimension must be specified. For example, an X/Y scan area or Z stack can have one set of *DimType* elements indicating the XY or Z dimension ID, and the total length of the sequence. For a two-dimensional (or higher) sequence, the first set of elements indicates the dimension that is traversed first, the second the next, etc. So for a sequence that captures a Z-stack of 5 frames at each of 4 X/Y scan positions (in that order), the *DimCount* would be 2, and the *DimTyp*e array would have four elements: SMDIM_Z, 5, SMDIM_XY, 4.

The *PosCount* and *Position* parameters are used to indicate the insertion position of the image's frames. *PosCount* should be equal to the number of dimensions in the set after insertion of the frames. For each position that will be specified, there should be two elements in the *Position* array. The first is the dimension ID and the second is the insertion position along that dimension, which may be –1 if the frames should be inserted at the end. For the example above, if the image's frames should be inserted at the 2nd time point for the 3rd channel, the PosCount would be 4, and the Position array would have 6 elements: SM_DIM_Z, 0, SMDIM_XY, 0, SMDIM_T, 1, SMDIM_C, 2. It will be an error to insert at a position where the previous elements are missing, e.g. in the previous example, the 1st time point and first two channels must already have been added. Note that a position of SMPOS_END (–1) should only be used for dimensions where the image will add frames at the end of the dimension – all other dimensional positions should be specified. It is also possible to specify the next position along a dimension.

Note: A given image can only be a member of a single set. This function will return an error if the specified image is part of a set and you then try to add it to another set.

See Also

IpSmAddFrame, IpSmNew

Example

The following example opens one of the sample images, and creates a 3-site set:

```
ret = IpWsLoadNumber(1)

ret = IpSMShow(SM_SELECT)
ipLArray(0) = IpSMNew()
ret = IpSMSetStr(ipLArray(0), SM_TITLE, 0,
"RebuiltSampleSet")
' the following two commands are optional
ret = IpSMSetStr(ipLArray(0), SM_EXPERIMENTER, 0,  "John")
ret = IpSMSetStr(ipLArray(0), SM_DESCRIPTION, 0, "")
' Set up ipArray to describe the organization of the

' sample image .In this case, 16 Z positions
  repeated for each of 3 sites
ipArray(0) = SMDIM_Z
ipArray(1) = 16
ipArray(2) = SMDIM_G
ipArray(3) = 3
' Set up ipLArray to describe the position in the set
' where this image should be added
' Since the set is new, add at the beginning (see also
IpSMAddFrame)
ipLArray(0) = SMDIM_C
ipLArray(1) = 0
ipLArray(2) = SMDIM_Z
ipLArray(3) = 0
IpLArray(4) = SMDIM_XY
IpLArray(5) = 0
IpLArray(6) = SMDIM_G
IpLArray(7) = 0
IpLArray(8) = SMDIM_T
IpLArray(9) = 0
ret = IpSMAdd(3, 0, 2, IpArray(0), 5, IpLArray(0))
```

IpSmAddFrame

Syntax **IpSmAddFrame** *(SetId, DocId, Frame, PosCount, Position)*

Description This function adds a frame from the specified image to an existing set.

Parameters

SetId	**Integer**	Indicates the set where the frames will be added.
DocId	**Integer**	Indicates the document to add to the set.
Frame	**Long**	Indicates the frame of the document that should be added to the set.
PosCount	**Integer**	Indicates the number of set positions in the *Position* array.
Position	**Long**	Array that indicates the position along each dimension where the image should be added.See Comments, below

Return Value 0 if successful, a negative error code if failed.

Comments The *PosCount* and *Position* parameters are used to indicate the insertion position of the frame. *PosCount* should be equal to the number of dimensions in the set after insertion of the frames. For each position that will be specified, there should be two elements in the *Position* array. The first is the dimension ID and the second is the insertion position along that dimension, which may be –1 if the frames should be inserted at the end.

For example, to add the frame as the 2nd time point for the third channel, the *PosCount* would be Z and the *Position* array would have 4 elements:

```
SmDim_T, 1, SmDim_C, 2.
```

It will be an error to insert at a position where the previous elements are missing, e.g. in the previous example, the 1st time point and first two channels must already have been added. Note that a position of SMPOS_END (–1) should only be used for dimensions where the image will add frames at the end of the dimension – all other dimensional positions should be specified. It is also possible to specify the next position along a dimension.

Note: A given image can only be a member of a single set. This function will return an error if the specified image is part of a set and you then try to add it to another set.

See Also IpSmAdd, IpSmNew

Example

```
Example:
This example opens one of the sample images, and adds the
contents of the image a frame at a time to the existing set.
This example will run best after running the example for
IpSMAdd.

Dim lCurrSet As Long
Dim lZ As Integer
Dim lSite As Integer
Dim lDocID As Long
Dim lFrame As Long

' Get the set ID for the current set
ret = IpSMGet(-1, SMGET_ACTIVE_SET, 0, 0, lCurrSet)
If (lCurrSet < 0) Then
    MsgBox("No active set")
    Exit Sub
End If
' load the second sample image
lDocID= IpWsLoad ("C:\Ipwin71\Images\PollenRed.seq","seq")
' We know that the image is organized as 16 Z
' positions repeated for each of 3 sites, so add the
' frames accordingly
' Initialize the position array
' We are only going to specify the 2 dimensions whose     '
locations are changing
' and the Channel dimension, because we are adding a      '
new channel
ipLArray(0) = SMDIM_Z
ipLArray(1) = 0
' this is where the Z location should go
ipLArray(2) = SMDIM_G
ipLArray(3) = 0
' and this is where the site location should go
ipLArray(4) = SMDIM_C
ipLArray(5) = 1    ' adding channel 1

' Start with frame 0
lFrame = 0
' loop for the number of sites
For lSite = 0 To 2
    ipLArray(3) = lSite
    ' loop for the number of Z positions
    For lZ = 0 To 15
        ipLArray(1) = lZ
        ret = IpSMAddFrame(lCurrSet, lDocID, lFrame, 3,
ipLArray(0))
    Next lZ
    lFrame = lFrame + 1     ' move to next image frame
Next lSite
```

IpSmBackgroundCorr

Syntax **IpSmBackgroundCorr***(DocId, Type, ActivePortion, NewImage)*

Description This function applies background correction to the seleted image in your set.

Parameters

DocId	**Integer**	Specifies the document to use as the background image.
Type	**Integer**	Indicates the type of correction to apply. Must be one of the following: SM_SUBTRACTION Background subtraction SM_FLATFIELD Background correction through division
ActivePortion	**Integer**	ActivePortion can be used to override the Z stack determination. If ActivePortion is non-zero, the correction will be applied to the active portion of the image. If ActivePortion is zero and the image is a member oft a set, this correction would be applied to the Z stack where the actual frame is a member.
NewImage	**Integer**	NewImage determines whether to create a new document with the corrected results (if NewImage is non-zero) or to apply the correction to the existing image.

Return Value The document ID of the corrected image if successful, a negative error code if failed.

See Also IpSmDespeckle, IpSmNormalize

IpSmBackgroundCorrShow

Syntax **IpSmBackgroundCorrShow***(Show)*

Description This function shows or hides the background correction dialog.

Parameters

Show	**Integer**	SM_SHOW	Show the dialog
		SM_HIDE	Hide the dialog

Return Value The document ID of the corrected image if successful, a negative error code if failed.

Comments Any value other than SM_HIDE will show the dialog.

IpSmDelete

Syntax **IpSmDelete***(SetID)*

Description This function deletes the specified set.

Parameters

SetId	**Integer**	Specifies the set that will be deleted.

Return Value 0 if successful, a negative error code if failed.

See Also IpSmRemove

IpSmDespeckle

Syntax **IpSmDespeckle***(Size, Sensitivity, ActivePortion, NewImage)*

Description This function applies the despeckling filter to the seleted image in your set.

Parameters

Size	**Integer**	Specifies the size of the filter kernel to use and must be 3, 5 , or 7 (3x3, 5x5, or 7x7)
Sensitivity	**Integer**	Determines how different the intensity of the center pixel in the filtering region must be before it is replaced by the region's median value.
ActivePortion	**Integer**	*ActivePortion* can be used to override the Z stack determination. If *ActivePortion* is non-zero, the correction will be applied to the active portion of the image. If ActivePortion is zero and the image is a member of a set, this correction would be applied to the Z stack where the actual frame is a member.
NewImage	**Integer**	*NewImage* determines whether to create a new document with the corrected results (if NewImage is non-zero) or to apply the correction to the existing image.

Return Value The document ID of the despeckled document, if successful, a negative error code if failed.

See Also IpSmBackgroundCorr, IpSmNormalize

IpSmDespeckleShow

Syntax	**IpSmDespeckleShow***(Show)*			
Description	This function shows or hides the despeckle dialog.			
Parameters	*Show*	**Integer**	SM_SHOW SM_HIDE	Show the dialog Hide the dialog
Return Value	0 if successful, a negative error code if failed.			
Comments	Any value other than SM_HIDE will show the dialog.			

IpSmExtract

Syntax	**IpSmExtract***(Dimension, Options)*		
Description	This function extracts a new workspace consisting of the frames along a specific dimension.		
Parameters	*Dimension*	**Integer**	Indicates the dimension along which to “play” the set. Dimension may be a dimension index or one of the dimension types used by IpSmAdd.
	Options	**Integer**	Allows you to set the Z options for extraction.
Comments	The frames are extracted from the current location (see IpSmSet).		
Return Value	The document ID of the extracted image if successful, a negative error code if failed.		
See Also	IpSmSet		

IpSmGet

Syntax **IpSmGet** *(SetId, Attribute,Param, Position, Value)*

Description This function gets the current set attributes

Parameters

SetId	**Integer**	Indicates the set to examine.
Attribute	**Integer**	Indicates the attribute that will be returned. See list below.
Param	**Integer**	Param is used to specify additional information about the attribute. See table under Comments.
Position	**Long**	Position is a long array that indicates the frame or matrix position to inquire. See Comments.
Value	**any**	Value is the user variable to receive the attribute. See Comments.

Return Value 0 if successful, a negative error code if failed.

Comments Unless otherwise indicated, SetID must indicate the Set to inquire. The Param and Position parameters are not used by all commands. Refer to the command of interest to see if the arguments are used.

Several of the *Attribute* parameters require that a set location is specified, i.e. SM_ELEMENT_DOC. A set location is specified by an array of two Longs with 2 elements per dimension of interest: the dimension identifier (i.e. SM_DIM_Z), followed by the location along the dimension. There are 5 dimensions supported at present, so a fully-specified location will require an array of 10 longs. The locations can be specified in any order, and dimensions may be omitted, in which case a location of zero is assumed. The number of dimensions (half the number of elements in the position array) must be specified in the Param argument.

The Set Manager attribute SM_LOCK_WORKSPACES has been changed to SM_LOCK_WORKSPACES. For backward compatibility, the original constant is still defined, but in the enumerations only the new one is used (e.g. SMGET_LOCK_WORKSPACES)

Basically, in a compact set, there may be multiple image workspaces that are part of the set, but each workspace represents one position along the "document dimension". In the past, the assumption was that this dimension was channels (because AFA builds sets that way, with one workspace per channel), but actually it could be any one of the 5 dimensions.

So the SM_LOCK_WORKSPACES attribute will synchronize the playing of all of the set workspaces, as long as the conditions explained above for a compact set apply (that there is one workspace for each position along the "document dimension").

The SM_DOC_DIMENSION attribute will return the document dimension for the specified set - this is a read-only attribute as the dimension cannot be set arbitrarily. The document dimension is saved with the set, and an attempt will be made to figure out the document dimension for pre-existing sets.

There is one way to set the document dimension, however. If you select the dimension of interest using SM_COMPACT_DIM, and then use SM_COMPACT to compact the set along that dimension, the document dimension will be set by the compaction operation.

The *Attribute* parameter determines the type of data returned to the user’s variable, and therefore the data type of the value variable, and can be one of the following:

Attribute	Type	Descrption
SM_NUMDIMS	Long	Get the total number of dimensions in the set. Param and Position arrays are not used.
SM_DIMTYPE	Long	Get the dimension type (see IpSMAdd). Param and Position arrays are not used.
SM_DIMLENGTH	Long	Get the length of the dimension at the location specified by the Position array, as described above. Indicate the dimension of interest by specifing SM _DIMAOI for the location along this dimension.
SM_ELEMENT_DOC	Long	Get the document ID of the element specified by the location in the Position array, as described above.
SM_ELEMENT_FRAME	Long	Get the frame number of the element specified by the location in the Position array.
SM_AUTO_CREATE		Controls whether to create new sets from N-D images.
SM_AUTO_ADD_TO_SET		Controls whether to add images to exisitng sets. Can be ond of the following; SM_AA_NONE = do not add images to exiting sets SM_AA_AS_CHANNEL = add images as new channel SM_AA_PROMPT = prompt for dimension to add
SM_ADJUST_RATE		Controls whether to automatically adjust the Set play rate

Attribute	Type	Descrption
SM_DISPTIMESTAMPS	This command selects whether to display time point time stamps on the set images. The value in Param indicates whether to display time stamps, and if so, what to display, and can be any combination of the following: SM_STAMP_NONE = When used alone, turn off time stamps. SM_STAMP_TIME_POINT = Display time stamp for the current time point. SM_STAMP_CAPTURE_TIME = Display acquisition time of the current frame. SM_STAMP_SEP_LINES = When both time point and acquisition time stamps are selected, specifies how the two time stamps will be separated. If this value is not specified, the two stamps will be combined in one line across the image. When this value is specified, the two time stamps will be displayed on separate lines. SM_STAMP_BURN_IN = Controls whether to burn the stamps into the set image(s). SM_STAMP_LEFT = Positions the time stamp at the left edge of the image(s). SM_STAMP_RIGHT = Positions the time stamp at the right edge of the image(s). SM_STAMP_CENTER = Positions the time stamp at the horizontal center of the image(s). SM_STAMP_TOP = Positions the time stamp at the top of the image(s). SM_STAMP_BOTTOM = Positions the time stamp at the bottom of the image(s). SM_STAMP_VCENTER =Positions the time stamp at the vertical center of the image(s).	

Attribute	Type	Descrption
SM_TIMESTAMPCOLOR	Displays the time stamp color. Should be one of the following: DISPCOLOR_RED DISPCOLOR_GREEN DISPCOLOR_BLUE DISPCOLOR_YELLOW DISPCOLOR_CYAN DISPCOLOR_MAGENTA DISPCOLOR_WHITE DISPCOLOR_BLACK	
SM_IS_SET_MEMBER	Long	SetID can be the set to search, or can be –1 to find out if the specified frame of the specified image document is a part of any active set. Param specifies a document ID of the image document. Position(0) specifies the frame of interest, which can be –1 to check whether any frame of the image is a set member. The Set ID of the set that contains the specified frame of the specified document is returned in the Value variable.
SM_GET_POSITION	Array	Param specifies a document ID and Position(0) the frame of interest. Value should be an array of 5 longs that will receive the location of the specified frame in its set. The Value will be arranged as follows, where any dimension's position may be –1 if the set does not contain the dimension: Value(0) Channel position Value(1) Position in Z stack Value(2) Position along X/Y scan area Value(3) Sampling position Value(4) Time point
SM_IS_SET_COMPLETE	Long	The Value variable will be set to indicate whether the set is complete (well-formed, with all dimensions filled equally). Param and Position are not used.
SM_DIMMAXLENGTH	Long	Get the maximum length of the dimension which is specified as described in SM_DIMLENGTH. If the set is complete (well-formed), this will be the same as the value returned by SM_DIMLENGTH. If the set is incomplete, then the maximum length found along the specified dimension will be returned.

Attribute	Type	Descrption
SM_NUMDOCUMENTS	Long	Get the number of documents in the set. Param and Position are not used.
SM_DOCUMENTID	Long	Get the document ID of the specified document in the set. Param should indicate which document to inquire, from 0 (zero) to the number of documents – 1. Position is not used.
SM_DIMSTART	Long	Get the start position of the specified dimension. Param should indicate the dimension to inquire, and Position is not used.
SM_DIMEND	Long	Get the end position of the specified dimension. Param should indicate the dimension to inquire, and Position is not used.
SM_ACTIVEDIM	Long	Get the active dimension. Param and Position are not used.
SM_IS_SET_LOADED	Long	The Value variable will be set to indicate whether all of the images of the set are currently loaded. Param and Position are not used. See also the IpSMSet command SM_RELOAD
SM_CURRENT_LOCATION	Array	The Value variable should be an array of 5 longs that will get the current location in the set. This is the location from which the set can be played.
SM_FRAME_RATE	Long	The Value variable will be set to indicate the specified set's current frame rate. Param and Position are not used
SM_WRAP_TYPE	Long	The Value variable will be set to indicate the specified set's wrap type (see IpSMSet for details). Param and Position are not used
SM_EXTRACT_Z_TYPE	Long	The Value variable will be set to indicate the type of Z dimension compression that will be applied when another dimension is extracted (see IpSMSet for details). Param and Position are not used.

Attribute	**Type**	**Description**
SM_EXTRACT_FOC_TYPE	Long	The Value variable will be set to indicate the type of Extended Depth of Field focus analysis that will be applied if the Z dimension compression is used (see IpSMSet for details). Param and Position are not used.
SM_IS_COMPACT	Long	The Value variable will be set to indicate if the set is compact. A set is considerd compact if there is one separate workspace or image document for each element along one dimension of the set, with elements from all other dimensions represented as frames in the sequence. Param and Position are not used.
SM_ACTIVE_SET	Long	Get the active set, or the set ID of the set that contains the active document. If the active document is not a member of a set, -1 is returned. Param and Position are not used.
SM_BACKGROUND_ID	Long	The Value variable will contain the set ID fot he background images set, or –1 if no set of background images os currently associated with the specificed set.
SM_LOCK_CHANNELS	Long	Gets whether to lock channel workspaces for synchronous display.Note that synchronous display is ignored when the active dimension is Channel or if the channel dimension is not used in the specified set.
SM_NUMSETS	Long	The Value variable will contain the number of open sets. The SetID, Param and Position are not used.
SM_SETID	Long	The Value variable will contain the set ID for the set specified by Param, which must be from zero to the number of open sets –1. The SetID and Position parameters are not used.
SM_IS_MODIFIED	Long	The Value variable will be set to indicate whether all of the set has been modified and has not been saved to file or the database. Param and Position are not used.
SM_SELECTED_Z_PLANE	Long	Gets the selected Z plane. The location of interest must be specified as described previously, except that the Z location must be set to zero.
SM_Z_PLANE_CONFIG	Long	Gets the EDF confidence for a given location, which must be specified as described previously, except that the Z location must be set to zero.

Attribute	**Type**	**Description**
SM_PLAYING	Long	Gets the current play command (See IpSmPlay). Param and Position are not used.
SM_UPDATE_FRAME	Long	Get the information to update the dialog's frame slider and edit control while playing. Param and Position are not used.
SM_FRAME_SKIP	Long	Get the number of frames to skip for fast forward and/or fast reverse. Param and Position are not used.
SM_USE_SELECTED_Z	Long	Get whether to use the selected Z plane when navigating in other dimensions. Otherwise, navigation uses the current Z position.
SM_ZLOCK_TIME_POINTS	Long	Get indication of whether to set all time points to the same Z position when using the SM_SELECTED_Z_PLANES command.
SM_ZLOCK_SITES	Long	Get indication of whether to set all sites to the same Z position when using the SM_SELECTED_Z_PLANES command.
SM_ZLOCK_XY_POS	Long	Get indication of whether to set all X and Y positions to the same Z position when using the SM_SELECTED_Z_PLANES command.
SM_ZLOCK_CHANNELS	Long	Get indication of whether to set all channels to the selected Z plane to an offset of the Z plane, or not to lock at all, when using the SM_SELECTED_Z_PLANES command.

Attribute	**Type**	**Descrption**
SM_CHANNEL_OFFSETS	Long	Get the channel offsets use if SM_ZLOCK_CHANNELS is set to SM_CHL_USE_CH_OFFSETS. The Value parameter should be an array of Longs. The SM-NUM_CH_OFFSETS can be used with SpSmGet to determine the array size prior to using this command.
SM_NUM_CH_OFFSETS	Long	Get the number of channel offsets that have been defined using SM_CHANNEL_OFFSETS. Param and Position are not used.
ISM_COMPACT_DIM	Integer	Returns the currently-selectted compaction dimension. Param is not used and must be 0, position is not used and must be IPNULL.

See Also IpSmGetStr, IpSmSet

IpSmGetStr

Syntax **IpSmGetStr***(SetId, Attribute, Param, Position, Value)*

Description This function gets the current set string information.

Parameters

SetId	**Integer**	Indicates the set to examine.
Attribute	**Integer**	Indicates the attribure that will be returned. See list below.
Param	**Integer**	Not used
Position	**Long**	For SM_CHANNELNAME, Position is a long array that indicates the channel name to inquire. See Comments.
Value	**String**	Value is the user-defined fixed-length string to receive the attribute. See Comments.

Return Value 0 or 1 if successful, a negative error code if failed.

Comments The *Attribute* parameter determines the type of data returned to the user's variable, and can be one of the following:

Attribute	**Descrption**
SM_SETNAME	Get the set/file name. The set name will be the name of the set file if the set has been saved to or load from disk. Otherwise the set title is used. Param and Position are not used.
SM_TITLE	Get the set title. Param and Position are not used.
SM_EXPERIMENTER	Get the set owner's name. Param and Position are not used.
SM_DESCRIPTION	Get the set description. Param and Position are not used.
SM_CREATIONDATE	Get the date the set was created, in the format YYYY/MM DDH:MM:S
SM_MODIFIEDDATE	Get the date that the set was last changed, in the format YYYY/MM/DD/HH:MM:SS . Any modification to the set changes this date automatically. Param and Position are not used.
SM_CHANNELNAME	Get the name of the specificed channel. Position should be an array of one long that indicates the channel of interest.

Attribute	**Descrption**
SM_DOCUMENT_FILE	Get the file name fo the specified document. Position should be an array of one long that indicates the document of interest (see SM_NUMDOCUMENTS to get the number of documents in the set).
SM_TIMESTAMP	Set the time stamp of the specified time point. The Position parameter should be an array of one long that indicates the time point of interest.
SM_BACKGROUND_SET	Get the file name of the background images set. If the specified set does not have a set of background images associated with it, or if the background images set was not save, the string will be empty. Param and Position are not used.
SM_CHANNEL_BY_NAME	For this command, the name of the channel is provided in the string, and the return code indicates the channel index (if the specified name matches an existing channel), IPCERR_EMPTY if there are no channel names defined, or -1 if the specified name cannot be found among the existing channels.
SM_DISPTIMESTAMPS	Displays the time stamp. Should be one of the following: SM_STAMP_BURN_IN = Controls whether to burn the stamps into the set image(s). SM_STAMP_LEFT = Positions the time stamp at the left edge of the image(s). SM_STAMP_RIGHT = Positions the time stamp at the right edge of the image(s). SM_STAMP_CENTER = Positions the time stamp at the horizontal center of the image(s). SM_STAMP_TOP = Positions the time stamp at the top of the image(s). SM_STAMP_BOTTOM = Positions the time stamp at the bottom of the image(s). SM_STAMP_VCENTER =Positions the time stamp at the vertical center of the image(s).

Attribute	Descrption
SM_TIMESTAMPCOLOR	Display the time stamp color. Should be one of the following: DISPCOLOR_RED DISPCOLOR_GREEN DISPCOLOR_BLUE DISPCOLOR_YELLOW DISPCOLOR_CYAN DISPCOLOR_MAGENTA DISPCOLOR_WHITE DISPCOLOR_BLACK

IpSmInfo

Syntax	**IpSmInfo(*Show*)**		
Description	This function displays or hides Set Information dialog.		
Parameters	*Show*	**Integer**	SM_SHOW Show the dialog. SM_HIDE Hide the dialog.
Return Value	0 if successful, a negative error code if failed.		
Comments	Any value other than SM_HIDE will show the dialog.		

IpSmNew

Syntax	**IpSmNew**
Description	This function creates a new, empty set.
Return Value	A positive Set ID if successful, a negative error code if failed.
Comments	A new set will have 0 dimensions initially.

IpSmNormalize

Syntax	**IpSmNormalize***(ActivePortion, NewImage)*		
Description	This function applies illumination normalization to the specified image or frames.		
Parameters	*ActivePortion*	**Integer**	*ActivePortion* can be used to override the Z stack determination. If *ActivePortion* is non-zero, the correction will be applied to the active portion of the image.
	NewImage	**Integer**	*NewImage* determines whether to create a new document with the corrected results (if NewImage is non-zero) or to apply the correction to the existing image.
Return Value	The document ID of the normalized document, if successful, a negative error code if failed.		

See Also IpSmBackgroundCorr, IpSmDespeckle

IpSmNormalizeShow

Syntax **IpSmNormalizeShow***(Show)*

Description This function shows or hides the normalization dialog.

Parameters

Show	**Integer**	SM_SHOW SM_HIDE	Show the dialog Hide the dialog

Return Value 0 if successful, a negative error code if failed.

Comments Any value other than SM_HIDE will show the dialog.

IpSmOpen

Syntax **IpSmOpen***(Type, FileName)*

Description This function loads the specified set

Parameters

Type	**Integer**	Indicates the source of the set, and the options for loading: SM_FILE = The set is loaded from the file specified by FileName. SM_DATABASE = The set is loaded from the database.
FileName	**String**	Specifies the set file name and may be empty (“ “) if loading the set from the database.

Comments Type may also include a SM_COMPACTLOAD flag to compact the set as it is loaded.

Return Value The set ID as a positive value if successful, a negative error code if failed.

See Also IpSmRemove

IpSmPlay

Syntax **IpSmPlay***(Command)*

Description This function plays the set along the specified dimension at the specified position.

Parameters

Command	**Integer**	Command starts the play command, must be a location along the active dimension or one of the following:	
		SM_STOP	Stop play
		SM_FORWARD	Play set forward
		SM_REVERSE	Play set in reverse
		SM_FIRST	Move to first location
		SM_LAST	Move to last location
		SM_PREVIOUS	Move to the previous location
		SM_NEXT	Move to the next location

Return Value 0 if successful, a negative error code if failed.

Comments Use the `IpSMSet SM_ACTIVEDIM` command to set the dimension that will be played. Use the `IpSMSet SM_CURRENT_LOCATION` command to set the location along all the set's dimensions. A particular dimension may be played by sequentially activating the appropriate workspaces and/or by activating the appropriate frame of a single workspace

See Also IpSmSet

IpSmRemoveImage

Syntax **IpSmRemoveImage(*SetID, DocID*)**

Description This function removes all the frames of the specified image from an existing set.

Parameters

SetID	**Integer**	Indicates the set from which the image should be removed.
DocID	**Integer**	Indicates the document to remove from the set.

Return Value 0 if successful, a negative error code if failed.

IpSmRemoveFrame

Syntax **IpSmRemoveFrame(*SetID, DocID,Frame*)**

Description This function removes the specified frame of the specified document from the specified set.

Parameters

SetID	**Integer**	Indicates the set from which the image should be removed.
DocID	**Integer**	Indicates the document to remove from the set.
Frame	**Long**	Indicates the frame of the document to remove.

Return Value 0 if successful, a negative error code if failed.

IpSmSave

Syntax **IpSmSave(*SetID, Type, FileName*)**

Description This function saves the specified set.

Parameters

SetID	**Integer**	Indicates the set that should be saved.
Type	**Integer**	Indicates the source of the set and the options for saving: SM_FILE The set in the file specified by FileName. SM_DATABASE The set is saved in the database.
FileName	**String**	Specifies the set file name if saving to a file, or the database record number if saving to the database.

Comments

Type can also include a SM_AUTOSAVE_DOCS flag to automatically save all of the set image documents as the set is saved, and/or SM_AUTOSAVE_BKGND to automatically save the associated background images set (if there is one).

Return Value

0 if successful, a negative error code if failed.

IpSmSet

Syntax

IpSmSet *(SetId, Attribute, Param, Value)*

Description

This function sets the set attributes.

Parameters

SetId	**Integer**	Indicates the set to receive the data.
Attribute	**Integer**	Indicates the attribure that will be changed. See list below.
Param	**Integer**	Param is used to specify additional information about the attribute. See table under Comments.
Value	**Any**	Value is the user variable to receive the attribute. See Comments.

Return Value

0 if successful, a negative error code if failed.

Comments

Several of the Attribute parameters require that a set location is specified, i.e. SM_ELEMENT_DOC. A set location is specified by an array of two Longs with 2 elements per dimension of interest: the dimension identifier (i.e. SM_DIM_Z), followed by the location along the dimension. There are 5 dimensions supported at present, so a fully-specified location will require an array of 10 longs. The locations can be specified in any order, and dimensions may be omitted, in which case a location of zero is assumed. The number of dimensions (half the number of elements in the position array) must be specified in the Param argument.

The Set Manager attribute SM_LOCK_CHANNELS has been changed to SM_LOCK_WORKSPACES. For backward compatibility, the original constant is still defined, but in the enumerations only the new one is used (e.g. SMGET_LOCK_WORKSPACES).

Basically, in a compact set, there may be multiple image workspaces that are part of the set, but each workspace represents one position along the "document dimension". In the past, the assumption was that this dimension was channels (because AFA builds sets that way, with one workspace per channel), but actually it could be any one of the 5 dimensions.

So the SM_LOCK_WORKSPACES attribute will synchronize the playing of all of the set workspaces, as long as the conditions explained above for a compact set apply (that there is one workspace for each position along the "document dimension").

The SM_DOC_DIMENSION attribute will return the document dimension for the specified set - this is a read-only attribute as the dimension cannot be set arbitrarily. The document dimension is saved with the set, and an attempt will be made to figure out the document dimension for pre-existing sets.

There is one way to set the document dimension, however. If you select the dimension of interest using SM_COMPACT_DIM, and then use SM_COMPACT to compact the set along that dimension, the document dimension will be set by the compaction operation.

The *Attribute* parameter determines the type of data returned to the user's variable, and can be one of the following:

Attribute	**Descrption**
SM_DIMSTART	Set the starting position of the dimension in Param. Value should be a long variable to receive the location. The start position is used only for IpSmPlay.
SM_DIMEND	Set the ending position of the dimension in Param. Value should be a long variable to receive the location. The end position is used only for IpSmPlay.
SM_ACTIVEDIM	Set the active dimension for IpSmPlay to the dimension specified in Param. The Value parameter is not used.
SM_RELOAD	Set Manager will load any of the set images that are not currently open in Image-Pro. The Param and Value parameters are not used. SM_RELOAD is not supported by IpSMGet.
SM_CURRENT_LOCATION	The Value argument should be an array of 5 longs indication the new location. The SM_DIM constants can be used to index the array, i.e. IpZArray (SM_DIM_Z) = Z location.

Attribute	**Descrption**
SM_FRAME_RATE	Param should be set to indicate the specified set's frame rate. Value is not used.
SM_WRAP_TYPE	Param indicates the new wrap type, from one of the following values: SM_WRAP_AT_END = When playing, wrap around from the end to the beginning of the active dimension. SM_WRAP_NONE = Stop at the end of the active dimension. SM_WRAP_AUTO_REV = Auto-reverse at the end of the active dimension. Value is not used
SM_EXTRACT_Z_TYPE	Param indicates the type of Z dimension compression that will be applied when another dimension is extracted: SM_EXTRACT_ONE_Z No Z compression = extract a single Z frame. SM_EXTRACT_COMPOSIT_Z = Compress Z dimension using Extended Depth of Field Composite option. SM_EXTRACT_BEST_Z = Compress Z dimension using Extended Depth of Field Best Focus option. Value is not used

SM_EXTRACT_FOC_TYPE	Param indicates the type of Extended Depth of Field focus analysis that will be applied if the Z dimension compression is used:
	SM_FOCUS_LOCAL_CONTRAST = Local contrast
	SM_FOCUS_MAX_DEPTH_CONTRAST = Local depth contrast.
	SM_FOCUS_MAX_INTENSITY = Maximum intensity.
	SM_FOCUS_MIN_INTENSITY = Minimum intensity.
	Value is not used

SM_UPDATE_FRAME	Param indicates whether to update the dialog's frame slider and edit control while playing. Value is not used
SM_FRAME_SKIP	Param indicates the number of frames to skip for fast forward and/or fast reverse. Value is not used.
SM_ADJUST_RATE	Controls whether to automatically adjust the Set play rate
SM_ZLOCK_XY_POS	Param indicates whether to set all X and Y positions to the same Z position when using the SM_SELECTED_Z_PLANES command. Value is not used.

Attribute	Descrption
SM_DISPTIMESTAMPS	This command selects whether to display time point time stamps on the set images. The value in Param indicates whether to display time stamps, and if so, what to display, and can be any combination of the following: SM_STAMP_NONE = When used alone, turn off time stamps. SM_STAMP_TIME_POINT = Display time stamp for the current time point. SM_STAMP_CAPTURE_TIME = Display acquisition time of the current frame. SM_STAMP_SEP_LINES = When both time point and acquisition time stamps are selected, specifies how the two time stamps will be separated. If this value is not specified, the two stamps will be combined in one line across the image. When this value is specified, the two time stamps will be displayed on separate lines. Value is not used. SM_STAMP_BURN_IN = Controls whether to burn the stamps into the set image(s). SM_STAMP_LEFT = Positions the time stamp at the left edge of the image(s). SM_STAMP_RIGHT = Positions the time stamp at the right edge of the image(s). SM_STAMP_CENTER = Positions the time stamp at the horizontal center of the image(s). SM_STAMP_TOP = Positions the time stamp at the top of the image(s). SM_STAMP_BOTTOM = Positions the time stamp at the bottom of the image(s). SM_STAMP_VCENTER =Positions the time stamp at the vertical center of the image(s).
SM_USE_SELECTED_Z	Param indicates whether to use the selected Z plane to use when navigating in other dimensions. Otherwise, navigation uses the current Z position. Value is not used.
SM_ZLOCK_TIME_POINTS	Param indicates whether to set all time points to the same Z position when using the SM_SELECTED_Z_PLANES command. Value is not used.

Attribute	Descrption
SM_ZLOCK_SITES	Param indicates whether to set all sites to the same Z position when using the SM_SELECTED_Z_PLANES command. Value is not used.

SM_TIMESTAMPCOLOR	Sets the time stamp color.The value in Param should be one of the following: DISPCOLOR_RED DISPCOLOR_GREEN DISPCOLOR_BLUE DISPCOLOR_YELLOW DISPCOLOR_CYAN DISPCOLOR_MAGENTA DISPCOLOR_WHITE DISPCOLOR_BLACK
SM_ZLOCK_CHANNELS	Param indicates whether to set all channels to the selected Z plane, to an offset of the Z plane, or not to lock at all, when using the SM_SELECTED_Z_PLANES command. Use one of the following constants: SM_CHL_NO_LOCK = Do not set other channels to the same Z position. SM_CHL_SEL_Z_PLANES = Set other channel locations to the same Z plane. SM_CHL_USE_CH_OFFSETS = Set other channel locations to the selcted Z position plus the offset specified for that channel using SM_CHANNEL_OFFSETS. Value is not used.
SM_CHANNEL_OFFSETS	Set the channel offsets to use if SM_LOCK_CHANNELS is set to SM_CHL_USE_CH_OFFSETS. The Value parameter should be an array of Longs. The size of the arry provided must be passed in through the Param parameter.
SM_AUTO_CREATE	Controls whether to create new sets from N-D images.

Attribute	**Descrption**
SM_AUTO_ADD_TO_SET	Controls whether to add images to exisitng sets. Can be ond of the following; SM_AA_NONE = do not add images to exiting sets SM_AA_AS_CHANNEL = add images as new channel SM_AA_PROMPT = prompt for dimension to add
SM_COMPACT_DIM	Selects the dimension along which the set will be compacted. Param must be one of the following: SMDIM_C (Channel), SMDIM_Z (Focus), SMDIM_XY (Site), SMDIM_G (Scan position) or SMDIM_T (Time). Value is not used and must be IPNULL.

See Also IpSmGetStr, IpSmGet, IpSmSetStr

IpSmSetEx

Syntax	**IpSmSet** *(SetId, Attribute, PositionCount, Position, By Ref New Value)*		
Description	This function sets the set attributes.		
Parameters	*SetId*	**Integer**	Indicates the set to receive the data.
	Attribute	**Integer**	Indicates the attribure that will be changed. Must be either: SM_SELECTED_Z_PLANE to set the selected Z plane or SM_Z_PLANE_CONFIG to set the EDF confidence for a given location.
	PositionCount	**Integer**	*PositionCount* is used to indicate the number of set positions included in the *Position* array. 5 is a typical value.
	Position	**Long**	Position is a long array that indicates the set location to inquire.
	NewValue	**Any**	A variable containing the new value for the attribute.
Return Value	0 if successful, a negative error code if failed.		
Comments	This function is similar to IpSmSet, except that the position information can be provided to indicate the location where the attribute should be set.		

IpSmSetStr

Syntax **IpSmSetStr** *(SetId, Attribute, Channel,,Data)*

Description This function sets the attributes in the set.

Parameters

SetId	**Integer**	Indicates the set to examine.
Attribute	**Integer**	Indicates the set attribure that will be changed. See list below.
Channel	**Long**	Channel is used only for SM_CHANNELNAME. Indicates the channel name to set. See comments below.
Data	**String**	Data is string to set the attribute. See Comments.

Return Value 0 or 1 if successful, a negative error code if failed.

Comments The *Attribute* parameter determines the type of data returned to the user's variable, and can be one of the following. Note that not all of the attributes supported by IpSmGetStr can be set using IpSmSetStr.

Attribute	**Descrption**
SM_TITLE	Set the set title.
SM_EXPERIMENTER	Set the set owner's name.
SM_CHANNELNAME	Set the name of the specificed channel.
SM_DESCRIPTION	Set the set description
SM_TIMESTAMP	Set the time stamp of the specified time point. The Position parameter indicates the time point of interest.

IpSmShow

Syntax

IpSmShow(*Show*)

Description

This function show or hides the Set Manager dialog.

Parameters

Show **Integer** Shows or hides the Set Manager dialog, as follows:

SM_SHOW	Show the last-used page of the dialog
SM_HIDE	Hide the dialog
SM_SELECT	Show the Select Set page of the dialog
SM_INFO	Show the Info/File page of the dialog.
SM_NAVIGATOR	Show the Navigator page of the dialog.

Return Value

0 if successful, a negative error code if failed.

IpSmShowNav

Syntax

IpSmShowNav(*Show*)

Description

This function show, minimizes, or hides the Set Navigator dialog.

Parameters

Show **Integer** Shows or hides the Set Manager dialog, as follows:

SM_SHOW	Displays the Navigator dialog in the most appropriate form for the active image.
SM_HIDE	Hides the Navigator dialog
SM_MINIMAL	Displays the Navigator minimal dialog in the most appropriate form for the active image
SM_SEQUENCE	Displays the minimal Navigator dialog in sequence toolbar mode even if the image is part of a set.

Return Value

0 if successful, a negative error code if failed.

IpSnap

Syntax

IpSnap()

Description

This function captures the currently-displayed state of the active workspace to a new image.

Comments

IpSnap creates a new 24-bit color single-frame workspace the same width and height as the active image. The new workspace represents the currently displayed state of the active workspace, including any contrast enhancements and/or display range, measurement overlays, and annotations.

Return Value	The document ID of the new workspace with the snapped image.		

IpSortAttr

Syntax	**IpSortAttr***(sAttr, sValue)*		
Description	Changes the various attributes of the sorted objects.		
Parameters	*sAttr*	**Integer**	Attribute to be changed. Must be one of the following: SORT_ROTATE - 0 = do not rotate, 1 = rotate SORT_MEAS - Measurements to be sorted by (i.e. BLBM_AREA, etc.) SORT_LABELS - 0 = labels off, 1 = labels on SORT_COLOR 0 = red 1 = green 2 = blue 3 = yellow SORT_INDEX - sorted image background gray level SORT_AUTO - 0 = user-defined background index 1 = automatic background index
	sValue	**Integer**	
See Also	IpSortShow, IpSortObjects		

IpSortObjects

Syntax	**IpSortObjects ()**
Description	This function sorts the objects in the Image-Pro workspace
See Also	IpSortShow, IpSortAttr

IpSortShow

Syntax	**IpSortShow**(*bShow*)		
Description	This function displays or hides the object sorting dialog		
Parameters	*bShow*	**Integer**	A value of 0 or 1 specifying whether the object sorting dialog is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog
See Also	IpSortObjects, IpSortAttr		

IpStAutoName

Syntax

IpStAutoName(*Format, Number, FileName*)

Description

This function generates a file name by combining a character string that you provide with the string value of an integer variable. It is typically used to create file names automatically in a loop that processes and saves multiple images (e.g., IMAGE001, IMAGE002, IMAGE003...). There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Parameters

Format	**String**	A string specifying the literal characters that are to make up the file name, and the position at which the number is to be inserted. The "#" character is used to represent the insert position for the numeric digits. See Example and Comments, below.
Number	**Integer**	An integer specifying the number that is to be converted into a string and combined with *Format* to create the file name.
FileName	**String**	The name of a fixed-length, string variable into which the final file name will be written.

Example

```
Dim X As Integer
Dim Iname As String * 255
For X = 1 To 10
   ret = IpAcqSnap(ACQ_CURRENT)
   ret = IpHstEqualize(BEST_FIT)
   ret = IpStAutoName("C:\IPWIN\IMAGES\EXP#.TIF",X,Iname)
   ret = IpWsSaveAs(Iname, "TIF")
   ret = IpDocClose()
Next
```

The set of statements above will capture, enhance and save 10 images. The file name will be composed by the `IpStAutoName` function and stored to a variable called

Iname. This variable is then specified in the *FileName* parameter of the `IpWsSaveAs` statement. The ten file names generated will be: `EXP1.TIF` to `EXP10.TIF`.

```
   IpStAutoName("C:\IPWIN\IMAGES\EXP###B.tif",  X, Iname)
```

If the statement above were used in the first example, the numeric digits would occupy three places in the file name, and the ten file names would be: `EXP001B.TIF` to `EXP010B.TIF`.

```
   IpStAutoName("C:\IPWIN\IMAGES\###EXP.tif",  X, Iname)
```

If the statement above were used in the first example, the numeric digits would occupy the first three places in the file name, and the ten file names would be: `001EXP.TIF` to `010EXP.TIF`.

Comments

The "#" character in the format string is used to denote the position at which the numeric digits are to be inserted. Multiple "#" characters can be used to specify that the number be expanded, with leading zeros if necessary, to fill all #- marked positions (see examples above).

Take care not to generate a file name that is longer than that allowed by DOS. The `IpStAutoName` function does not do any error checking for length.

Before calling `IpStAutoName`, the variable into which the file name is written *must* be declared as a *fixed-length string* (be sure to allocate sufficient space for it). In the example above, this was done with the `Dim Iname As String * 255` statement.

IpStGetSingle

Syntax **IpStGetSingle**(*Prompt, SingleRet, InitVal, MinVal, MaxVal, IncVal*)

Description This function issues a dialog box that prompts the user for a single-point value. There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Parameters

Prompt	**String**	A string specifying the message to be displayed in the dialog box.
SingleRet	**Single (Basic)** **LPSINGLE (C)**	The address (name) of the single-point variable that will receive the value entered by the user.
InitVal	**Single (Basic)** **LPSINGLE (C)**	The initial (default) single-point value.
MinVal	**Single ((Basic)** **LPSINGLE (C)**	The smallest value that can be entered by the user.
MaxVal	**Single (Basic)** **LPSINGLE (C)**	The largest value that can be entered by the user.
IncVal	**Single (Basic)** **LPSINGLE (C)**	The increment by which the value will be increased or decreased by one click of the ◆ or ◆ button, respectively, in the dialog box.

Return Value This function will return a 1 if user clicks **OK**; a 0 if the user clicks “Cancel.”

Example The following example prompts the user for a gamma value.

```
Dim GValue as single
ret=IpStGetSingle("Enter gamma value",GValue,1.0,0.2, 2.5,
0.1)
if ret=1 Then' user pressed OK
   ret = IpLutSetAttr(LUT_GAMMA, GValue * 100)
End If
```

See Also IpStGetString, IpStGetInt, IpMacroStop

IpStGetInt

Syntax

IpStGetInt(*Prompt, IntRet, InitVal, MinVal, MaxVal*)

Description

This function issues a dialog box that prompts the user for an integer value. There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Parameters

Prompt	**String (Basic)** **LPSTR (C)**	A string specifying the message to be displayed in the dialog box.
IntRet	**Integer**	The address (name) of the integer variable that will receive the value entered by the user.
InitVal	**Integer**	The initial (default) integer value.
MinVal	**Integer**	The smallest value that can be entered by the user.
MaxVal	**Integer**	The largest value that can be entered by the user.

Return Value

This function will return a 1 if user clicks **OK**; a 0 if the user clicks **Cancel**.

Example

The following example prompts the user for a filter strength.

```
Sub StGetInt()
Dim FtrStrength as integer
ret=IpStGetInt("Enter filter strength",FtrStrength,5,1,10)
if ret=1 then  'user pressed OK
   ret=IpFltLoPass(3,FtrStrength,1)
End If
End Sub
```

See Also

IpStGetString, IpStGetSingle, IpMacroStop

IpStGetString

Syntax **IpStGetString**(*Prompt, RetString, MaxLen*)

Description This function issues a dialog box that prompts the user for a string. There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Parameters

Prompt	**String**	A string specifying the message to be displayed in the dialog box.
RetString	**String**	The address (name) of a fixed-length, string variable that will receive the string entered by the user.
MaxLen	**Integer**	The maximum number of characters that can be stored in *RetString*.

Return Value This function will return a 1 if user clicks **OK**; a 0 if the user clicks **Cancel**.

Example The following example prompts the user for a file name.

```
Dim filename as string * 20
ret = IpStGetString("Please enter file name", filename, 20)
if ret = 1 then' user pressed OK
    .
    .
    .
End If
```

Comments In BASIC, *RetString* should be pre-dimensioned to at least the length specified in *MaxLen.*

See Also IpStGetInt, IpStGetSingle, IpMacroStop

IpStGetName

Syntax **IpStGetName**(*Title, Default, Filter, Filename*)

Description This function displays a standard “Open File” dialog box to prompt the user for a file name. There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Note - this function will return a 0 if the user cancels the dialog box.

Parameters

Title	**String**	A string that will appear as the Title of the “Open File” dialog box.
Default	**String**	A string specifying the directory for which the “Open File” dialog box will be opened.
Filter	**String**	A pattern string specifying the types of file names to be listed in the dialog box. The standard DOS wildcard characters can be used to define this pattern string (e.g.," `*.*`", `"*.TIF"`, `"IMG*.TIF"`). A zero-length string (e.g., `""`) defaults to a pattern of `"*.*"`.
Filename	**String**	The name of a fixed-length, string variable into which the file name, selected by the user, will be written.

Example

```
Dim Iname As String * 255
Dim More As Integer = IpStGetName
   ("Select Slide","C:\RESULTS","*.TGA", Iname)
Do While More <> 0
  ret = IpWsLoad(Iname, "TGA")
  ret = IpHstEqualize(BEST_FIT)
  ret = IpWsSave()
  ret = IpDocClose()
  More = IpStGetName("Select Slide","C:\RESULTS",*.TGA",Iname)
Loop
```

This set of statements will open, enhance and save each image selected by the user, until the user clicks the **Cancel** button in the "Select Slide" dialog box.

Comments

The return code for this function denotes whether the user has selected a file or clicked **Cancel**. You can use this return code to determine when to end a loop that is being applied to all images selected by a user (see example above). Be sure to assign the return code to a variable other than the one used by the other functions in your macro (i.e., do not use `ret`). If the name is not unique, there is no guarantee that it is `IpStGetName's` return code that you are testing.

Before calling `IpStGetName`, the variable into which the file name is written *must* be declared as a *fixed-length string* (be sure to allocate sufficient space for it). In the example above, this was done with the `Dim Iname As String * 255` statement.

Return Value

Returns 1 if the file does not exist, 2 if the file exists, If you cancel, the function returns 0.

IpStSearchDir

Syntax

IpStSearchDir(*Directory, Filter, Number, Filename*)

Description

This function obtains a file's name from its position in a directory list. It can be used to process the entire contents of a directory. There is no *Image-Pro* equivalent to this function; it is one that must be manually edited into your macro.

Parameters

Directory	**String**	A string specifying the directory from which file names are to be obtained.
Filter	**String**	A pattern string specifying the types of file names that are to be included when the directory is searched. The standard DOS wildcard characters can be used to define this pattern string (e.g.," `*.*`", `"*.TIF"`, `"IMG*.TIF"`). A zero-length string (e.g., `""`) defaults to a pattern of `"*.*"`. The specified pattern is used to produce the list of files referenced by the *Number* parameter.
Number	**Integer**	An integer specifying the entry in the directory list (as produced by *Filter*) for which the file name is to be obtained. The first position in the list is considered position 0.
Filename	**String**	The name of a fixed-length string variable into which the file name will be written.

Return Value

This function will return special integer values to indicate whether a file name was found at the specified position. This return code can be tested by your macro to determine whether you want to process the contents of *FileName*. The possible return values are:

A Return Value Of...	Means That...

0	There is no entry at the specified position.
1	The specified position contains a file name. The name of the file will be written to the variable specified in *FileName.*
2	The specified position contains a subdirectory entry. The name of the subdirectory will be written to the variable specified in *FileName.*
3	The specified position contains a Volume Label. The Volume ID will be written to the variable specified in *FileName.*

Example

```
Dim X As Integer
Dim DStat As Integer
Dim Iname As String * 255
X = 0
DStat = IpStSearchDir("C:\IPWIN7\IMAGES","*.TIF",X,Iname)
debug.print Dstat,Iname
Do While DStat = 1
   ret = IpWsLoad(Iname, "TIF")
   ret = IpHstEqualize(BEST_FIT)
   ret = IpWsSave()
   ret = IpDocClose()
   X = X + 1
   DStat = IpStSearchDir("C:\IPWIN7\IMAGES", "*.TIF",X,Iname)
debug.print Dstat,Iname
Loop
```

The set of statements above will open, enhance and save all TIF images in the C:\IPWIN7\IMAGES directory.

```
   ret = IpStSearchDir("C:\IPWIN7\IMAGES","*.*",2,Iname)
   ret = IpWsLoad(Iname, "")
```

The pair of statements above will load the first file in the C:\IPWIN7\IMAGES directory.

Comments

Before calling `IpStSearchDir`, the variable into which the file name is written must be declared as a fixed-length string (be sure to allocate sufficient space for it). In the first example above, this was done with the `Dim Iname As String * 255` statement.

The first example also shows how to test the return code to determine when to end a loop that is to be applied to all images in a directory list. Be sure to assign the return code to a variable other than the one used by the other functions in your macro (i.e., do not use `ret`). If the name is not unique, there is no guarantee that it is `IpStSearchDir's` return code you are testing.

If you are using `IpStSearchDir` to process an entire subdirectory list (i.e., *Filter* specifies `"*.*"`) consider starting your search at entry position 2, as positions 0 and 1 generally contain directory entries — 0 contains the subdirectory's entry (i.e., ".") and 1 contains the parent directory's entry (i.e., ".."). If you choose to begin your search at position 0, be sure to include instructions that test `IpStSearchDir`'s return code and take appropriate action if a subdirectory or volume ID is encountered.

See Also

IpStSortedList

IpStSortedList

Syntax **IpStSortedList** (*Directory, Filter, Attribute, List*)

Description This function returns a sorted list of files from a directory. The file names for the list can be retrived using IpStSearchDir.

Parameters

Directory	**String**	A string specifying the directory from which file names are to be obtained.
Filter	**String**	A pattern string specifying the types of file names that are to be included when the directory is searched. The standard DOS wildcard characters can be used to define this pattern string (e.g.,`" *.*"`, `"*.TIF"`, `"IMG*.TIF"`). A zero-length string (e.g., `""`) defaults to a pattern of `"*.*"`.
Attribute	**Integer**	Attribute, which can be one of the following constants, all of which will return a sorted list of image numbers to List except for **SORT_GET_NFILES** (see notes for that attribute). **SORT_GET_NFILES** = returns number of files in the Directory. pList is ignored, should be IPNULL. **SORT_BY_NAME_ASC =** sort by file name ascending **SORT_BY_NAME_DEC** = sort by file name descending **SORT_BY_SUFF_ASC** = sort by file name numerical suffix ascending (e.g. image1.tif, image2.tif, image10.tif) **SORT_BY_SUFF_DEC** = sort by file name suffix descending **SORT_BY_DATE_ASC** = sort by file time ascending **SORT_BY_DATE_DEC** = sort by file time descending
List	**Any**	The List should be an array of integers that will receive the file indexes, sorted according to the selected sAttribute. The array must be large enough to accommodate all file indexes. The number of images can be retrieved using **SORT_GET_NFILES**. The values from the list can be used to retrieve image names using IpStSearchDir (Directory, Filter, Number, FileName) function, where Number is an element of List.

Return Value This function returns the number of files in the folder, sorted in the order specified.

Example

```
Sub GetSortedList()

Dim sDirectory As String
Dim sFilter As String, NFiles%, i%
Dim FileName As String*255

sDirectory="L:\Images\Sort"
sFilter="*.*"

‘get number of files
NFiles=IpStSortedList(sDirectory,sFilter,SORT_GET_NFILES,IpNULL
)

ReDim FileList(NFiles) As Integer
'get list sorted by name
ret=IpStSortedList(sDirectory,sFilter,SORT_BY_NAME_ASC,FileList
(0))
'print list
Debug.Print "File list sorted by name"
For i=0 To NFiles-1
  ‘get file name
  If IpStSearchDir (sDirectory,sFilter, FileList(i),
Filename)=1 Then   'print only files, skip folder names
Debug.Print i & "  " & FileName
  End If
Next

'get list sorted by time
ret=IpStSortedList(sDirectory,sFilter,SORT_BY_TIME_ASC,FileList
(0))
'print list
Debug.Print "File list sorted by time"
For i=0 To NFiles-1
  'get file name
  If IpStSearchDir(sDirectory,sFilter,FileList(i), Filename)=1
Then
'print only files, skip folder names
Debug.Print i & "  " & FileName
  End If
Next
```

Examples, con’t.

```
'get list sorted by suffix
ret=IpStSortedList(sDirectory,sFilter,SORT_BY_SUFF_ASC,FileList
(0))  'print list
Debug.Print "File list sorted by suffix"
For i=0 To NFiles-1
'get file name
  If IpStSearchDir (sDirectory,sFilter, FileList(i),
Filename)=1 Then
'print only files, skip folder names
Debug.Print i & "  " & FileName
  End If
Next
End Sub

‘*****************************************************
Original list:
L:\Images\Sort\file1.TIF
L:\Images\Sort\file10.TIF
L:\Images\Sort\file2.TIF
L:\Images\Sort\file1.jpg
```

```
Output:
File list sorted by name
2  L:\Images\Sort\file1.jpg
3  L:\Images\Sort\file1.TIF
4  L:\Images\Sort\file10.TIF
5  L:\Images\Sort\file2.TIF
File list sorted by time
0  L:\Images\Sort\file2.TIF
1  L:\Images\Sort\file10.TIF
2  L:\Images\Sort\file1.TIF
3  L:\Images\Sort\file1.jpg
File list sorted by suffix
2  L:\Images\Sort\file1.jpg
3  L:\Images\Sort\file1.TIF
4  L:\Images\Sort\file2.TIF
5  L:\Images\Sort\file10.TIF
```

Note: These examples illustrate the value of properly formatting image file names as they are saved. If the files were created using a zero-padded name format, they would sort correctly, e.g. if the file names were file001.jpg, file001.tif, file010.tif and file002.tif, then sort by name would return:

```
2  L:\Images\Sort\file001.jpg
3  L:\Images\Sort\file001.TIF
5  L:\Images\Sort\file002.TIF
4  L:\Images\Sort\file010.TIF
```

IpStageAbsZ

Syntax **IpStageAbsZ(*Abs ZPos*)**

Description This functions moves the stage to an absolute Z position, thereby changing the focus.

Parameters

AbsZPos	**Single**	The position (in millimeters) from the origin of the vertical (Z) axis to which the stage is to be moved.

Example The following example moves the stage to a position 50 microns from the focus origin and away from the lens (down).

```
ret = IpStageAbsZ(-0.05)
```

See Also IpStageZ

IpStageAbsZEx

Syntax **IpStageAbsZEx*(Z, Fine Z, uiFlags)***

Description This function moves the stage to the absolute Z position.

Parameters

Z	**Float**	The position (in millimeters) from the origin of the vertical (Z) axis to which the stage is to be moved.
Fine Z	**Float**	Position of the fine Z, if used.

uiFlags	**Integer**	Flags are defined as follows:
		`STG_USE_ORIGINAL_XYZ 1`
		`STG_USE_COARSE_XY 2`
		`STG_USE_COARSE_Z 4`
		`STG_USE_FINE_X 8`
		`STG_USE_FINE_Y 16`
		`STG_USE_FINE_Z 32`
		`STG_USE_CONTINUOUS_FOCUS 64`
		`STG_AFA_LIST_RESERVED_1 128`
		`STG_AFA_LIST_RESERVED_2 256`
		`STG_AFA_LIST_RESERVED_3 512`
		`STG_AFA_LIST_RESERVED_4 1024`
		`STG_AFA_LIST_RESERVED_5 2048`
		`STG_AFA_LIST_RESERVED_6 4096`
		`STG_AFA_LIST_RESERVED_7 8192`
		`STG_AFA_LIST_RESERVED_8 16384`
		`STG_AFA_LIST_RESERVED_9 32768`

Example The following example moves the stage to a position 50 microns from the focus origin and away from the lens (down).

```
  ret = IpStageAbsZEx(-0.0, 0.1, STG_USE_FINE_Z)
```

See Also IpStageAbsZ, IpStageZ

IpStageAcq

Syntax **IpStageAcq*(DbSpec, FileSpec, UseDb)***

Description This function starts the Acquire process.

Parameters

DbSpec	**String**	Indicates the database name and path
FileSpec	**String**	Indicates the file name and path
UseDb	**Integer**	Indicates whether to use a database (`STG_DB`) or not to use a database (`STG_NO_DB`).

Example The following statement will acquire to the current database:

```
ret = IpStageAcq(“c:\ipwin7\test.mdb”, “c:\ipwin7\test.tif”,
      STG_DB)
```

Entering `“\\”` in lieu of a file name will acquire image to a workspace without writing it to a file.

Comments If template mode is off, the macro will use the file and database names passed in the string. If template mode is on, the file name passed in the string is ignored, and a Windows file box is displayed; the user is forced to enter the path and name.

This command is equivalent to clicking on the **Acquire** button of the ***Acquire*** tab page in the *Stage-Pro* dialog box. All currently selected acquisition parameters on this page will be executed. All images will be tagged with the *Stage-Pro* location information.

IpStageAcqFrame

Syntax

IpStageAcqFrame*(AcqType)*

Description

This function will acquire a single frame and tag that frame with the *Stage-Pro* properties.

Parameters

AcqType	**Integer**	This can acquire to a new workspace or to the current active workspace. ACQ_NEW ACQ_CURRENT

Example

The following statement will snap a frame into a new workspace and tag it with *Stage-Pro*'s property list:

```
ret = IpStageAcqFrame(ACQ_NEW)
```

Return Value

This function returns the Document ID, which will be an integer greater than or equal to 0. A negative return value indicates an error.

Comments

To retrieve the *Stage-Pro* properties use the functions IpStageDocGet() and IpStageDocGetStr(). See these functions for specific details.

If **Tile Images** is selected, a *Stage*-Pro will create a tiled image. If **Multi-Plane** or **Software Auto**-focus is selected, EDFs will be acquired in the in-focus image created.

Otherwise, a single image will be generated (as in IpAcqSnap), and the *Stage-Pro* location information will be added to the image.

IpStageAddListPoint

Syntax **IpStageAddListPoint (*ListID, Index, Position, PointAry)***

Description This function adds a point to an existing AFA point list.

Parameters

ListID	**Integer**	Indicates the ID of the existing list where the point should be added.
Index	**Integer**	Indicates the position in the list where the point should be added: -1 = add to end of list n = specific position in the list
Position	**Integer**	STG_AT_CUR_STG_POS = Use the current stage position for the position of the point STG_AT_GIVEN_POS = Use the values in *PointAry* as the position of the point.
PointAry	**Any**	Can be null if *Position* = STG_AT_CUR_STG_POS Must be an array of 3 single giving the X, Y, and Z position of the point (as an absolute XYZ position with respect to the defined area of travel) to add for STG_AT_GIVEN_POS .

Return Value 0 if successful, a negative error code if failed.

IpStageAddListPointEx

Syntax **IpStageAddListPointEx (ListID, Index, Where, PointAry, Flags)**

Description This function adds a point to an existing AFA point list.

Parameters

ListID	**short**	Indicates the ID of the existing list where the point should be added.
Index	**short**	Indicates the position in the list where the point should be added: -1 = add to end of list n = specific position in the list
Where	**Integer**	STG_AT_CUR_STG_POS = Use the current stage position for the position of the point STG_AT_GIVEN_POS = Use the values in *PointAry* as the position of the point.
PointAry	**LPFloat**	Can be null if *Position* = STG_AT_CUR_STG_POS Must be an array of 3 single giving the X, Y, and Z position of the point (as an absolute XYZ position with respect to the defined area of travel) to add for STG_AT_GIVEN_POS .
uiFlags	**Integer**	Flags are defined as follows:

STG_USE_ORIGINAL_XYZ	1
STG_USE_COARSE_XY	2
STG_USE_COARSE_Z	4
STG_USE_FINE_X	8
STG_USE_FINE_Y	16
STG_USE_FINE_Z	32
STG_USE_CONTINUOUS_FOCUS	64
STG_AFA_LIST_RESERVED_1	128
STG_AFA_LIST_RESERVED_2	256
STG_AFA_LIST_RESERVED_3	512
STG_AFA_LIST_RESERVED_4	1024
STG_AFA_LIST_RESERVED_5	2048
STG_AFA_LIST_RESERVED_6	4096
STG_AFA_LIST_RESERVED_7	8192
STG_AFA_LIST_RESERVED_8	16384
STG_AFA_LIST_RESERVED_9	32768

Return Value 0 if successful, a negative error code if failed.

IpStageControl

Syntax **IpStageControl(*Setting, OutVal*)**

Description This function is used to set the origin and logical step size. It is also used to query the current position of the stage, and to turn various attributes *on* or *off*.

Parameters

Setting	**Integer**	An enumerated integer used to read and set stage controller options. See list and definitions under **Comments**, below.
OutVal	**Single**	Variable that will pass in or receive the value with which *Setting* will operate. See definitions under **Comments**, below, for the values required by each *Setting* option.

Example The following example sets the origin of the X/Y axis to the current position.

```
IpStgVal = STG_CURRENT
ret = IpStageControl(SETORIGIN, IpStgVal)
Set fine coarse
IpStgVal = STG_FINE_Z
IpStgVal = STG_COARSE_Z
ret = IpStageControl(STG_SELECT_FINE_FOCUS, IpStgVal)

IpStgVal = STG_FINE_X
IpStgVal = STG_COARSE_X
IpStageControl(STG_SELECT_FINE_XY, IpStgVal)

Set use totals.
IpStgVal=TRUE
IpStgVal=FALSE
ret=IpStageControl(STG_GET_XY_DISPLAY_TOTAL, IpStgVal)
ret=IpStageControl(STG_GET_Z_DISPLAY_TOTAL, IpStgVal)
```

The following example sets the XY origin to the center of the stage.

```
IpStgVal = STG_CENTER
ret = IpStageControl(SETORIGIN, IpStgVal)
```

The following example sets the X-axis step size to 500 microns (.5 millimeters).

```
IpStgVal = 0.5
ret = IpStageControl(SETSTEPX, IpStgVal)
```

The following statements get the X, Y, and Z positions of the stage.

```
Dim XPos as single, YPos as single, ZPos as single
ret = IpStageControl(GETX, XPos)
ret = IpStageControl(GETY, YPos)
ret = IpStageControl(GETZ, ZPos)
“The following code will set the z-travel limits for a multi-
plane acquisition.
Sub SetLimits()
     Dim ZTop As Single
     Dim ZBot As Single
     ZTop = 1.0    ‘NOTE: This is in mm
     ZBot = -1.0
```

```
      ret = IpStageControl(STG_SET_Z_TOP, ZTop)
     Debug.Print ret
      ret = IpStageControl(STG_SET_Z_BOT, ZBOT)
     Debug.Print ret
  End Sub”
Examples:
‘Select random pattern
IpStgVal = STG_RANDOM
IpStageControl(STG_SET_SCAN_PATTERN, IpStgVal)

‘Use 5 frames out of current scan area
IpStgVal = 5
IpStageControl(STG_NUM_RND_FRAMES, IpStgVal)

‘Recalculate the random list
IpStgVal = 0
IpStageControl(STG_RECALC_RND, IpStgVal)
```

Comments The following table describes the values allowed in the *Setting* and *Outval* parameters.

Setting	**DESCRIPTION**	*OutVal*
SETSTEPX	This command sets the X-axis logical step size, which is used by the IpStageStepXY function.	The logical step size, in millimeters.
SETSTEPY	This command sets the Y-axis logical step size, which is used by the IpStageStepXY function.	The logical step size, in millimeters.
SETSTEPZ	This command sets the Z-axis logical step size, which is used by the IpStageStepZ function.	The logical step size, in millimeters.
SETORIGIN	This command sets the origin of the X, Y, and Z-axes. The X/Y origin is set as specified in the *Outval* parameter.	The position to which the X/Y origin is to be set. Must be one of the following: `STG_UPLEFT` - sets X/Y origin at the upper-left corner of the stage. `STG_CENTER` - sets X/Y origin at the center of the stage. `STG_CURRENT` - sets X/Y origin at the controller’s current X/Y position. `STG_ZCURRENT` - sets Z origin at the controller’s current Z position.

GETX	This command gets the current X position of the stage, in millimeters. The value is written to the variable you specify in *OutVal*.	The name of the variable receiving the X location value. Be sure this variable is of BASIC type **Single**.
GETY	This command gets the current Y position of the stage, in millimeters. This value is written to the variable you specify in *OutVal*.	The name of the variable receiving the Y location value. Be sure this variable is of BASIC type **Single**.

Setting	**DESCRIPTION**	***Outval***
GETZ	This command gets the current Z position of the stage, in millimeters. This value is written to the variable you specify in *OutVal*.	The name of the variable receiving the Z location value. Be sure this variable is of BASIC type **Single**.
STG_GET_OFFSET_CORR	Gets the information to turn objective offset off or on	0 = off, 1 = on
STG_GET_3_POINT_PLANE	Gets the information to turn the 3 point plane off or on	0 = off, 1 = on
STG_PRESENT	This command checks to see if there is a stage present.	Returns a boolean value of 1 if a stage is present, 0 if not.
STG_FOCUS_PRESENT	This command checks to see if there is a focus drive present. It may be anywhere in Stage-Pro or Scope-Pro.	Returns a boolean value of 0 if a focus drive is present anywhere in the configuration, 1 if not.
STG_SET_XY_SPEED	This command sets the speed of travel in the X and Y directions.	The speed of travel from 1 to 100 as a percentage of maximum speed. Be sure that this variable is of the BASIC type **Single.**
STG_SET_Z_SPEED	This command sets the speed of travel in the Z and Y direction. *This function works only if your stage supports separate XY and Z speed settings*	The speed of travel from 1 to 100 as a percentage of maximum speed. Be sure that this variable is of the BASIC type **Single.**
STG_SET_SCANAREA_X_FRAMES	This command sets the width of the scan area in number of frames .	The scan area width in frames.

Setting	**DESCRIPTION**	*Outval*
STG_SET_SCANEARA_Y_FRAMES	This command sets the height of the scan area in number of frames	The scan area height in frames.
STG_SET_SCANAREA_X_MM	This command sets the width of the scan area in millimeters.	The scan area width in millimeters.
STG_SET_SCANAREA_Y_MM	This command sets the height of the scan area in millimeters.	The scan area height in millimeters.
STG_SET_Z_TOP	This command sets the top value of the Z stack in millimeters.	The top value of the Z stack in millimeters.
STG_SET_OFFSET_CORR	Sets the information to turn objective offset off or on	0 = off, 1 = on
STG_SET_Z_BOT	This command sets the bottom value of the Z stack in millimeters.	The bottom value of the Z stack in millimeters.
STG_SET_NUM_PLANES	This command sets the number of planes in the Z stack.	The number of planes in the Z stack.
STG_SELECT_BG_WS	This command is used to select the current workspace as the background.	Returns the doc ID for a valid workspace, or an error message.
STG_SELECT_BG_SUBTRACT	This command turns background subtraction on or off.	Returns a boolean value of 1 if background subtraction is on, 0 it it’s off.
STG_SELECT_BG_FLATFIELD	This command turns background flatfield correction on or off.	Returns a boolean value of 1 if flatfield correction is on, 0 it it’s off.
STG_SELECT_TILE	This command turns image tiling on or off.	Returns a boolean value of 1 if image tiling is on, 0 it it’s off.
STG_SELECT_USE_BG_CORRECTION	This command indicates if background correction should be used.	Returns a boolean value of 1 if background correction is on, 0 it it’s off.
STG_SELECT_USE_SAMPLE_PATTERNS	This command indicates if pattern sampling should be used.	Returns a boolean value of 1 if pattern sampling is on, 0 it it’s off.

Setting	**DESCRIPTION**	*Outval*
STG_SELECT_USE_ALL_GROUPS	This command indicates if all groups should be used.	Returns a boolean value of 1 if use all groups is on, 0 if it's off.
STG_SELECT_USE_RESET_SWAF_ORIGIN	This command will reset the Z origin after a software autofocus operation.	
STG_GET_3_POINT_PLANE	Gets the information to turn the 3 point plane off or on	0 = off, 1 = on
STG_SET_XY_SEQ	This command turns the ability to save XY as a sequence.	Returns a boolean value of 1 if save XY as a sequence is on, 0 if it's off
STG_SET_GUARD_PIX	This command sets the guard frame in pixels.	The size of the guard frame in pixels.
STG_NUM_RND_FRAMES	This command sets the number of frames to be used in the random pattern.	The number of frames to use.
STG_RECALC_RND	This command recalculates the number of frames to be used in the random pattern.	The number of frames to use.
STG_SET_SCAN_PATTERN	This command sets the type of scan pattern	Must be one of the following: STG_SNAKE STG_SNAKE_90 STG_ONE_WAY STG_RANDOM
STG_SEELCT_FINE_XY	This command gets the fine or course X and/or Y values	0 = off, 1 = on
STG_GET_OBJ_OFFSET_CORR	Moves the stage to recent the view when an objective changes	0 = off, 1 = on
STG_SET_OBJ_OFFSET_CORR	Moves the stage to recent the view when an objective changes	0 = off, 1 = on

See Also IpStageStepXY, IpStageXY, IpStageStepZ, IpStageZ

IpStageCreateList

Syntax	**IpStageCreateList *()***		
Description	This function creates an empty AFA site list.		
Return Value	A zero-based list ID if successful, a negative error code if failed.		

IpStageDeleteList

Syntax	**IpStageDeleteList (ListID, PointsOnly)**		
Description	This function deletes all the points in the list.		
Parameters	*ListID*	**Integer**	Indicates the ID of the existing list to be deleted
	PointsOnly	**Integer**	True = Remove all the points, keep empty list. False = Remove all points, remove empty list.
Return Value	0 if successful, a negative error code if failed.		

IpStageDeletePoint

Syntax	**IpStageDeletePoint *(ListID, Index)***		
Description	This function deletes specific points in an existing list.		
Parameters	*ListID*	**Integer**	Indicates the ID of the existing list from which the points will be deleted.
	Index	**Integer**	Index of the point to remove, from zero to the number of points in the list minus one.
Return Value	0 if successful, a negative error code if failed.		

IpStageDocGet

Syntax **IpStageDocGet***(Setting, DocID, Value)*

Description This function gets information on an image captured by *Stage-Pro*. This is similar to the position information displayed by right clicking on the image.

Parameters *Setting* **Integer** Must be one of the following:

`STGINF_X_POS` returns the X offset of the image from the origin of the Area of Travel.

`STGINF_Y_POS` returns the Y offset of the image from the origin of the Area of Travel.

`STGINF_Z_POS` returns the Z position of the image.

`STGINF_XY_FIELD` returns the number of the field in the Scan Area.

`STGINF_Z_FIELD` returns the number of the plane.

`STGINF_Z_NUMPLANES` returns the number of planes in the Z stack.

`STGINF_Z_MIN` returns the Z position of the lowest plane with in-focus material. Will return 0 if the image was not captured using either Multi-Plane Focus or Software Auto-Focus.

`STGINF_Z_MAX` returns the Z position of the highest plane with in-focus material. Will return 0 if the image was not captured using either Multi-Plane Focus or Software Auto-Focus.

`STGINF_Z_DIST` returns the distance between the lowest and highest planes with in-focus material. Will return 0 if the image was not captured using either Multi-Plane Focus or Software Auto-Focus.

`STGINF_Z_BEST` returns the Z position of the plane with the most in-focus material. Will return 0 if the image was not captured using Software Auto-Focus.

DocID	**Integer**	Document ID of the image to get information on. Can use `DOCSEL_ACTIVE` for current active image.
Value	**Single**	Variable where the parameter value will be returned.

Example The following statement will get the absolute X offset of the current active workspace.

```
Dim xPos As Single
ret = IpStageDocGet (STGINF_X_POS, DOCSEL_ACTIVE,  xPos)
```

Comments This information will only be attached to an image captured through *Stage-Pro*.

IpStageDocGetStr

Syntax

IpStageDocGetStr*(Setting, DocID, String)*

Description

This function gets information on an image captured by *Stage-Pro*. This is similar to the position information displayed by right clicking on the image.

Parameters

Setting	**Integer**	Must be one of the following: `STGINF_PATTERNNAME` returns the name of the Sample Pattern that was active when the image was captured. `STGINF_GROUPNAME` returns the name of the Group in Sample Pattern that was active when the image was captured. `STGINF_SAMPLENAME` returns the name of the well.
DocID	**Integer**	Document ID of the image to get information on. Can use `DOCSEL_ACTIVE` for current active image.
String	**String**	Variable where the string will be returned.

Example

The following statement will get the name of the well in which the current active image was captured:

```
Dim MyString As String *60
ret = IpStageDocGetStr(STGINF_SAMPLENAME,  DOCSEL_ACTIVE,
MyString)
The following statement will get the pattern name in which a
given image was captured:
Dim DocID As Short
Dim szPtn As String *255
DocID = IpStageAcqFrame (ACQ_NEW)
ret = IpStageDocGetStr (STGINF_PATTERNNAME, DocID,
      szPtn)
```

Comments

This information will only be attached to an image captured through *Stage-Pro*.

IpStageField

Syntax **IpStageField***(FieldNum)*

Description This function moves the stage to a specific field.

Parameters

FieldNum	**Integer**	Number of the field to move to. Can also be one of the following:
		`STG_BEGINNING`
		`STG_END`
		`STG_NEXT`
		`STG_PREVIOUS`

Example The following statement will move to the *third* field in the current Scan Area:

```
ret = IpStageField(2)
```

Comments Field numbers start at 0 and go to *n* –1, where *n* is the number of fields defined. The IpStageGet command `STG_NUM_FIELDS` can be used to determine the number of fields in the current Scan Area.

DESCRIPTION	***Value***
`STG_BEGINNING`	This will move to the first frame in the current Scan Area.
`STG_END`	This will move to the last frame in the current Scan Area.
`STG_NEXT`	This will move to the next frame in the current Scan Area
`STG_PREVIOUS`	This will move to the previous frame in the current Scan Area.

IpStageFocusLimits

Syntax **IpStageFocusLimits***()*

Description This function invokes the routine that prompts the user to set the upper and lower limits for the Z travel.

IpStageGet

Syntax **IpStageGet***(Setting, Arg, Value)*

Description This function gets information on the current stage parameters

Parameters

Setting	**Single**	Must be one of the following: `STG_NUM_FIELDS` returns the total number of fields in the current Scan Area. ***Note:*** `STG_NUM_FIELDS` *returns 1 (one) if **Tile Images** is selected on the **Acquire** tab page.* `STG_X_FIELDS` returns the number of fields in the X direction in the current Scan Area. `STG_Y_FIELDS` returns the number of fields in the Y direction in the current Scan Area. `STG_GUARD_PIX` returns the width of the guard frame in pixels. `STG_GET_RAW_X` reports the raw X position information returned by the controller in the controller's native units, normally pulses or motor steps. `STG_GET_RAW_Y` reports the raw Y position information returned by the controller in the controller's native units, normally pulses or motor steps. `STG_GET_RAW_Z` reports the raw Z position information returned by the controller in the controller's native units, normally pulses or motor steps. `STG_GET_SLICE_SIZE` reports the size of a single Z slice. STG_GET_Z_TOP returns the current upper limit of the Z stack.

Parameters	*Setting*	**Single**	STG_GET_Z_BOT returns the current lower limit of the Z stack. STG_GET_X_CORRECTION returns the difference between the origin of the area of travel and the origin of the scan area. STG_GET_Y_CORRECTION returns the difference between the origin of the area of travel and the origin of the scan area. STG_TOTAL_AREA returns the total area of the Scan Area in square mm. STG_X_MM returns the width of the frame in mm STG_Y_MM returns the height of the frame in mm STG_X_PIX returns the width of the frame in pixels STG_Y_PIX returns the height of the frame in pixels STG_NUM_GROUPS returns the number of groups that are defined in the current Sample Pattern. ***Note:*** *If* ***Use Sample Pattern*** *is not selected on the* ***Acquire*** *tab page,* STG_NUM_GROUPS *returns 0 (zero).* ***If Use All Groups*** *is not selected,* STG_NUM_GROUPS *returns 1 (one).* STG_CURR_GROUP returns the number (0 to *n*-1) of the current Group in the current Sample Pattern. STG_NUM_WELLS returns the number of wells in the current Sample Pattern. STG_NUM_WELLS_X returns the number of wells in X in the current Sample Pattern. STG_NUM_WELLS_Y returns the number of wells in Y in the current Sample Pattern. STG_CURR_WELL returns the number (0 to *n*-1) of the current well in the current Sample Pattern. STG_CURR_XY_FIELD returns the number (0 to *n*-1) of the current frame in the current Scan Area. STG_WELLS_IN_CURR_GROUP returns the number of wells in the current Group in the current Sample Pattern. ***Note:*** *If* ***Use Sample Pattern*** *is not selected,*

		STG_WELLS_IN_CURR_GROUP *returns 1 (one)*. STG_NUM_PLANES returns the number of Z planes. **Note:** STG_NUM_PLANES returns 0 (zero) if there is no Z focus control or if **Control Z Plane** or **Auto-Focus When Acquiring** is not selected. STG_NUM_PLANES returns 1 (one) if **EDF Capture** is not selected. STG_NUM_SCAN_AREAS returns the number of currently defined Scan Area settings files. STG_NUM_SAMPLE_PATTERNS returns the number of currently defined Sample Patterns. STG_PIX_PER_MM_X returns the frame width in number of pixels per millimeter STG_PIX_PER_MM_Y returns the frame height in pixels per millimeter STG_MM_PER_PIX_X returns the frame width in number of millimeters per pixel STG_MM_PER_PIX_Y returns the frame height in number of millimeters per pixel STG_XY_SPEED returns the speed of travel in the X or Y direction STG_Z_SPEED returns the speed of travel in the Z direction
		STG_GETXY_FINE_COARSE STG_GET_Z_FINE_COARSE STG_GET_XY_DISPLAY_TOTAL STG_GET_Z_DISPLAY_TOTAL STG_GET_Z_FINE_MAX
Arg	**Integer**	Reserved, set to 0
Value	**Any**	Indicates the user's variable where the parameter value will be returned.

Example

```
The following statement gets the number of fields currently
defined in the Scan Area:
Dim NumFields As Single
ret = IpStageGet (STG_NUM_FIELDS,0,NumFields)
```

Comments You cannot record this macro.

IpStageGetAbsPoint

Syntax	**IpStageGetAbsPoint** *(ListID, Index, IpfPointAry)*		
Description	This function gets the absolute X, Y, and Z values of a specific point in an existing list.		
Parameters	*ListID*	**Integer**	Indicates the zero-based list ID.
	Index	**Integer**	Indicates the zero-based point index.
	IpfPointAry	**LPFLOAT**	An array of 3 floats to hold absolute x,y, and z position information with respect to the defined area of travel.
Return Value	0 if successful, a negative error code if failed.		

IpStageGetAbsPointEx

Syntax	**IpStageGetAbsPointEx***(ListID, Index, IpfPointAry, uiFlags)*		
Description	This function gets the absolute X, Y, and Z values of a specific point in an existing list.		
Parameters	*ListID*	**Integer**	Indicates the zero-based list ID.
	Index	**Integer**	Indicates the zero-based point index.
	IpfPointAry	**LPFLOAT**	An array of 3 floats to hold absolute x,y, and z position information with respect to the defined area of travel.

	uiFlags	**Integer**	Flags are defined as follows:
			`STG_USE_ORIGINAL_XYZ 1`
			`STG_USE_COARSE_XY   2`
			`STG_USE_COARSE_Z    4`
			`STG_USE_FINE_X      8`
			`STG_USE_FINE_Y     16`
			`STG_USE_FINE_Z     32`
			`STG_USE_CONTINUOUS_FOCUS  64`
			`STG_AFA_LIST_RESERVED_1   128`
			`STG_AFA_LIST_RESERVED_2   256`
			`STG_AFA_LIST_RESERVED_3   512`
			`STG_AFA_LIST_RESERVED_4   1024`
			`STG_AFA_LIST_RESERVED_5   2048`
			`STG_AFA_LIST_RESERVED_6   4096`
			`STG_AFA_LIST_RESERVED_7   8192`
			`STG_AFA_LIST_RESERVED_8   16384`
			STG_AFA_LIST_RESERVED_9 32768

Return Value	0 if successful, a negative error code if failed.		

IpStageGetAbsPosition

Syntax	**IpStageGetAbsPosition***(IpPointAry)*
Description	This function gets the absolute positions of X, Y,and Z in Point (0), Point(1),and Point(2).

Parameters

IpfPointAry	**Single**	An array of 3 singles to hold absolute x,y, and z position information with respect to the defined area of travel.

Comments

The absolute position is the current relative position returned by the normal get functions, plus the distance from the origin of the area of travel to the origin of the scan area.

Example

```
dim Point(3) as single
IpStageGetAbsPosition(Point)
```

Return Value

0 if successful, a negative error code if failed.

IpStageGetAbsPositionEx

Syntax **IpStageGetAbsPositionEx** *(lpPointAry,uiFlags)*

Description This function gets the absolute positions of X, Y,and Z in Point (0), Point(1),and Point(2).

Parameters

IpfPointAry	**Single**	An array of 3 singles to hold absolute x,y, and z position information with respect to the defined area of travel.
uiFlags	**Integer**	Flags are defined as follows: STG_USE_ORIGINAL_XYZ 1 STG_USE_COARSE_XY 2 STG_USE_COARSE_Z 4 STG_USE_FINE_X 8 STG_USE_FINE_Y 16 STG_USE_FINE_Z 32 STG_USE_CONTINUOUS_FOCUS 64 STG_AFA_LIST_RESERVED_1 128 STG_AFA_LIST_RESERVED_2 256 STG_AFA_LIST_RESERVED_3 512 STG_AFA_LIST_RESERVED_4 1024 STG_AFA_LIST_RESERVED_5 2048 STG_AFA_LIST_RESERVED_6 4096 STG_AFA_LIST_RESERVED_7 8192 STG_AFA_LIST_RESERVED_8 16384 STG_AFA_LIST_RESERVED_9 32768

IpStageGetListLength

Syntax **IpStageGetListLength** *(ListID)*

Description This function gets the zero-based list length

Parameters

ListID	**Integer**	Indicates the zero-based list ID.

Return Value The list length if successful, a negative error code if failed.

IpStageGetListLocked

Syntax **IpStageGetListLocked** *(ListID)*

Description This function indicates if the list is locked. If so, the list cannot be modified.

Parameters

ListID	**Integer**	Indicates the zero-based list ID.

Return Value The list length if successful, a negative error code if failed.

IpStageGetListModified

Syntax **IpStageGetListModified** *(ListID)*

IpStageGetListModified

Description	This function indicates if the list has been modified.		
Parameters	*ListID*	**Integer**	Indicates the zero-based list ID.
Return Value	The list length if successful, a negative error code if failed.		

IpStageGetListName

Syntax	**IpStageGetListName** *(ListID, szName)*		
Description	This function gets the name of the zero-based list.		
Parameters	*ListID*	**Integer**	Indicates the zero-based list ID.
	szName	**LPSTR**	Indicates the name of the list.
Return Value	The list length if successful, a negative error code if failed.		

IpStageGetNumLists

Syntax	**IpStageGetNumLists** *()*
Description	This function gets the zero-based number of lists
Return Value	The number of lists if successful, -1 for none.

IpStageGoToListPos

Syntax	**IpStageGoToListPos** *(ListID, Index)*		
Description	This function moves the stage to the absolute XYZ value of a specific point in an existing list. Sets the origin of the scan area.		
Parameters	*ListID*	**Integer**	Indicates the zero-based list ID.
	Index	**Integer**	Indicates the zero-based point index.
Return Value	0 if successful, a negative error code if failed.		

IpStageModifyListPoint

Syntax **IpStageModifyListPoint** *(ListID, Index, Position, PointAry)*

Description This function modifies the position of an existing point in an existing AFA point list.

Parameters

ListID	**Integer**	Indicates the ID of the existing list where the position of the point should be changed
Index	**Integer**	Indicates the zero-based position of the point in the list.
Position	**Integer**	STG_AT_CUR_STG_POS = Use the current stage position for the position of the point STG_AT_GIVEN_POS = Use the values in *PointAry* as the position of the point.
PointAry	**Any**	Can be null if *Position* = STG_AT_CUR_STG_POS Must be an array of 3 single giving the X, Y, and Z position of the point (as an absolute XYZ position with respect to the defined area of travel) to add for STG_AT_GIVEN_POS .

Return Value 0 if successful, a negative error code if failed.

IpStageModifyListPointEx

Syntax **IpStageModifyListPointEx** *(ListID, Index, Where, PointAry)*

Description This function modifies the position of an existing point in an existing AFA point list.

Parameters

ListID	**Integer**	Indicates the ID of the existing list where the position of the point should be changed
Index	**Integer**	Indicates the zero-based position of the point in the list.
Where	**Integer**	STG_AT_CUR_STG_POS = Use the current stage position for the position of the point STG_AT_GIVEN_POS = Use the values in *PointAry* as the position of the point.
PointAry	**Any**	Can be null if *Position* = STG_AT_CUR_STG_POS Must be an array of 3 single giving the X, Y, and Z position of the point (as an absolute XYZ position with respect to the defined area of travel) to add for STG_AT_GIVEN_POS .

uiFlags	**Integer**	Flags are defined as follows:
		`STG_USE_ORIGINAL_XYZ 1`
		`STG_USE_COARSE_XY   2`
		`STG_USE_COARSE_Z    4`
		`STG_USE_FINE_X      8`
		`STG_USE_FINE_Y     16`
		`STG_USE_FINE_Z     32`
		`STG_USE_CONTINUOUS_FOCUS  64`
		`STG_AFA_LIST_RESERVED_1   128`
		`STG_AFA_LIST_RESERVED_2   256`
		`STG_AFA_LIST_RESERVED_3   512`
		`STG_AFA_LIST_RESERVED_4   1024`
		`STG_AFA_LIST_RESERVED_5   2048`
		`STG_AFA_LIST_RESERVED_6   4096`
		`STG_AFA_LIST_RESERVED_7   8192`
		`STG_AFA_LIST_RESERVED_8   16384`
		`STG_AFA_LIST_RESERVED_9   32768`

Return Value 0 if successful, a negative error code if failed.

IpStagePlane

Syntax **IpStagePlane***(PlaneNum)*

Description This function moves the stage to the specific Z plane.

Parameters

PlaneNum	**Integer**	Number of the plane to move to. Can also be one of the following:
		`STG_BEGINNING`
		`STG_END`
		`STG_NEXT`
		`STG_PREVIOUS`

Example The following statement will move to the origin of the ***third*** plane in the current Z stack:

```
ret = IpStagePlane(2)
```

Comments Plane numbers start at 0 and go to *n* –1, where *n* is the number of planes defined. The IpStage Get command `STG_NUM_PLANES` can be used to determine the number of planes in the current Z stack.

DESCRIPTION	***Value***
`STG_BEGINNING`	This will move to the first plane in the current stack.
`STG_END`	This will move to the last plane in the current stack.
`STG_NEXT`	This will move to the next plane in the current stack
`STG_PREVIOUS`	This will move to the previous plane in the current stack.

IpStageSampleGroupByName

Syntax	**IpStageGroupByName***(GroupName)*
Description	This function loads a Group within a Sample Pattern.
Parameters	*GroupName* **String** The name of a Group as it appears in the list box on the ***Sample Pattern*** tab.
Example	The following statement will load the group named “Group 1”. `ret = IpStageGroupByName(“Group 1”)`
Comments	This function does a string compare to match the name supplied with a name in the list.

IpStageSampleGroupByNum

Syntax	**IpStageGroupByNum***(GroupNum)*
Description	This function loads a Group within a Sample Pattern.
Parameters	*GroupNum* **Integer** The number of the position of a Group as it appears in the list box on the ***Sample Pattern*** tab.
Example	The following statement will load the group that is ***second*** in the Group list. `ret = IpStageGroupByNum(1)`
Comments	Group numbers start at 0 (zero) and continue to *n*-1, where *n* is the number of groups defined. The IpStageGet Command STG_NUM_GROUPS can be used to determine the number of groups defined.

IpStageSamplePatternByName

Syntax **IpStageSamplePatternByName***(PatternName)*

Description This function loads a Sample Pattern.

Parameters

PatternName	**String**	The name of a Sample Pattern as it appears in the list box on the ***Sample Pattern*** tab.

Example The following statement will load the template for a 96-well plate.

```
ret = IpStageSamplePatternByName(“Costar96WellPlate”)
```

Comments When *Stage-Pro* is loaded it scans the `ScpPtn` directory and loads all **Sample Pattern** names into the list box on the ***Sample Pattern*** tab. This function does a string compare to match the name supplied with a name in the list, therefore there is **no** path associated with the string.

IpStageSamplePatternByNum

Syntax **IpStageSamplePatternByNum***(PatternNum)*

Description This function loads a Sample Pattern.

Parameters

PatternNum	**Integer**	The number of the position of a Sample Pattern as it appears in the list box on the ***Sample Pattern*** tab.

Example The following statement will load the template for the second pattern in the Sample Pattern list.

```
ret = IpStageSamplePatternByNum(1)
```

Comments Sample Pattern numbers start at 0 (zero) and continue to *n*-1, where *n* is the number of patterns defined. The IpStageGet Command STG_NUM_PATTERNS can be used to determine the number of patterns defined.

IpStageSetListName

Syntax **IpStageSetListName** *(ListID, szName)*

Description This function sets the name of the zero-based list.

Parameters

ListID	**Integer**	Indicates the zero-based list ID.
szName	**LPSTR**	Indicates the name of the list.

Return Value The list length if successful, a negative error code if failed.

IpStageSetListLocked

Syntax	**IpStageSetListLocked** *(ListID,bLocked)*
Description	This function indicates if the list is locked. If so, the list cannot be modified.
Parameters	*ListID* **Integer** Indicates the zero-based list ID.
	bLocked **Integer** Turns the lock on or off.
Comments	The get / set list locked functions will allow AFA to flag a set as being locked. If a list is locked the Stage-Pro interface will not modify that list. The add point, delete point, sort list, and delete list macros will fail (and return an error code) if called for a locked list.
Return Value	The list length if successful, a negative error code if failed.

IpStageSetListModified

Syntax	**IpStageSetListModified** *(ListID, bModified)*
Description	This function indicates if the list has been modified.
Parameters	*ListID* **Integer** Indicates the zero-based list ID.
	bModified **Integer** Turns the modification on or off.
Comments	The get / set modified functions add a flag to the list structure that Stage-Pro will set if Stage-Pro modifies the list. Stage-Pro will not specifically look for this flag, but will incorporate any macro/AFA changes when the tab regains focus.
Return Value	The list length if successful, a negative error code if failed.

IpStageScanPatternByName

Syntax	**IpStageScanPatternByName***(ScanPatternName)*
Description	This function loads a Scan Area and Pattern.
Parameters	*ScanPatternName* **String** The name of a Scan Area and Pattern as it appears in the list box on the ***Scan Area*** tab.
Example	The following statement will load the Scan Area and Pattern named “ScanArea1”. `ret = IpStageScanPatternByName(“ScanArea1”)`
Comments	This function does a string compare to match the name supplied with a name in the **Scan Area** and **Pattern** list box on the ***Scan Area*** tab.

IpStageScanPatternByNum

Syntax	**IpStageScanPatternByNum***(ScanPatternNum)*
Description	This function loads a Scan Area and Pattern.
Parameters	*ScanPatternNum* **Integer** The number of the position of a Scan Area and Pattern as it appears in the list box on the ***Scan Area*** tab.
Example	The following statement will load the Scan Area and Pattern that is ***second*** in the **Scan Area** and **Pattern** list of the ***Scan Area*** tab. `ret = IpStageScanPatternByNum(1)`
Comments	Scan Area numbers start at 0 (zero) and continue to *n*-1, where *n* is the number of Scan Areas defined. The IpStageGet Command STG_NUM_SCAN_AREAS can be used to determine the number of Scan Areas defined.

IpStageSetArea

Syntax	**IpStageSetArea***(Method)*
Description	This function prompts the user to set the scan area visually. Depending on the second parameter, you will be asked for the corners or the sides of the Scan Area.

Parameters	*Method* **Integer** Indicates how to set the Scan Area:
	`STG_CORNERS`
	`STG_SIDES`

Example	The following statement will set the upper left and lower right corners of the Scan Area: `ret = IpStageSetArea (STG_CORNERS)`
Comments	Set the Scan Area by the corners for areas defined as rectangles. Set the Scan Area by the sides for round objects. This function has the same effect as using the **Corners** and **Sides** radio buttons, and clicking the **Set Area by Stage** button.

IpStageShow

Syntax **IpStageShow**(*bShow*)

Description This function displays or hides the "*Stage-Pro*" user interface.

Parameters

bShow	**Integer**	An integer value specifying whether the *Stage-Pro* window is to be shown (`STG_SHOW`) or hidden (`STG_HIDE`). Use `STG_SHOW_MID` to show the minimal dialog

Example The following statement will open the *Stage-Pro* window.

```
ret = IpStageShow(STG_SHOW)
```

Comments It is not necessary to display the *Stage-Pro* dialog when executing any of the stage controller functions from a macro. Its disposition, shown or hidden, is entirely up to you. You will want to display the dialog if your program requires the user to make choices within it; however, if your purpose is merely to move the stage in a predefined manner, there is no need to display the dialog.

IpStageShowTab

Syntax **IpStageShowTab**(*bShow*,*PageNum*)

Description This function displays or hides a *Stage-Pro* page.

Parameters

bShow	**Integer**	An integer value specifying whether the *Stage-Pro* window is to be shown (`STG_SHOW`) or hidden (`STG_HIDE`).

PageNum	**Integer**	Determines which tab page of the *Stage-Pro* page to show. Constants are defined for the following:
		`STG_AREA`
		`STG_PATTERN`
		`STG_LENS`
		`STG_STAGE`
		`STG_ACQ`
		`STG_CONFIG`
		`STG_SAMPLE_PATTERN`

Example The following statement will open the ***Stage-Pro*** dialog and display the ***Acquire*** tab page:

```
ret = IpStageShowTab(STG_SHOW,STG_ACQ)
```

Comments You cannot record this macro.

IpStageSettings

Syntax **IpStageSettings**(*FileSpec, Save*)

Description This loads or saves a *Stage-Pro* settings file (`*.stg`).

Parameters

FileSpec	**String**	The path and name of the *Stage-Pro* settings file.
Save	**Integer**	Indicates whether to load (`STG_LOAD`) or save (`STG_LOAD`) the settings.

Example The following statement will save the current stage settings:

```
  ret = IpStageSettings(“c:\ipwin7\test.stg”, STG_SAVE)
```

Comments If template mode is off, the macro will use the file and database names passed in the string. If template mode is on, the file name passed in the string is ignored, and a Windows file box is displayed; the user is forced to enter the path and name.

IpStageSortList

Syntax **IpStageSortList** *(ListID, iByMinDist)*

Description This function sorts an existing AFA point list.

Parameters

ListID	**Integer**	Indicates the ID of the existing list to be sorted.
ByMinDist	**Integer**	1 = Sort by minimum distance 0 = Sort by XY

Return Value The list length if successful, a negative error code if failed.

IpStageStepXY

Syntax **IpStageStepXY**(*Direction*)

Description This function moves the stage by one logical step, relative to its current position.

Parameters *Direction* **Integer** An enumerated integer that specifies the direction in which the stage is to move. Must be one of the following:

STG_UP

STG_RIGHT

STG_DOWN

STG_LEFT

See definitions under **Comments**, below

Example The following example sets the X-axis logical step size to 0.7 millimeters, then moves the stage right by this amount.

```
ret = IpStageControl(SETSTEPX, 0.7)
ret = IpStageStepXY(STG_RIGHT)
```

Comments Use IpStageControl SETSTEPX or SETSTEPY commands to set the logical step size.

The following table describes the values allowed in *Direction*.

Direction	DESCRIPTION
STG_UP	This value moves the stage one logical step to the north.
STG_RIGHT	This value moves the stage one logical step to the east.
STG_DOWN	This value moves the stage one logical step to the south.
STG_LEFT	This value moves the stage one logical step to the west.

See Also IpStageControl, IpStageXY, IpStageStepZ, IpStageZ

IpStageStepZ

Syntax **IpStageStepZ**(*Direction*)

Description This function moves the focus by one logical step, relative to its current position.

Parameters

Direction	**Integer**	An enumerated integer that specifies the direction in which the stage is to move. Must be one of the following: `STG_UP` - Moves the stage one logical step closer to the lens. `STG_DOWN` - Moves the stage one logical step away from the lens. `STG_AUTO` - Positions the stage automatically using the hardware's auto-focus facility.

Example

The following example sets the Z-axis step size to 20 microns (if the current unit is millimeters), then moves the stage up by this amount.

```
ret = IpStageControl(SETSTEPZ, 0.02)
ret = IpStageStepZ(STG_UP)
```

Comments

Use the IpStageControl `SETSTEPZ` command to set the logical step size.

Do not use the `STG_AUTO` option unless your motorized stage hardware is equipped with automatic focus circuitry. Using it with a controller that does not have auto-focus can cause the hardware to hang.

See Also

IpStageControl, IpStageStepXY, IpStageXY, IpStageZ

IpStageWell

Syntax **IpStageWell***(WellNum)*

Description This function moves the stage to the specific well.

Parameters

WellNum	**Integer**	Number of the well to move to. Can also be one of the following:
		`STG_BEGINNING`
		`STG_END`
		`STG_NEXT`
		`STG_PREVIOUS`

Example The following statement will move to the origin of the ***third*** well in the currently selected group of the current sample pattern.

```
IpStageWell(2)
```

Comments Well numbers start at 0 and go to *n* –1 (where *n* is the number of wells in the current group of the current sample pattern). The IpStageGet command `STG_NUM_WELLS` can be used to determine the number of wells in the currently selected group of the current sample pattern.

DESCRIPTION	***Value***
STG_BEGINNING	This will move to the first well in the currently selected group of the current sample pattern.
STG_END	This will move to the last well in the currently selected group of the current sample pattern.
STG_NEXT	This will move to the next well in the currently selected group of the current sample pattern.
STG_PREVIOUS	This will move to the previous well in the currently selected group of the current sample pattern.

Wells are numbered by rows. For example, on a 96-well plate, wells 0 through 11 correspond to wells **A,1** through **A,12**; wells 12 through 23 to well **B,1** through **B,12**; etc.

IpStageXY

Syntax

IpStageXY(*xPosition, yPosition*)

Description

This functions moves the stage to an absolute position.

Parameters

xPosition	**Single**	The position (in millimeters) on the X-axis to which the stage is to be moved.
yPosition	**Single**	The position (in millimeters) on the Y-axis to which the stage is to be moved.

Example

The following example moves the stage over a 4x3 well matrix. Each well is 2mm away from the well to its right, and 1.5mm from the well under it. The upper-left well is under the camera when the macro begins.

```
Dim XPos As Single, YPos As Single
Dim XIndex As Integer, YIndex As Integer
‘ Set the origin of the X- and Y-axis to the current position.
ret = IpStageControl(SETORIGIN, STG_CURRENT)
XPos = 0.0
YPos = 0.0
For YIndex = 1 to 3
For XIndex = 1 to 4
   ‘ Snap an image and process it
   ret = IpAcqSnap(ACQ_NEW)
     .
     .
     .
   ‘ Move the stage to the right
   XPos = XPos + 2.0
   ret = IpStageXY(XPos, YPos)
Next XIndex
XPos = 0.0
YPos = YPos + 1.5
Next YIndex
.
.
.
```

Comments

Distance is measured from the X/Y origin. The origin of the X- and Y-axis can be set using IpStageControl.

See Also

IpStageControl, IpStageStepXY, IpStageZ

IpStageXYRead

Syntax

IpStageXYRead*(ipString, iNumChar, iTimeout)*

Description

This function allows your application to read a reply string from the stage controller.

Parameters

ipString	**String**	The ASCII Z character string sent by the stage.
iNumCharacters	**Integer**	The number of characters to attempt to read from the stage controller.
ITimeout	**Integer**	The maximum time in milliseconds to wait for the string to be sent.

Return Value

The number of characters read if successful; 0 (zero) if no response; or negative if failed.

Comments

This function is usually used after IpStageXYWrite to receive a reply from the stage when the command is complete.

See Also

IpStageXYWrite

IpStageXYWrite

Syntax	**IpStageXYWrite***(ipString, iTimeout)*		
Description	This function allows your application to send commands to the stage controller.		
Parameters	*ipString*	**String**	The ASCIIZ character string sent to the stage.
	iTimeout	**Integer**	The maximum time in milliseconds to wait for the string to be sent.
Return Value	The number of characters written if successful; 0 if failed.		
Comments	Use IpStageXYRead to receive the results of the command. This macro command should be followed by a pause or IpMacroStop to give the Write macro time to communicate with the controller and for the controller to process the command. *Note:* Success of this function does not assure that *Stage-Pro* can communicate with the stage controller.		
See Also	IpStageXYRead		

IpStageZ

Syntax **IpStageZ**(*zPosition*)

Description This functions moves the stage vertically to an absolute position, thereby changing the focus.

Parameters

zPosition	**Single**	The position (in millimeters) from the origin of the vertical (Z) axis to which the stage is to be moved.

Example The following example moves the stage to a position 50 microns from the focus origin and away from the lens (down).

```
ret = IpStageZ(-0.05)
```

Comments The origin of the Z-axis can be set using IpStageControl.

Be sure the **Z Revolution** option has been set correctly in the ***Stage-Pro*** page on your workstation. This option establishes the distance per revolution of the focus knob for your particular stage controller. It is used by *Image-Pro Plus* to translate the millimeter value in *zPosition* into motor steps for the controller. If it has not been set for the workstation, Z positioning will be inaccurate. See *Setup* in *Section 2.*

See Also IpStageControl, IpStageXY, IpStageStepZ

IpStageZRead

Syntax	**IpStageZRead***(ipString, iNumChar, iTimeout)*		
Description	This function allows your application to receive a focus command.		
Parameters	*ipString*	**String**	The ASCIIZ character string sent by the focus hardware.
	iNumCharacters	**Integer**	The number of characters to attempt to read from the stage controller.
	iTimeout	**Integer**	The maximum time in milliseconds to wait for the string to be sent.
Return Value	The number of characters read if successful; 0 if failed.		
See Also	IpStageZWrite		

IpStageZWrite

Syntax	**IpStageZWrite***(ipString, iTimeout)*		
Description	This function allows your application to send a focus command to the stage.		
Parameters	*ipString*	**String**	The ASCIIZ character string sent to the focus hardware.
	iTimeout	**Integer**	The maximum time in milliseconds to wait for the string to be sent.
Return Value	The number of characters written if successful; 0 if failed.		
Comments	Use IpStageZRead to receive the results of the command. This macro command should be followed by a pause or IpMacroStop to give the Write macro time to communicate with the controller and for the controller to process the command. *Note:* Success of this function does not assure that *Stage-Pro* can communicate with the stage controller.		
See Also	IpStageZRead		

IpSurfAutoRefresh

Syntax **IpSurfAutoRefresh(*bAutoRefresh*)**

Description When *AutoRefresh* is on, changing the surface plot attributes using `IpSurfSet` will refresh the plot.

Parameters

bAutoRefresh	**Integer**	A value of 0 or 1 specifying whether the auto-refresh function is on or off. Where: 0 - AutoRefresh off 1 - AutoRefresh on

Comments Leaving the *AutoRefresh* on and changing the attributes may slow down the process if there are more than a few attributes. A better method is to turn *AutoRefresh* off, change the attributes, and turn *AutoRefresh* back on.

See Also IpSurfOutput, IpSurfSet, IpSurfGet, IpSurfShow

IpSurfGet

Syntax **IpSurfGet*(Attr, Value)***

Description Gets the various attributes of the surface plot diagram.

Parameters

Attr	**Integer**	Attribute to be found. See table below:
Value	**Long**	See table below:

ATTRIB	**ALLOWED VALUES**
SP_VIEW_ELEVATION	any integer 0-90
SP_VIEW_ROTATION	any integer -180 - 180

SP_STYLE_TYPE	SPS_WIREFRAME = wire frame (0)
	SPS_UNSHADED = unshaded (1)
	SPS_SHADED = shaded (2)

SP_STYLE_WIREFRAME_SPAN	any integer 0-100
SP_STYLE_DRAWEDGES	0 - edges off 1 - edges on
SP_STYLE_DRAWAXES	0 - axes off 1 - axes on
SP_STYLE_ZSCALE	any integer 0 - 400
SP_LIGHT_ELEVATION	any integer 0 - 90
SP_LIGHT_ROTATION	any interger -180 to 180
SP_LIGHT_COLOR	color reference
SP_AMBIENT_REFLECTANCE	any integer 0 - 100
SP_DIFFUSE_REFLECTANCE	any integer 0 -100
SP_SPECULAR_REFLECTANCE	any integer 0 -100
SP_GLOSS	any integer 0 -100
SP_COLORIZED_FROM	any integer 0 - 255
SP_COLORIZED_TO	any integer 0 - 255
SP_COLORIZED_FROM_COLOR	color reference
SP_COLORIZED_TO_COLOR	color reference
SP_SURFACE_COLOR_SPIN	any integer 0 - 5
SP_SURFACE_COLOR_SPREAD	0 - spread off 1 - spread on

Example

```
ret = IpSurfGet(SP_VIEW_ELEVATION,45)
```

See Also IpSurfShow, IpSurfOutput, IpSurfAutoRefresh

IpSurfOutput

Syntax	**IpSurfOutput(*Value)***		
Description	This function sends the surface plot diagram to the specified location.		
Parameters	*Value*	**Integer**	Indicate where the output should be sent: SPO_NEW = new image (1) SPO_NEW_WITH_ISCALE = new image with intensity scale (2) SPO_PRINTER = printer (3) SPO_CLIPBOARD - clipboard (4)
Example	`ret = IpSurfOutput(SPO_NEW)`		
See Also	IpSurfShow, IpSurfSet, IpSurfGet, IpSurfAutoRefresh		

IpSurfSet

Syntax	**IpSurfSet*(Attr, Value)***		
Description	Sets the various attributes of the surface plot diagram.		
Parameters	*Attr*	**Integer**	Attribute to be set. See table below:
	Value	**Long**	See table below:

ATTRIB	**ALLOWED VALUES**
SP_DEFAULT	any value, sets all attributes to default values.
SP_VIEW_ELEVATION	any integer 0-90
SP_VIEW_ROTATION	any integer -180 - 180

SP_STYLE_TYPE	SPS_WIREFRAME = wire frame (0)
	SPS_UNSHADED = unshaded (1)
	SPS_SHADED = shaded (2)

SP_STYLE_WIREFRAME_SPAN	any integer 0-100
SP_STYLE_DRAWEDGES	0 - edges off 1 - edges on
SP_STYLE_DRAWAXES	0 - axes off 1 - axes on
SP_STYLE_ZSCALE	any integer 0 - 400
SP_STYLE_TEXTURED	0 = texture off 1 = texture on
SP_LIGHT-ELEVATION	any integer 0 - 90
SP_LIGHT_ROTATION	any interger -180 to 180
SP_LIGHT_COLOR	color reference
SP_AMBIENT_REFLECTANCE	any integer 0 - 100
SP_DIFFUSE_REFLECTANCE	any integer 0 -100
SP_SPECULAR_REFLECTANCE	any integer 0 -100
SP_GLOSS	any integer 0 -100
SP_COLORIZED_FROM	any integer 0 - 255
SP_COLORIZED_TO	any integer 0 - 255
SP_COLORIZED_FROM_COLOR	color reference
SP_COLORIZED_TO_COLOR	color reference

ATTRIB	ALLOWED VALUES
SP_TEXTURE_ID	Document ID of textured image
SP_SHADOW_DEPTH	Shadow depth, any integer 0-255
SP_SURFACE_COLOR_SPIN	any integer 0 - 5
SP_SURFACE_COLOR_SPREAD	0 - spread off 1 - spread on

Example

```
ret = IpSurfSet(SP_VIEW_ELEVATION,45)
```

See Also IpSurfShow, IpSurfOutput, IpSurfAutoRefresh

IpSurfShow

Syntax **IpSurfShow (***bShow*)

Description This function displays or hides the surface plot tool.

Parameters

bShow	**Integer**	A value of 0 or 1 specifying whether the surface plot tool is to be displayed or suppressed. Where: 0 - hides the dialog 1 - shows the dialog

Example

```
ret = IpSurfShow(1)
```

See Also IpSurfOutput, IpSurfSet, IpSurfGet, IpSurfAutoRefresh

IpTagAddClass

Syntax **IpTagAddClass***(Name)*

Description This function can be used to add a Manual Tag class.

Parameters

Name	**String**	Name of the class to add.

IpTagAttr

Syntax **IpTagAttr** *(bAttr, Value)*

Description This function turns the **Manual Tagging** options on or off.

Parameters

bAttr	**Integer**	Identifies the measurement option. See definitions under comments, below
Value	**Integer**	Specifies how the option for *Attrbute* should be set. See definitions under comments, below

Comments

Command	**Value**	**Description**
TAG_VIEW_COUNTS TAG_VIEW_POINTS TAG_VIEW_CLASSSTATS	1 or 0	1 = turn option on 0 = no effect
TAG_VIEW_AREA TAG_VIEW_MARKER TAG_VIEW_LABEL TAG_MEAS_XPOS TAG_MEAS_YPS TAG_MEAS_INTENSITY TAG_MEAS_CLASS TAG_MEAS_RED TAG_MEAS_GREEN TAG_MEAS_BLUE TAG_MEAS_AREA	1 or 0	1 = turn option on 0 = turn option off
TAG_MEAS_RADIUS	integre 1-15	Set area radius to value. Valid values are integers 1-15

Example

```
Sub mtagAttrXpos()
ret = IpTagAttr(TAG_MEAS_XPOS, 0)
ret = IpTagAttr(TAG_MEAS_XPOS, 1)
ret = IpTagAttr(TAG_MEAS_YPOS, 0)
End Sub
```

Example, con't.

```
Sub mtagAttrRadius()
ret = IpTagAttr(TAG_MEAS_AREA, 1)
ret = IpTagAttr(TAG_MEAS_AREA, 0)
ret = IpTagAttr(TAG_MEAS_AREA, 1)
ret = IpTagAttr(TAG_MEAS_RADIUS, 7)
ret = IpTagAttr(TAG_MEAS_RADIUS, 8)
End Sub
Sub mtagAttrView()
ret = IpTagAttr(TAG_VIEW_LABEL, 0)
ret = IpTagAttr(TAG_VIEW_AREA, 1)
ret = IpTagAttr(TAG_VIEW_MARKER, 0)
ret = IpTagAttr(TAG_VIEW_MARKER, 1)
End Sub
Sub mtagAttrShow()
ret = IpTagAttr(TAG_VIEW_MARKER, 1)
End Sub
Sub mtagAttrHide()
ret = IpTagAttr(TAG_VIEW_MARKER, 0)
End Sub
Sub mtagViewCounts()
ret = IpTagAttr(TAG_VIEW_COUNTS, 1)
End Sub
Sub mtagViewPoints()
ret = IpTagAttr(TAG_VIEW_POINTS, 1)
End Sub
Sub mtagViewStats()
ret = IpTagAttr(TAG_VIEW_CLASSSTATS, 1)
End Sub
```

IpTagDelete

Syntax **IpTagDelete***(Index)*

Description This function deletes the marker number index, or all markers if index = -1.

Parameters

Index	**Integer**	Index of the tag to be deleted.

Example

```
Sub mtagDelete()
ret = IpTagDelete(9)
ret = IpTagDelete(5)
End Sub

Sub mtagDeleteAll()
ret = IpTagDelete(-1)
End Sub
```

IpTagDeleteClass

Syntax **IpTagDeleteClass***(ClassId)*

Description This function can be used to delete one or all of the Manual Tag classes.

Parameters

ClassID	**Integer**	Index of the class to be deleted (from 0 to the number of classes -1) or -1 to delete all classes.

Comments When all classes are deleted (either using a ClassID of -1 or when the last class is deleted), the color and symbol status is reset so that the first class added thereafter gets the first color and class symbol. Various parts of the Manual Tag dialogs must disable when there are no classes defined

IpTagGet

Syntax **IpTagGet***(Cmd, wParam, lpParam)*

Description This function gets the specified markers.

Parameters

Cmd	**Integer**	see comments below
wParam	**Integer**	see comments below
lpParam	**Any**	The address (name) of the variable that will receive the requested data. Be sure this variable is of the type required by *Cmd*. See *Cmd* description under Comments, below.

Comments

Cmd	wParam	lpParam
GETNUMPTS	class index	pointer to a single-point variable or array
	-1	returns total number of markers for a single single-point varaiable
	other	returns total number of markers in class *wParam* and their percentage of the total number for an array of single-point values. **Note:** *lpParam* must point to an array of 2 real numbers.
GETNUMCLASS	not used	Pointer to a single-point variable, which receives the number of classes
GETPOINTS	point index starting from 0	pointer to a single-point array, return x ,y, class, intensity, red, green, blue values in *lpParam (0)* through *lpParam (6)* **Note:** *lpParam* must point to an array of 7 real numbers.

GETSTATS	not used	pointer to a single-point array *lpParam[0]* = min *lpParam [1]* = max *lpParam[2]* = average number of markers *lpParam[3]* = standard deviation *lpParam[4]* = total number of markers **Note:** *lpParam* must point to an array of 5 real numbers.

Example

```
Dim SingleNumTags As Single
Dim SingleClassTags(2) As Single
‘get total number tags
ret = IpTagGet(GETNUMPTS,–1, SingleNumTags)
‘now get class 0 tags
ret = IpTagGet(GETNUMPTS,0, SingleClassTags(0))
‘SingleClassTags (0) is the number
```

Return Value

IPCERR_NOTFOUND: information not available.
IPCERR_INVARG: invalid argument
IPCERR_NONE: no error

IpTagLoadEnv

Syntax

IpTagLoadEnv*(PointsFile)*

Description

This function loads environment setting information from the points file.

Parameters

PointsFile	**String**	Name of the file where the environment setting information is stored.

Example

```
  Sub mtagLoadEnv()
  ret = IpTagLoadEnv("C:\IPWSRC\TEST.TAG")
  End Sub
```

IpTagLoadPoints

Syntax

IpTagLoadPoints*(PointsFile)*

Description

This function loads marker information from the points file and displays the markers.

Parameters

PointsFile	**String**	Name of the file where the point information is stored.

Example

```
  Sub mtagLoadPoints()
  ret = IpTagLoadPoints("C:\IPWSRC\JUNK.TAG")
  End Sub
```

See Also

IpTagSavePoints

IpTagPt

Syntax	**IpTagPt***(XPos, YPos, PointClass)*		
Description	This function attaches marker information to the image. Identical to the “Tag Points” command in the Manual Point Count dialog.		
Parameters	*XPos*	**Integer**	Location of the point on the (virtual) x-axis of the image.
	YPos	**Integer**	Location of the point on the (virtual) y-axis of the image.
	PointClass	**Integer**	Indicates the class of the point to be marked.
See Also	IpTagLoadPoints		

IpTagSaveData

Syntax	**IpTagSaveData***(DataFile,SaveMode)*		
Description	Save measurement results(x,y, intensity ,RGB values,statistics, etc.) into the data file.		
Parameters	*DataFile*	**String**	When saving data to a file, indicates the path and name of the file.
	SaveMode	**Integer**	Must be one of the following: S_HEADER = save with header S_X_AXIS = save with the left column S_CLIPBOARD = copy table to clipboard S_DDE = send table contents to external program via DDE (Excel is the default) S_APPEND = append to the existing file S_PRINT_TABLE = send data to printer
Comments	SaveMode values can be "Or'd" together (see example below)		

Example

```
IpTagSaveData ("C:\IPWIN\data.cnt", S_APPEND+S_HEADER+S_X_AXIS)
Sub mtagSaveData()
ret = IpTagSaveData("C:\IPWSRC\TEST.CNT",
S_APPEND+S_HEADER+S_X_AXIS)
End Sub
Sub mtagClipbrd()
ret = IpTagSaveData("", S_CLIPBOARD+S_HEADER+S_X_AXIS)
End Sub
```

IpTagSaveEnv

Syntax

IpTagSaveEnv*s(Filename)*

Description

This function saves the current environment setting (i.e. class information) into the named file.

Parameters

Filename	**String**	Name of the file where the environment information is stored.

Example

```
Sub mtagSaveEnv()
ret = IpTagSaveEnv("C:\IPWSRC\JUNK.TAG")
End Sub
```

Comments

IpTagLoadEnv

IpTagSavePoints

Syntax

IpTagSavePoints*(PointsFile)*

Description

Save marker information in a file.

Parameters

PointsFile	**String**	Name of the file to store marker information.

Example

```
Sub mtagSavePoints()
ret = IpTagSavePoints("C:\IPWSRC\JUNK.TAG")
End Sub
```

See Also

IpTagLoadPoints

IpTagShow

Syntax

IpTagShow*(bShow*)

Description

Opens or closes the **Manual Tagging** window.

Parameters

bShow	**Integer**	If bShow =1, opens the window If bShow = 0, closes the window

Example

```
Sub mtagShow()
ret = IpTagShow(1)
End Sub

Sub mtagHide()
ret = IpTagShow(0)
End Sub
```

IpTagUpdate

Syntax **IpTagUpdate**( )

Description This function updates the manual tagging window display.

Example

```
Sub mtagUpdate()
ret = IpTagUpdate()
End Sub
```

IpTemplateMode

Syntax **IpTemplateMode**(*OnOff*)

Description This function turns template mode on or off. When template mode is on, the user may pass parameter values to the macro via a standard *Image-Pro* dialog box. If parameter values are included in the *Auto-Pro* function statement, they will be used as default values to the dialog box, which the user may accept or change. Macro execution will not proceed until the user has completed and closed the dialog box, or clicked "Continue" in the template-mode message box.

When template mode is off, *Auto-Pro* functions are performed using the parameter data supplied in the macro.

Parameters

OnOff	**Integer**	An integer value of 0 or 1 specifying whether subsequent *Auto-Pro* functions are to be performed in template mode. Where: 0 - Disables template mode. 1 - Enables template mode.

Example

```
ret = IpTemplateMode(1)
ret = IpWsLoad("C:\IPWIN\IMAGES\IMAGE1.TIF", "TIF")
ret = IpTemplateMode(0)
ret = IpWsScale(200, 300, 1)
ret = IpHstEqualize(EQ_BESTFIT)
ret = IpFltSharpen(3, 3, 2)
```

In this example, template mode is first enabled to allow the user to select the file upon which the rest of the macro will operate. Once the user selects an image, template mode is turned off to allow the remainder of the macro to run automatically.

See Also IpMacroStop

IpTextBurn

Syntax

IpTextBurn*(Text, Pos)*

Description

Burns the text into the image using the selected font name, size, text attributes, and currently selected foreground and background colors.

Parameters

Text	**String**	Contains the text to burn into the image.
Pos	**POINTAPI**	Coordinate of the top left corner of the string in image coordinate.

Example

```
 Example:
Sub Annotate()
ret = IpTextFont("Wide Latin", 30)
ret = IpTextSetAttr(TXT_BOLD, 1)
ret = IpTextSetAttr(TXT_UNDERLINE, 1)
ret = IpTextSetAttr(TXT_ITALIC, 0)
ret = IpTextSetAttr(TXT_STRIKEOUT, 0)
ret = IpTextSetAttr(TXT_ENCLOSED, 0)
ret = IpTextSetAttr(TXT_DROPSHADOW, 0)
ret = IpTextSetAttr(TXT_SPACING, 0)
Pts(0).x = 51
Pts(0).y = 41
ret = IpTextBurn("Test Image", Pts)
End Sub
```

Comments

This function is no longer supported in *Image-Pro Plus*. It has been retained for compatibility with previous versions. New macros should use the **IpAn** *Auto-Pro* functions.

See Also

IpTextFont, IpTextSetAttr, IpTextShow

IpTextFont

Syntax

IpTextFont *(FontName,FontSize)*

Description

Sets the font name and size for the text.

Parameters

FontName	**String**	Name of the font (i.e.Times New Roman)
FontSize	**Integer**	Point size of the font (i.e.12 points)

Example

```
ret = IpTextFont("Wide Latin", 30)
```

Comments

This function is no longer supported in *Image-Pro Plus*. It has been retained for compatibility with previous versions. New macros should use the **IpAn** *Auto-Pro* functions.

See Also

IpTextBurn, IpTextSetAttr, IpTextShow

IpTextGetAttr

Syntax

IpTextGetAttr(*AttrType, AttrValue***)**

Description

This function retrieves text attribute values.

Parameters

AttrType	**Integer**	Attribute type is one of the following: TXT_BOLD Bold=1, normal=0 TXT_UNDERLINE Underline=1, normal=0 The following are no longer supported: TXT_STRIKEOUT TXT_DROPSHADOW TXT_ENCLOSED TXT_SPACING
AttrValue	**Integer**	Value for AttrType.

Example

```
ret = IpTextGetAttr(TXT_SPACING, 1)
```

Comments

This function is no longer supported in *Image-Pro Plus*. It has been retained for compatibility with previous versions. New macros should use the **IpAn** *Auto-Pro* functions.

See Also

IpTextFont, IpTextBurn, IpTextShow

IpTextSetAttr

Syntax

IpTextSetAttr(*AttrType, AttrValue***)**

Description

This function selects text attribute value.

Parameters

AttrType	**Integer**	Attribute type is one of the following: TXT_BOLD Bold=1, normal=0 TXT_UNDERLINE Underline=1, normal=0 TXT_ITALIC Italic=1, normal=0 The following are no longer supported: TXT_STRIKEOUT TXT_DROPSHADOW TXT_ENCLOSED TXT_SPACING
AttrValue	**Integer**	Value for AttrType.

Example

```
ret = IpTextSetAttr(TXT_BOLD, 1)
```

Comments

This function is no longer supported in *Image-Pro Plus.* It has been retained for compatibility with previous versions. New macros should use the **IpAn** *Auto-Pro* functions.

See Also

IpTextFont, IpTextBurn, IpTextShow

IpTextShow

Syntax

IpTextShow *(bShow)*

Description

This function is used to open or close the text window. Equivalent to selecting the Show Text command to open the window, and double-clicking its control box to close it.

Parameters

bShow	**Integer**	0 = Closes the text window 1 = Opens the text window

Example

```
ret = IpTextShow(1)
```

Comments

This function is no longer supported in *Image-Pro Plus*. It has been retained for compatibility with previous versions. New macros should use the **IpAn** *Auto-Pro* functions.

See Also

IpTextFont, IpTextBurn, IpTextSetAttr

IpTileAdd

Syntax

IpTileAdd *(docId)*

Description

This function adds a new image or workspace to list of images to Tile

Parameters

docID	**Short**	ID of the workspace to add to the document list

Return Value

0 if successful, -1 if failed, IPCERR_INVARG if document is not present.

IpTileApply

Syntax

IpTileApply*()*

Description

This function applies the Tiling, using the currently specified options, and the values either calculated or supplied by macro calls to `IpTileSetEx( ).`

Return Value

0 if successful, -1 if failed, IPCERR_EMPTY if there are no images specified.

IpTileCalculate

Syntax

IpTileCalculate*()*

Description

This function calculates the Tiling using the currently specified options.

Return Value

0 if successful, -1 if failed, IPCERR_EMPTY if there are no images specified.

IpTileGet

Syntax **IpTileGet**(*sAttribute, sParam, lpData)*

Description This function gets data about the images to be tiled.

Parameters

sAttribute	**Short**	Attribute to get, see list and comments below
sParam	**Short**	Number of items for the list to get, see list and comments below
lpData	**LPVOID**	Pointer to appropriate data array or value, see list and comments below

Integer Argument	**Description**
TILE_METHOD	Get the method for Tiling calculations. Should be either of the following:
ALGN_FFT	Use FFT full correlation
AGLN_FFTPHASE	Use FT Phase correlation
TILE_ANGLE_NUM	Get the number of angles – must be a power of two
TILE_SCALE_NUM	Get the number of scales – must be a power of two
TILE_OPTIONS	Get Options: scale, rotate, or translate
TILE_CAL_ORDER	Gets the order of the images as per calibrated positions
TILE_REF_FRAME	Gets the reference frame in the list
TILE_ALG_OPTION	Gets the algorithm specific option
TILE_GETNUMFRAMES	Gets the number of frames in the list
TILE_GETFRAMELIST	Gets the list of frames
TILE_TRIMBORDERS	Trim image borders down to fully-overlapping farmes
GETNUMDOC	Gets the number of images in the list
GETDOCLST	Get the list of doc IDs, maximum = sParam
TILE_UPDATEUI	Determine if the user interface has been updated.
TILE_INTERATE	Interate, setting the results to be the next input.

<table>
<tr><th>Single Point Argument</th><th>Description</th></tr>
<tr><td>TILE_X_PERIMAGE</td><td>X pixel shift per image (stacks)</td></tr>
<tr><td>TILE_Y_PERIMAGE</td><td>Y pixel shift per image (stacks)</td></tr>
<tr><td>TILE_X_CAL_ANGLE</td><td>Calibrated X angle shift (stacks)</td></tr>
<tr><td>TILE_Y_CAL_ANGLE</td><td>Calibrated Y angle shift (stacks)</td></tr>
<tr><td colspan="2">Note that these are valid only after IpTileCalculate is called or these values are set by a macro call. The second parameter is the index (see TILE_GETNUMFRAMES)</td></tr>
</table>

<table>
<tr><td colspan="2">Get only, for each frame, expressing how it is manipulated compared to the previous frame</td></tr>
<tr><th>Argument</th><th>Description</th></tr>
<tr><td>TILE_OFFSET_COUNT</td><td>Number of matching offsets (short)</td></tr>
<tr><td>TILE_ANGLE_COUNT</td><td>Number of matching angles (short)</td></tr>
<tr><td>TILE_SCALE_COUNT</td><td>Number of matching scales (short)</td></tr>
</table>

<table>
<tr><td colspan="2">Second parameter is the index (see TILE_GETNUMFRAMES)</td></tr>
<tr><th>Argument</th><th>Description</th></tr>
<tr><td>TILE_ANGLE_VAL</td><td>List of single matching angles</td></tr>
<tr><td>TILE_SCALE_VAL</td><td>List of single matching scales</td></tr>
<tr><td>ALFN_OFFSET_RANK</td><td>List of single relative match values</td></tr>
<tr><td>TILE_ANGLE_RANK</td><td>List of single relative match values</td></tr>
<tr><td>TILE_SCALE_RANK</td><td>List of single relative match values</td></tr>
</table>

<table>
<tr><td colspan="2">List of the best Tiling values. Second parameter is the index of the frames, 0 to n-2. DOCSEL_ALL gets/sets the entire list of TILE_GETNUMFRAMES values</td></tr>
<tr><th>Argument</th><th>Description</th></tr>
<tr><td>TILE_BEST_OFFSET</td><td>Listof TILE_GETNUMFRAMES POINT API offsets</td></tr>
<tr><td>TILE_BEST_ANGLE</td><td>List of TILE_GETNUMFRAMES single matching angles</td></tr>
<tr><td>TILE_BEST_SCALE</td><td>List of TILE_GETNUMFRAMES single matching scales</td></tr>
</table>

<table>
<tr><td colspan="2">TILE_METHOD arguments. Additional methods can be added here, with TILE_ALG_OPTION arguments for algorithm specific settings.</td></tr>
<tr><th>Argument</th><th>Description</th></tr>
<tr><td>TILE_FFT</td><td>FFT correlation</td></tr>
<tr><td>TILE_USER</td><td>User-specified offsets</td></tr>
<tr><td>TILE_ALWAYSRECALC</td><td>Always recalculate. Use with <b>IpTileSetInt.</b></td></tr>
</table>

TILE_ALG_OPTION calls for TILE_FFT, specific to that algorithm	
Argument	**Description**
TILE_FFTFULL	Set to full FFT correlation
TILE_FFTPHASE	Set to FFT phase correlation

TILE_ALG_OPTION calls for TILE_USER, specific to that algorithm	
Argument	**Description**
TILE_USER_X	X shift per plane (single)
TILE_USER_Y	Y shift per plane (single)
TILE_USER_XANGLE	X shift angle (single, degrees)
TILE_USER_YANGLE	Y shift angle (single, degrees)
TILE_USER_XDIST	X shift angle (single, degrees)
TILE_USER_YDIST	Y shift angle (single, degrees)
TILE_USER_ZDIST	Z shift angle (single, degrees)

IpTileOpen

Syntax **IpTileOpen***(FileName)*

Description This function loads the current offset values.

Parameters *FileName* **LSPTR** Load offset values. Fails if the number of offsets does not match the current number of selected frames/images, or if the tile layouts are different.

Return Value 0 if successful, -1 if failed, IPCERR_EMPTY if there are no values to load.

IpTileRemove

Syntax **IpTileRemove***(docID)*

Description This function removes the specified workspace/image/frame from the Tiling list.

Parameters *docID* **Short** ID of the workspace to remove from the document list. DOCSEL_ALL to clear the list.

Return Value 0 if successful, -1 if failed,

IpTileSave

Syntax **IpTileSave***(FileName)*

Description This function saves the current offset values.

Parameters *FileName* **LSPTR** Saves offset values. Fails if the number of offsets does not match the current number of selected frames/images, or if the tile layouts are different.

Return Value 0 if successful, -1 if failed, IPCERR_EMPTY if there are no values to save.

IpTileSetEx

Syntax	**IpTileSetEx** *(sAttribute, sParam, lpData)*		
Description	This function sets the tiling attributes		
Parameters	*sAttribute*	**Short**	Attribute to set, see list and comments in IpTileGet
	sParam	**Short**	Number of items for the list to set, see list and comments in IpTileGet
	lpData	**LPVOID**	Pointer to appropriate data array or value, see list and comments in IpTileGet
Return Value	0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.		
See Also	IpTileSetInt, IpTileSetSingle		

IpTileSetInt

Syntax	**IpTileSetInt** *(sAttribute, sParam, sData)*		
Description	This function sets the tiling attributes		
Parameters	*sAttribute*	**Short**	Attribute to set, see list and comments in **IpTileGet.**
	sParam	**Short**	Number of items for the list to set, see list and comments in **IpTileGet**
	sData	**Short**	Pointer to appropriate data array or value, see list and comments in **IpTileGet**
Return Value	0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.		

IpTileSetSingle

Syntax	**IpTileSetSingle** *(sAttribute, sParam, fData)*		
Description	This function sets thte tiling attributes		
Parameters	*sAttribute*	**Short**	Attribute to set, see list and comments in IpTileGet
	sParam	**Short**	Number of items for the list to set, see list and comments in IpTileGet
	fData	**Single**	Pointer to appropriate data array or value, see list and comments in IpTileGet
Return Value	0 if successful, IPCERR_INVCOMMAND if failed, number of values for list function.		

IpTileShow

Syntax	**IpTileShow***(nDialog, bShow)*		
Description	This function shows or hides the Tiling dialog.		
Parameters	*nDialog*	**Short**	Use one of the following to indicate which dialog to hide or show: TILE_IMAGETAB TILE_OPTIONTAB TILE_PREVIEW TILE_ADJUST
	bShow	**Bool**	A value of 0 or 1, indicates whether to show or hide the selected Tile dialog 0 = hide the dialog 1 = show the dialog
Return Value	0 if successful, IPCERR_INVCOMMAND if the dialog cannot be shown		

IpToolbarGetStr

Syntax	**IpToolbarGetStr** *(Attribute, Value)*		
Description	Gets the current value of a toolbar attribute.		
Parameters	*Attribute*	**Integer**	IPTB_TOOLBAR = current toolbar
	Value	**String**	For IpToolbarGetStr commands, Value should be a fixed-length string to receive the current workflow toolbar file.
Return Value	Value of the selected attribute if successful		

IpToolbarSelect

Syntax	**IpToolbarSelect** *(Toolbar)*		
Description	Selects the specified toolbar as the current toolbar.		
Parameters	*Toolbar*	**String**	Indicate the name of the toolbar and the path.
Comments:	If the workflow toolbar is currently displayed, it will be updated to the selected toolbar. This function does not display the workflow toolbarif it is not already visible.		

IpToolbarShow

Syntax	**IpToolbarShow*(Show)***		
Description	This function shows or hides the current workflow toolbar.		
Parameters	*Show*	**Integer**	0 = hide the toolbar anything non-zero = show the dialog The workflow toolbar must be defined by IpToolbarSelect, or by previous use in Image-Pro.
Return Value	Will return IPCERR_NODOC if a workflow toolbar has not been defined.		

IpTraceAttr

Syntax	**IpTraceAttr *(sAttr, lValue)***		
Description	This function sets the trace tool attributes and settings.		
Parameters	*sAttr*	**Integer**	Selects the attribute or setting. See list below.
	lValue	**Long**	Value of the attribute or setting. See list below.

ATTRIB	**ALLOWED VALUES**	**DESCRIPTION**
TR_ERASER	5 - 100	Eraser size in pixels
TR_MODE	0 = none 1 = drawing 2 = erasing	Drawing mode
TR_PEN	5 - 30	Pen size in pixels
TR_SHOW	0 = hide 1 = show	Shows or hides trace tool

See Also IpTraceShow, IpTraceDo

IpTraceDo

Syntax	**IpTraceDo *(sCmd)***		
Description	This function builds or deletes the trace.		

Parameters	*sCmd*	**Integer**	Indicates the action to be performed. Must be one of the following:
			TR_AUTO = Perform auto-trace
			TR_IMAGE = Create trace image
			TR_DELETE = Delete trace

See Also IpTraceAttr, IpTraceShow

IpTraceShow

Syntax **IpTraceShow** ***(bShow)***

Description This function is used to show or hide the trace objects tool.

Parameters

bShow	**Integer**	1 = show trace objects tool. 0 = hide trace objects tool.

Example

```
ret = IpTraceShow(1)
```

See Also IpTraceAttr, IpTraceDo

IpTrackBar

Syntax **IpTrackBar**(*Cmd, tValue, sCaption*)

Description This function manages the progress bar at the bottom of the *Image-Pro* window. The progress bar can be used to illustrate the degree of completion of a user-defined process. It also allows the user to abort your process with the **<Esc>** key. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Parameters

Cmd	**Integer**	A command ID, which is used to open, update and close the progress bar. Must be one of the following: TBOPEN TBUPDATE TBCLOSE See definitions under Comments, below
tValue	**Integer**	An integer specifying data with which *Cmd* will operate. See definitions under Comments, below, for the values required by each command
sCaption	**String**	A string that will be used as the caption for the progress bar. This parameter is used when *Cmd* is set to TBOPEN. It is ignored, otherwise (when this is the case, just set *sCaption* to an empty string — i.e., "").

Example The following example uses the progress bar to show the progress of a pixel inversion operation.

```
Dim BarTitle as String
Dim yLine As Integer, xPix As Integer
Dim iInfo as IPDOCINFO

ret = IpDocGet(GETDOCINFO,DOCSEL_ACTIVE,iInfo)

Redim ImBuf(1 To iInfo.Width,1 To iInfo.Height) As Integer
ret = IpDocGetArea(DOCSEL_ACTIVE,iInfo.Extent,ImBuf(1,1),0)

BarTitle = "Inverting Image"

ret = IpTrackBar(TBOPEN,iInfo.Height,BarTitle)

For yLine = 1 To iInfo.Height
For xPix = 1 To iInfo.Width - 1
      ImBuf(xPix,yLine) = 255 - ImBuf(xPix,yLine)
Next xPix
If IpTrackBar(TBUPDATE, yLine - 1, "") <> 0 Then
      GoTo userabort
End If
```

```
Next yLine

ret = IpDocPutArea(DOCSEL_ACTIVE,iInfo.Extent,ImBuf(1,1),0)

ret = IpAppUpdateDoc(DOCSEL_ACTIVE)

userabort:

ret = IpTrackBar(TBCLOSE,0,"")
```

Comments

Cmd options are as follows:

***Cmd* VALUE**	**DESCRIPTION**	***tValue* VALUE**
TBOPEN	Opens the progress bar indicator with the specified caption, and sets the range of possible update values	The range of possible update values.
TBUPDATE	Updates the length of the progress bar based upon the value specified in *tValue*, relative to the range that was specified in TBOPEN.	A value between 0 and (range - 1) that represents the degree of completion at that point.
TBCLOSE	Closes (removes) the progress bar.	Not used by TBCLOSE. Must be 0.

IpTrackFile

Syntax

IpTrackFile*(szFileName, bSave)*

Description

This function loads or saves a tracking file.

Parameters

szFileName	**String**	Indicates the name of the file to load or save.
bSave	**Short**	Indicates whether to save or load the tracking file. Should be either: 0 = load the track settings from a file and append them to the existing list 1 = save the current track settings to a file

Return Value

0 if successful, a negative error code if failed.

Example

```
ret = IpTrackFile(“AllTracks.trc, 0”)
```

IpTrackMeas

Syntax	**IpTrackMeas***(sCommand, 1Opt1, lParam)*		
Description	This function gets and sets various parameters of the track measurements.		
Parameters	*sCommand*	**Short**	See comments and list below.
	lOpt1	**Long**	See comments and list below.
	lParam	**Any**	See comments and list below.
Comments	This macro takes the following commands:		

Command	**1Opt**	**lParam**	**Description**
TM_NUM_ TRACKS_GET	Not used.	Pointer to a double that will receive the value	Gets the number of manual tracks
TM_NUM_POINTS_ GET	Index of the track zero-based.	Pointer to a double that will receive the value.	Gets the number of points in the track.
TM_POINTS_GET	Index of the track zero-based	Pointer to an array of doubles, large enough to receive all coordinates. The size of the array must be not less than 2*NumPoints, where NumPoints is the number of points in the element (see TM_NUM_POINTS_ GET) . The points are in image coordinates.	Gets the coordinates of the points in the track.
TM_NUM_MEAS_G ET	Not used.	Pointer to a double that will receive the value.	Gets the number of selected measurements.
TM_NUM_SEL_ MEAS_GET	Not used.	Pointer to a double that will receive the value.	Gets the number of selected measurements

Command	**1Opt**	**lParam**	**Description**
TM_MEAS_LIST_ GET	Not used.	Pointer to an array of doubles, large enough to receive the values. The size of the array must be not less than 2*NumMeas, where NumMeas is the number of active measurements (see TM_NUM_MEAS_GET) . The list is retrieved by pairs, where the first element is the measurement ID and the second element is the statistical field. If the measurement has statistical field Values, the second element will receive 1-based index of measurement multiplied by TR_VALUE. OutArr[0] – measurement ID of measurement 1 OutArr[1] – statistical field of measurement 1 OutArr[3] – measurement ID of measurement 2 OutArr[4] – statistical field of measurement 2	Gets the list of active manual measurements

Command	1Opt	lParam	Description
TM_MEAS_GET	Index of the active measurement from 0 to NumMeas - 1	Pointer to an array of doubles, large enough to receive all values. The size of the array must be not less than NumObj, where NumObj is the number of objects in the manual measurements list (see TM_NUM_TRACKS_GET)	Gets the measurement values of the manual track
TM_STATS_GET	Index of the active measurement from 0 to NumMeas - 1	pointer to an array of double[10] that will receive the information. The structure of the array is the following: Stats[0] – mean value (TRSTMean) Stats[1] – standard deviation (TRSTStDev) Stats[2] – min value (TRSTMin) Stats[3] – max value (TRSTMax) Stats[4] – range (TRSTRange) Stats[5] – sum (TRSTSum) Stats[6] – index of minimum (TRSTIndMin) Stats[7] – index of maximum (TRSTIndMax) Stats[8] – total number of objects (TRSTNObj) Stats[9] – number of shown objects (TRSTNShown) Coimments: statistical parameters are calculated only from visible tracks, hidden tracks are ignored.	Gets the measurement statistics

Command	**1Opt**	**lParam**	**Description**
TM_ADD_TRACK	Number of points in the track.	Pointer to an array of POINTAPI that contains points in image coordinates	Adds a new track. In the template mode, you will be prompted to add a track manually.
TM_INIT_AUTO_ TRACK	Not used, should be 0	Not used, should be IpNull	Initiates auto-tracking using the current count/size settings to identify tracking objects. In the template mode, you will be asked to set the count/size parameters and then comfirm the correctness of the outlines
TM_ADD_AUTO_ TRACK	Number of points in the track (should be 1)	Pointer to an array of POINTAPI that contains the starting points of the track in image coordinates	Adds a new track automatically. In the template mode, you will be prompted to add the first point manually
TM_ADD_AUTO_AL L_TRACKS	Not used, should be 0	Not used, should be IpNull	Finds all tracks on the acive image automatically. In the template mode, you will be asked to set the count/size parameters and then comfirm the correctness of the outlines
TM_SEL_GET	Index of the track (zero-based)	Pointer to a double that will receive the value	Gets the selection status of the track.
TM_SEL_SET	Index of the track (zero-based) Use TM_ALL to select or deselect all tracks	Double value: 0 = Deselect 1 = Select	Sets the selection status of the track.
TM_SHOW_GET	Index of the track (zero-based)	Pointer to a double that will receive the value	Gets the visibility status of the track
TM_SHOW_SET	Index of the track (zero-based)	Double value: 0 = Hide 1 = Show	Sets the visibility status of the track.
TM_COLOR_GET	Index of the track (zero-based)	Pointer to a double that will receive the value	Gets the color of the track.

Return Value

0 if successful, a negative error code if failed.
** Id of new track if successful, a negative error code if failed.

Example

```
Sub SetTrackParameters()
ret = IpTrackShow(TRACK_TABLE,TRACK_SHOW)
‘add new track
ret = IpListPts(Pts(0),"84 154 164 192 255 233 402 286 512 299
519 258 459 217 349 191")
ret = IpTrackMeas(TM_ADD_TRACK ,8,Pts(0))
‘change name
ret = IpTrackMeasSetStr(M_NAME_SET,1,"Base Track")
‘set yellow color
ret = IpTrackMeasSet(TM_COLOR_SET,0,65535)
End Sub
```

IpTrackMeasGetStr

Syntax

IpTrackMeaseGetStr*(sCommand, 1Opt1, dParam)*

Description

This function gets various string parameters for the tracking measurments.

Parameters

sCommand	**Short**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments

This macro takes the commands described below:

Command	**Opt 1**	**dParam**	**Description**
TM_TRACK_PREF_GET	Not used, should be 0	String that will receive the tracking prefix.	Gets the tracking preferences
TM_NAME_GET	Index of the trrack, 0-based	String that will receive the name of the track.	Gets the name of the track.

Return Value

0 if successful, a negative error code if failed.

See Also

IpTrackMeasSetStr, IpTrMeas

IpTrackMeasSet

Syntax

IpTrackMeaseSet*(sCommand, lOpt, dParam)*

Description

This function sets various tracking parameters. This function is a version of IpTrackMeas.

Parameters

sCommand	**Short**	See comments and list below.
lOpt	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments This macro takes the following commands:

Command	IOpt	dParam	Description
TM_UPDATE	Not used, should be 0	Not used, should be 0	Updates the tracking data tables. Applies new settings, should be called after changing any tracking options from a macro.
TM_TRACK_ COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color.	Sets the default line color for tracking.
TM_TEXT_COLOR	Not used, should be 0	Color in hexadecimal format as &Hrrggbb, where rr, gg,bb are Red, Green and Blue components of color	Sets label color for tracking
TM_COLORING	Not used, should be 0	0 = fixed color 1 = random color	Sets the tracking color type
TM_EL_SIZE	Not used, should be 0	Value = 0, 1, or 2	Tracking arrow size
TM_FONT_SIZE	Not used, should be 0	Value	Sets font size for tracking labels.
TM_LABEL_TYPE	Not used, should be 0	one of the following: trLabelsShowName, trLabelsShowMeasurement trLabelsShowNone	Sets label type of measurements (name,first measurement, none)
TM_SWAP_RC	Not used, should be 0	0 = off 1 = on	Swaps rows/columns of data table for exporting to Excel
TM_RESET_MEAS	Not used, should be 0	Not used, should be 0	Resets the list of selected measurements

IpTrackMeasSet

Command	Opt 1	dParam	Description
TM_ADD_MEAS	Should be one of the following: TRM_DIST TRM_X_COORD TRM_Y_COORD TRM_OR_DIST TRM_ANGLE TRM_SPEED TRM_ACCELERATION TRM_ACC_DIST	Statistical parameter of the tracking measurement: TRSTMean – mean TRSTStDev – standard deviation TRSTMin – minimum TRSTMax – maximum TRSTRange – range TRSTSum – sum TRSTIndMin – index of minimum TRSTIndMax – index of maximum TRSTNObj – number of elements TR_VALUE – values	Adds a measurement to the list of selected measurements
TM_ADD_INT_TRACK	Not used, should be 0	Not used, should be 0	Adds an intensity track
TM_ADD_CORREL_TRACK	Not used, should be 0	Not used, should be 0	Adds a correlation track based on the current AOI
TM_SHOW_STATS	Not used, should be 0	0 = Hide statistics 1 = Show statistics	Shows or hides the statistics pane of the Tracking data table
TM_SHOW_ALL	Not used, should be 0	Not used, should be 0	Shows all objects
TM_SHOW_SELECTED	Not used, should be 0	0 = Hide objects 1 = Show objects	Shows or hides the selected objects

Command	Opt 1	dParam	Description
TM_DELETE_ALL	Not used, should be 0	Not used, should be 0	Deletes all objects
TM_DELETE_SELECTED	Not used, should be 0	0 = Hide objects 1 = Show objects	Deletes the selected objects
TM_COLOR_SET	Index of the track, 0-based	Double value, color in bbggrr format	Sets the tracking color
TM_NUM_DEC	Not used, should be 0	Value	Sets the number of digits after the decimal point in the data table
TM_TRACK_SMOOTHING	Not used, should be 0	Smoothing value	Sets the smoothing of track coordinates using a running average filter
TM_TIME_UNITS	Not used, should be 0	Should be one of the following: trtuSecond trtuMinute trtuHour	Sets the time units for time-related measurements

Command	Opt 1	dParam	Description
TM_MIN_TRACK_LENGTH	Not used, should be 0	Value in pixels	Minimum total track length in pixels

TM_SEARCH_RADIUS	Not used, should be 0	Value in pixels	Sets the search radius (velocity limit) for automatic tracking
TM_ACCEL_LIMIT	Not used, should be 0	Value in pixels	Sets the acceleration limit for automatic tracking
TM_AUTO_ACCEL_LIMIT	Not used, should be 0	Value 0 = Off 1 = On	Sets auto to acceleration limit for automatic tracking
TM_PARTIAL_TRACKS	Not used, should be 0	Value 0 = Off 1 = On	Sets support for partial tracks
TM_MIN_TRACK_LEN	Not used, should be 0	Value	Sets the minimum track length
TM_TRACK_SHOW_OUTLINES	Not used, should be 0	Value 0 = Off 1 = On	Shows or hides the object outlines with semi-automatic tracking
TM_TRACK_SHOW_COMPLETE_TRACK	Not used, should be 0	Value 0 = show partial track 1 = show complete track	Sets the View/Output option to display partial or complete tracks
TM_TRACK_HEAD_LENGTH	Not used, should be 0	Head length	Sets the head length for the partial tracks
TM_TRACK_TAIL_LENGTH	Not used, should be 0	Tail length	Sets the tail length for the partial tracks
TM_TRACK_ONE_OBJ	Not used, should be 0	Value 0 = Off 1 = On	Sets the track one object option
TM_TRACK_COHER_FLTR	Not used, should be 0	Value 0 = Off 1 = On	Sets the coherence filtering option
TM_TRACK_ANGLE_DEV	Not used, should be 0	Value	Sets the angle range(in degrees) for coherence filtering

Command	Opt 1	dParam	Description
TM_TRACK_COHER_FLT_SIZE	Not used, should be 0	Value	Sets the coherence filter in terms of percent of image size
TM_SPLIT_TRACK	Not used, should be 0	Not used, should be 0	Splits the selected track
TM_TRACK_PREDICTION	Not used, should be 0	Value	Sets the tracking prediction depth
TM_TRACK_CORR_REF_ PREV	Not used, should be 0	Value 0 = First frame 1 = Previous frame	Sets the reference frame option for correlation tracking
TM_TRACK_CORR_SCALE	Not used, should be 0	Value 0 = Off 1 = On	Sets the scaling option for correlation tracking
TM_TRACK_CORR_ROT	Not used, should be 0	Value 0 = Off 1 = On	Sets the rotation option for correlation tracking
TM_TRACK_CORR_PHASE	Not used, should be 0	Value 0 = Full correlation 1 = Phase correlation	Sets the phase option for correlation tracking
TM_TRACK_CORR_THRES	Not used, should be 0	Value of correlation threshold	Sets correlation threshold
TM_TRACK_DATA_INDEX	Not used, should be 0	Value 0 = Frame index 1 = Relative time 2 = Absolute time	Sets the type of measurement index for the data table
TM_TRACK_USE_CUSTOM_INTERVAL	Not used, should be 0	Value 0 = Off 1 = On	Sets the custom frame interval
TM_TRACK_CUSTOM _INTERVAL	Not used, should be 0	Value, in seconds	Sets the custom frame interval in seconds
TM_MERGE_SELECTED	Not used, should be 0	Not used, should be 0	Merges selected tracks
TM_SPLIT_SELECTED	Not used, should be 0	Not used, should be 0	Splits selected tracks
TM_AUTO_SPLIT	Not used, should be 0	Value 0 = Off 1 = On	Sets the auto-split option
TM_WATERSHED_SPLIT	Not used, should be 0	Value 0 = Off 1 = On	Sets the watershed split option

Command	Opt 1	dParam	Description
TM_SHARED_OBJECTS	Not used, should be 0	Value 0 = Off 1 = On	Allows objects to be shared between tracks.

TM_MOTION_TYPE	Not used, should be 0	Value 0 = Chaotic 1 = Directional 2 = Straight	Sets the predominant motion type for the objects
TM_GRAPH _MEAS	Type of new measurement, must be one of the following: TRM_DIST TRM_X_COORD TRM_Y_COORD TRM_OR_DIST TRM_ANGLE	Statistical parameter of the tracking measurement: TRSTMean - mean TRSTStDev - standard deviation TRSTMin - minimum TRSTMax - maximum TRSTRange - range TRSTSum - sum TRSTIndMin – index of minimum TRSTIndMax – index of maximum TRSTNObj – number of elements TR_VALUE - values	Sets measurements for tracking graph
TM_GRAPH-RANGE_AUTO	Not used, should be 0	Value	Sets auto-range for the tracking graph
TM_GRAPH_RANGE_MIN	Not used, should be 0	Double value, color in bbggrr format	Sets the minium range for the tracking graph
TM_GRAPH_RANGE_MAX	Not used, should be 0	Value	Sets the maxiium range for the tracking graph
TM_GRAPH_X_LABELS	Not used, should be 0	Should be one of the following: trxlFrameNumber trxlRelTime trxlAbsTime	Sets X label type for graph

Return Value 0 if successful, a negative error code if failed.

Example

```
Sub SetTrackingOptions()
‘set color
ret = IpTrackMeasSet(TM_TRACK_COLOR,0,65535)
ret = IpTrackMeasSet(TM_TEXT_COLOR,0,16777215)
‘arrow size
ret = IpTrackMeasSet(TM_EL_SIZE,0,2)
‘labels
ret = IpTrackMeasSet(TM_FONT_SIZE,0,20)
ret = IpTrackMeasSet(TM_LABEL_TYPE,0,trLabelsShowMeasurement)
ret = IpTrackMeasSet(TM_COLORING,0,0)
ret = IpTrackMeasSetStr(TM_TRACK_PREF_SET,0,"Obj")
‘define measurements list
ret = IpTrackMeasSet(TM_RESET_MEAS,0,0)
ret = IpTrackMeasSet(TM_ADD_MEAS,TRM_DIST,TRSTSum)
ret = IpTrackMeasSet(TM_ADD_MEAS,TRM_DIST,TR_VALUE)
ret = IpTrackMeasSet(TM_ADD_MEAS,TRM_X_COORD,TR_VALUE)
ret = IpTrackMeasSet(TM_ADD_MEAS,TRM_Y_COORD,TR_VALUE)
ret = IpTrackMeasSet(M_UPDATE,0,0)
End Sub

‘set tracking graph parameters
Sub SetGraphOptions()
ret = IpTrackShow(TRACK_GRAPH,TRACK_SHOW)
ret = IpTrackMeasSet(TM_GRAPH_MEAS,TRM_DIST,TR_VALUE)
ret = IpTrackMeasSet(TM_GRAPH_RANGE_AUTO,0,0)
ret = IpTrackMeasSet(TM_GRAPH_RANGE_MIN,0,0.000000)
ret = IpTrackMeasSet(TM_GRAPH_RANGE_MAX,0,200.000000)
End Sub
```

See Also

IpTrackMeasSetStr, IpTrackMeasGetStr, IpTrMeas

IpTrackMeasSetStr

Syntax **IpTrackMeaseSetStr***(sCommand, 1Opt1, dParam)*

Description This function gets various string parameters for the tracking measurments.

Parameters

sCommand	**Short**	See comments and list below.
lOpt1	**Long**	See comments and list below.
dParam	**Double**	See comments and list below.

Comments This macro takes the commands described below:

Command	**Opt 1**	**dParam**	**Description**
TM_TRACK_PREF_ SET	Not used, should be 0	String with tracking prefix.	Sets tracking prefix
TM_NAME_SET	Index of the trrack, 0-based	String with new name.	Sets the name of the track.

Return Value 0 if successful, a negative error code if failed.

See Also IpTrackMeasSetStr, IpTrMeas

IpTrackMove

Syntax **IpTrackMove***(sDialog,xPos, yPos)*

Description This function moves the tracking windows.

Parameters

Dialog	**Short**	A constant, indicating what to move. Should be one of the following:
		TRACK_TABLE = Tracking data table
		TRACK_GRAPH = Tracking graph

xPos	**Short**	Indicates the X window position
yPos	**Short**	Indicates the Y window position

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpTrackMOVE (TRACK_TABLE,632,18)
```

IpTrackOptionsFile

Syntax **IpTrackOptionsFile** *(szFilename, bSave)*

Description This function loads or saves a set of tracking options.

Parameters

szFilename	**LPSTR**	A string specifying the name of the file from which the calibration values will be read or written.
bSave	**Short**	Indicates whether to save or load a file. Must be one of the following: 0 = load file 1 = save file

Return Value 0 if successful, a negative error code if failed.

Example

```
ret = IpTrackOptionsFile(“def.tro”,0)
```

See Also IpTrackFile

IpTrackSaveData

Syntax **IpTrackSaveData***(sSrcFlags, sDstFlags, szDest)*

Description This functionsave the data from tracking data windows.

Parameters

sSrcFlags	**Integer**	Combination of data source flags and data type flags that specify the source and type of data to be saved. See comments and list below.
sDestFlags	**Integer**	Combination of data destination flags and (optional) file option flags that specify the destination and format for the saved data. See comments and list below.
szDest	**LPSTR**	Indicates the destination file name. Used with TRDF_FILE only.

The data source, type, destination, and file option flags are described here:

Flag Type	Name	Description
Data source flags	TR_MM_DATA	Save tracking measurements data table contents to selected destination (default if source is not supplied).
	TR_MM_STATS	Save tracking measurements statistics contents to selected destination
	TR_MM_ACTIVE	Save tracking measurements data and statistics if it is shown to selected destination
	TR_GRAPH	Save the tracking graph data to selected destination.
Flag Type	**Name**	**Description**
Data type flags	TRDF_TABLE	Save the information as a text table

	TRDF_GRAPH	Save the information as a graph

Data destination flags	TRDF_FILE	Copy data to tab-delimited file (default if destination is not supplied). Not valid with TRTF_GRAPH.
	TRDF_CLIPBOARD	Copy data to clipboard. Valid only for TR_GRAPH with TRTF_GRAPH.
	TRDF_DDE	Send contents to Excel via COM. Not valid with TRTF_GRAPH
File option flags	TRDF_CSV	The default format of the data file is a tab-delimited table of values, with one line per row. TRDF_CSV can be used to specify that the data file should be written as a comma-delimited file (usually compatible with import into spreadsheets and databases). Cannot be combined with TRDF_HTML
	TRDF_HTML	Can be used to specify that the data file should be written as a HTML file containing an HTML TABLE. Cannot be combined with TRDF_CSV

Return Value 0 if successful, a negative error code if failed.

Example

```
save tracking measurements data table
ret = IpTrackSaveData(TR_MM_ACTIVE, TRDF_FILE, "C:\t1.htm")
```

IpTrackSize

Syntax **IpTrackSize***(sDialog,xSize, ySize)*

Description This function resizes the tracking toolbar and dialogs.

Parameters

sDialog	**Integer**	A constant, indicating what to resize. Should be one of the following:
		TRACK_TABLE = Tracking data table
		TRACK_GRAPH = Tracking graph

xSize	**Integer**	Sets the dialog width.
ySize	**Integer**	Sets the dialog height.

Return Value 0 if successful, a negative error code if failed, IPCEER_INVARG if out of range or negative.

Example

```
ret = IpTrackMOVE (TRACK_GRAPH,451,541)
```

IpTrackShow

Syntax **IpTrackShow***(sDialog, sShow)*

Description

This function shows or hides the tracking windows.

Parameters

sDialog	**Integer**	A constant, indicating what to show or hide. Should be one of the following:
		TRACK_TABLE = Tracking data table
		TRACK_GRAPH = Tracking graph

sShow	**Integer**	A constant, indicating if the window should hidden or shown. Should be one of the following: TRACK_HIDE = Hides the window or dialog TRACK_SHOW = Shows the window or dialog

Return Value

0 if successful, a negative error code if failed.

Example

```
ret = IpTrackShow(TRACK_TABLE, TRACK_SHOW)
ret = IpTrackShow(TRACK_GRAPH, TRACK_SHOW)
```

IpTrim

Syntax

IpTrim *(inString)*

Description

This function returns the portion of a fixed-length string that has been filled by an Auto-Pro fuction.

Parameters

inString	**String**	A fixed-length string. See comments.

Return Value

A string trimmed to the content returned by the Auto-Pro function.

Example

Many Auto-Pro functions return strings to the caller. These Auto-Pro functions take a fixed length string, dimensioned like the following example:

```
Dim aString as String*255
```

Comments

The Auto-Pro function will fill the fixed length string with the requested text, but the text will in almost all cases not entirely fill the provided string (255 characters in this example), and IPBasic is not aware of the text length actually used.

IpWsChangeDescription

Syntax

IpWsChangeDescription(*DescriptionType*, *Description*)

Description

This function sets or changes the descriptive information associated with the active image. Equivalent to setting the **Title, Artist, Date** and **Comments** fields with the **Info** command.

Parameters

DescriptionType	**Integer**	An enumerated integer specifying the descriptive field to which the string in the *Description* parameter is to be applied. Must be one of the following: INF_TITLE INF_ARTIST INF_DATE INF_DESCRIPTION INF_NAME INF_RANGE These options correspond to the “Information” dialog box's “Title”, “Artist”, “Date”, “Comments”, “Name”, and “Display Range” fields, respectively.
Description	**String**	The string that is to be written to the field specified in *DescriptionType*.

Example

```
Sub IpWsChangeDescription_example()

  Dim description As String
  description = "This demonstrates how text is placed in the" + Chr$(13) + Chr$(10)
  description = description + "description field.  As you can see, there is" +
  Chr$(13) + Chr$(10)
  description = description + "a particular technique for inserting multi-line" +
  Chr$(13) + Chr$(10)
  description = description + "entries..."
  ret = IpWsChangeDescription(INF_TITLE, "My Image")
  ret = IpWsChangeDescription(INF_ARTIST, "Experienced Image-Pro User")
  ret = IpWsChangeDescription(INF_DESCRIPTION, description)
  description = “This line sets the display range for a single point image:
  Ret=IpWsChangeDescription(INF_RANGE,“1.04, 256.5”)
  description = “The following line determines and sets the display range
  automatically
  Ret=IpWsChangeDescription(INF_RANGE,“auto”)

End Sub
```

Comments

INF_RANGE applies only to single point images. The description for this value may be “auto” or you may give a starting and ending value for the range, such as `(1, 257).`

See Also

IpWsChangeInfo

IpWsChangeInfo

Syntax	**IpWsChangeInfo**(*InfoType*, *Info*)		
Description	This function assigns a logical DPI value to the active image. Equivalent to setting the **Dots/Inch X** and **Dots/Inch Y** fields with the **Info** command.		
Parameters	*InfoType*	**Integer**	An enumerated integer selecting the DPI field that is to be set. Must be one of the following: INF_DPIX INF_DPIY These options correspond to the **Dots/Inch X** and **Dots/Inch Y** fields, respectively.
	Info	**Integer**	An integer specifying the DPI value that is to be set.

Example

```
ret = IpWsChangeInfo(INF_DPIX, 300)
```

This statement will set the **Dots/Inch X** field to 300.

See Also IpWsChangeDescription

IpWsConvertFile

Syntax

IpWsConvertFile(*DstFile, DstFormat, SrcFile, SrcFormat, Compr, imClass, HalfType, HalfOpt, Dpi*)

Description

This function converts the specified file to a new format. Equivalent to the **Batch Conversion** command.

Parameters

DstFile	**String**	A string specifying the name of the file to which the converted image data will be written.
DstFormat	**String**	A string specifying the format in which the converted data will be written. See `IpWsSaveAs` for valid file format strings.
SrcFile	**String**	A string specifying the name of the file that is to be converted.
SrcFormat	**String**	A string specifying the format of the source file. See `IpWsSaveAs` for valid file format strings.
Compr	**Integer**	An enumerated integer specifying the compression method that is to be applied to the converted image. Must be one of the following: IFFCOMP_NONE IFFCOMP_DEFAULT IFFCOMP_RLE IFFCOMP_JPEG IFFCOMP_LZW IFFCOMP_LZWHPRED See definitions under Comments, below. Take care to specify a compression method that is valid for the specified *FileFormat*. To determine which methods are valid, select file format and class in the“**Batch File Conversion** dialog box, and review the options presented in the **Compression** list box.
imClass	**Integer**	An enumerated integer specifying the class to which the image is to be converted. Must be one of the following: IFFCL_GRAY IFFCL_PALETTE IFFCL_RGB Take care to specify a class that is valid for the specified *FileFormat*. To determine which classes are valid, select the file format in the **Batch File Conversion** dialog box, and review the options presented in the **Image Class** list box.

HalfType	**Integer**	Obsolete, set to zero
HalfOpt	**Integer**	Obsolete, set to zero
Dpi	**Integer**	An integer specifying the resolution at which the image is to be halftoned. This parameter is ignored if the *imClass* parameter is other than IFFCL_BILEVEL, or when *HalftoneType* is set to 6. When this is the case, just set *Dpi* to 0.

Example

```
ret =
IpWsConvertFile("abc.bmp","BMP","abc.tif","TIF",IFFCOMP_RLE,IFFCL_GRAY,
0,0,0)
```

This statement will convert file ABC.TIF to a *Gray Scale*, BMP format, using RLE compression. The values in the last three parameters (i.e., `0,0,0`) are ignored because the image is not being converted to IFFCL_BILEVEL.

Comments

Compr values are as follows:

VALUE	DESCRIPTION
IFFCOMP_NONE	Applies no compression.
IFFCOMP_DEFAULT	Applies default compression for the selected format.
IFFCOMP_RLE	Applies Run Length Encoding.
IFFCOMP_JPEG	Applies JPEG compression
IFFCOMP_LZW	Applies Lempel-Zif & Welch encoding.
IFFCOMP_LZWHPRED	Applies Lempel-Zif & Welch encoding with horizontal differencing.

IpWsConvertImage

Syntax **IpWsConvertImage** ***(Type, Conversion, InStart, InEnd, OutStart, OutEnd)***

Description This function converts the image to a type. Equivalent to selecting the **Convert To** command.

Parameters

Type	**Integer**	Determines the image type to convert to. Valid values are:
		IMC_GRAY = 1
		IMC_PALETTE = 2
		IMC_RGB = 3
		IMC_GRAY12 = 4
		IMC_SINGLE = 5
		IMC_GRAY16 = 6
		IMC_RGB36 = 8
		IMC_RGB48 = 9

Conversion	**Integer**	Indicates the conversion style. See list of valid entries below:

Value	DESCRIPTION
CONV_SCALE	0: Multiplicative scaling

CONV_SHIFT	1: Bit Shift - this and CONV_SCALE are identical for demotion.
CONV_DIRECT	2: Direct value copy
CONV_USER	3: Use the ranges InStart, InEnd, OutStart, and OutEnd to scale the input type to the output type. In an 8 to 12 bit conversion, for example, InStart = 0 and InEnd = 128, OutStart = 0 and OutEnd = 4095 will effectively map values of 128 or above in the input to 4095 in the output. This is only valid for grayscale promotions and RGB promotions: it will return an IPCERR_INVARG for other image types, including attempting to promote from a grayscale to an RGB or vice versa. Ignored for demotion.
CONV_MCOLOR	4: Convert to IMC_PALETTE using the Mcolor algorithm.
CONV_MEDIAN	5: Convert to IMC_PALETTE using the Median algorithm, with InStart and InEnd providing the StartIndex and NumColors values.
CONV_PSEUDOCOLOR	6: Convert to a IMC_PALETTE image using the pseudocolor mapping (if it exists). This functionality could be accessed using IpWsConvertToPaletteMedian (-1, -1) in IPP 3.0.1.

InStart	**Long**	Starting range for Conv_User scaling. InStart and InEnd are reused as StartIndex and NumColors for CONV_MEDIAN.
InEnd	**Long**	Ending range for Conv_User scaling. InStart and InEnd are reused as StartIndex and NumColors for CONV_MEDIAN.
OutStart	**Long**	Starting range for Conv_User scaling.
OutEnd	**Long**	Ending range for Conv_User scaling.

Example

```
Sub IpWsConvertImage_example()

  ' load image and convert it to 16-bit grayscale

  ret = IpWsLoad("C:\IPWIN\Images\Colordot.tif","tif")
  ret = IpWsConvertImage(IMC_GRAY16, CONV_SCALE , 0, 0, 0, 0)

End Sub
```

Return Value

Doc Id of the new image if successful, IPCERR_INVARG if the arguements are incorrect.

Comments

InStart, InEnd, OutStart, OutEnd: Starting and ending ranges for CONV_USER scaling: these represent the beginning and end values for a linear scaling of the input to output images upon promotion.

IpWsConvertToBilevel

Syntax

IpWsConvertToBilevel(*HalftoneType*, *Screen*, *OutputDpi*)

Description

This function converts the image to a 1-BPP, Black and White image, using your choice of halftoning methods. Equivalent to selecting **Bilevel** with the **Convert To** command.

Parameters

HalftoneType	**Integer**	An integer from 0 - 6 specifying the halftoning method to be used. Where: 0 - Angle Dot Screen 1 - Flat Dot Screen 2 - Angle Line Screen 3 - Horz Line Screen 4 - Vert Line Screen 5 - Error Diffusion 6 - Threshold
Screen	**Integer**	An integer from 0 to 3 specifying the screen resolution or halftone option to be used. Where: For *HalftoneType* values of 0 - 4: 0 - Largest LPI value 1 - Second-largest LPI value 2 - Second-smallest LPI value 3 - Smallest LPI value For *HalftoneType* values of 5: 0 - 4 Weights 1 - 12 Weights 2 - Fuzzy 3 - Random This parameter is ignored when *HalftoneType* is 6. When this is the case, just set *Screen* to 0.
OutputDpi	**Integer**	An integer specifying the resolution at which the image is to be halftoned. This parameter is ignored if the *imClass* parameter is other than IFFCL_BILEVEL, or when *HalftoneType* is set to 6. When this is the case, just set *OutputDpi* to 0.

Return Value

As bilevel images are not supported in IPP 4.0 OR HIGHER, this function now returns IPCERR_FUNC .

Example

```
ret = IpWsConvertToBilevel(0, 0, 100)
```

This statement will convert the image to Bilevel, using Angle Dot Screen halftoning with the largest screen, and 100 DPI output.

Comments

This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsConvertToSingle

Syntax	**IpWsConvertToSingle**( )
Description	This function converts the image to a single-point *Gray Scale* image, with values ranging from 0.0 to 255.0. Equivalent to selecting **Single Point** with the **Convert To** command.
Return Value	This function returns the Document ID of the new image, which will be an integer greater than 0.
Comments	This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsConvertToGray

Syntax	**IpWsConvertToGray**( )
Description	This function converts the image to an 8-BPP *Gray Scale* image. Equivalent to selecting **Gray Scale** with the **Convert To** command.
Return Value	This function returns the Document ID of the new image, which will be an integer greater than 0.
Comments	This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.
See Also	IpWsGray12To8

IpWsConvertToGray12

Syntax	**IpWsConvertToGray12**( )
Description	This function converts the image to a 12-BPP *Gray Scale* image. Equivalent to selecting **Gray Scale 12** with the **Convert To** command.
Return Value	This function returns the Document ID of the new image, which will be an integer greater than 0.
Comments	This function is not supported in *Image-Pro Plu*s. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsConvertToGray16

Syntax	**IpWsConvertToGray16**( )
Description	This function converts the image to a 16-BPP *Gray Scale* image. Equivalent to selecting **Gray Scale 16** with the **Convert To** command.
Return Value	This function returns the Document ID of the new image, which will be an integer greater than 0.
Comments	This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsConvertToGrayEx

Syntax

IpWsConvertToGrayEx*(start16, end16 ,start8, end8)*

Description

This function converts the image to a 8-BPP *Gray Scale* image. Equivalent to selecting **Gray Scale** with the **Convert To** command.

Parameters

Start16	**Integer**	An integer between 0 and 65535 (inclusive) that identifies the beginning of the range of 16-bit values to be converted.
End16	**Integer**	An integer between 0 and 65535 (inclusive) that identifies the end of the range of 16-bit values to be converted.
Start8	**Integer**	An integer between 0 and 255 (inclusive) that identifies the beginning of the 8-bit range to which the 16-bit values will be converted.
End8	**Integer**	An integer between 0 and 255 (inclusive) that identifies the end of the 8-bit range to which the 16-bit values will be converted.

Example

The following statement converts the entire 16-bit range to 8 bits.

```
ret = IpWsConvertToGrayEx(0, 65535, 0, 255)
```

The following statement converts bits 2 - in the 16-bit image (i.e., values 0 to 1020) to bits 0 -7 (i.e., 0 to 255) in an 8-bit image.

```
ret = IpWsConvertToGrayEx(0, 1020, 0, 255)
```

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0, -1 if failed.

Comments

This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

See Also

IpWsConvertToGray

IpWsConvertToPaletteMColor

Syntax

IpWsConvertToPaletteMColor( )

Description

This function converts the image to an 8-BPP *Palette-class* image, using Media Cybernetic's proprietary M/Color method. Equivalent to selecting **Palette** with the **Convert To** command, then choosing MColor.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0.

See Also

IpWsConvertToPaletteMedian

Comments

This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsConvertToPaletteMedian

Syntax **IpWsConvertToPaletteMedian**(*StartIndex*, *NumColors*)

Description This function converts a pseudo-colored, gray-scale image to a *Palette-class* image, using the pseudo-color palette definition method. Equivalent to selecting **Palette** with the **Convert To** command, then choosing Median.

Parameters

StartIndex	**Integer**	An integer from 0 to 13 (inclusive), representing the palette position into which the first color will be placed.
NumColors	**Integer**	An integer from 4 to 256 (inclusive), representing the number of colors in the resulting palette.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0.

Example

```
ret = IpWsConvertToPaletteMedian(0, 256)
```

This statement will convert the image to an 8-BPP *Palette-class* image, using the Median method, with 256 colors in the palette, starting at index 0.

```
ret = IpWsConvertToPaletteMedian(6, 55)
```

This statement will convert the image to a 8-BPP *Palette-class* image, using the Median method, with 55 colors in the palette, starting at index 6.

Comments This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

See Also IpWsConvertToPaletteMColor

IpWsConvertToRGB

Syntax **IpWsConvertToRGB**( )

Description This function converts the image to a 24-BPP (chunky) *True Color* image. Equivalent to selecting **RGB** with the **Convert To** command.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0.

Comments This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

IpWsCopy

Syntax

IpWsCopy( )

Description

This function copies the contents of the selected AOI or image to the Clipboard. Equivalent to using the **Copy** command (or the CTRL+INS key combination) to copy image data to the Clipboard.

Example

```
ipRect.left = 41
ipRect.top = 71
ipRect.right = 106
ipRect.bottom = 110
ret = IpAoiCreateBox(ipRect)
ret = IpWsCopy()
```

This group of statements will copy the AOI that has just been defined, and place it on the Clipboard.

See Also

IpWsPaste

IpWsCopyFrames

Syntax

IpWsCopyFrames*(lStart, lNumber)*

Description

This function copies the contents of the selected frame or frames to the Clipboard. Equivalent to using the **Copy Frame** command from Sequence Editing menu to copy frames to the Clipboard.

Parameters

lStart	**Long**	Indicates the first frame to copy.
lNumber	**Long**	Indicates the number of frames to copy.

Example

```
ret = IpWsCopyFrames(1,3)
```

This statement will copy 3 frames to the Clipboard, starting with frame 1.

Comments

Copied frames may be used with `IpWsPasteFrames`.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpWsPasteFrames, IpWsCutFrames

IpWsCreate

Syntax **IpWsCreate**(*Width*, *Height*, *Dpi*, *Class*)

Description This function creates an empty image window of the specified dimensions and class. Equivalent to clicking the **New** button in the **New** command's **Create New Image** dialog box.

Parameters

Width	**Integer**	An integer representing the number of pixels the new image will contain in the horizontal direction.
Height	**Integer**	An integer representing the number of pixels the new image will contain in the vertical direction.
Dpi	**Integer**	An integer representing the logical resolution, expressed in dots per inch.
Class	**Integer**	An enumerated integer specifying the class of the image to be created. Must be one of the following: IMC_GRAY IMC_PALETTE IMC_RGB IMC_RGB36 IMC_RGB48 IMC_GRAY12 IMC_GRAY16 IMC_SINGLE See definitions under Comments, below.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpWsCreate(270, 250, 90, IMC_PALETTE)
```

This statement will create an empty *Palette-class* image, 270 pixels wide by 250 pixels high, logically having 90 dots per inch.

Comments *Class* values are as follows:

VALUE	**DESCRIPTION**
IMC_GRAY	The new image is of *Gray Scale* class.
IMC_PALETTE	The new image is of *Palette* class.
IMC_RGB	The new image is of *True Color* class.
IMC_RGB36	The new image is of *RGB 32* class.
IMC_RGB48	The new image is of *RGB 48* class.
IMC_GRAY12	The new image is of *Gray Scale* 12 class.
IMC_GRAY16	The new image is of *Gray Scale* 16 class.
IMC_SINGLE	The new image is of *Single Point* class.

IpWsCreateEx

Syntax **IpWsCreateEx*(Width, Height, Dpi, Class, lNumFrames)***

Description This function creates a new sequence of the specified dimensions and class.

Parameters

Width	**Integer**	An integer representing the number of pixels the new image will contain in the horizontal direction.
Height	**Integer**	An integer representing the number of pixels the new image will contain in the vertical direction.
Dpi	**Integer**	An integer representing the logical resolution, expressed in dots per inch.
Class	**Integer**	An enumerated integer specifying the class of the image to be created. Must be one of the following: IMC_GRAY IMC_PALETTE IMC_RGB IMC_RGB36 IMC_RGB48 IMC_GRAY12 IMC_GRAY16 IMC_SINGLE See definitions under Comments, below.
lNumFrames	**Long**	Indicates the number of frames to create.

Return Value

This function returns the Document ID of the new sequence, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpWsCreateEx(270, 250, 90, IMC_GRAY12, 3)
```

This statement will create an empty grayscale 12 sequence,270 pixels wide by 250 pixels high, logically having 90 dots per inch and 3 frames.

Comments

Class values are as follows:

VALUE	DESCRIPTION
IMC_GRAY	The new image is of *Gray Scale* class.
IMC_PALETTE	The new image is of *Palette* class.
IMC_RGB	The new image is of *True Color* class.
IMC_RGB36	The new image is of RGB 32 class.
IMC_RGB48	The new image is of RGB 48 class.
IMC_GRAY12	The new image is of *Gray Scale* 12 class.
IMC_GRAY16	The new image is of *Gray Scale* 16 class.
IMC_SINGLE	The new image is of *Single Point* class.

IpWsCreateFromClipboard

Syntax

IpWsCreateFromClipboard( )

Description

This function creates an image window from the contents of the Clipboard. Equivalent to clicking **Clipboard** in the **New** command's **Create New Image** dialog box.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0.

Comments If there is nothing on the Clipboard, nothing will occur.

IpWsCreateFromVri

Syntax **IpWsCreateFromVri**(*Vri, Name, Mode*)

Description This function creates a new image workspace (document) from a VRI handle. There is no *Image-Pro* command equivalent to this function; it is one that must be manually written with the macro editor.

Note - if you are programming with Image-Pro's Software Development Kit (SDK), the VRI handle is the Virtual Image handle defined by your Halo Imaging Library (HIL).

Parameters

Vri	**Integer**	The handle (type short in C) to the image bit map. This handle can be obtained with `IpDocGet`.
Name	**String**	A string specifying the name to appear in the title bar of the new workspace.
Mode	**Integer**	An enumerated integer specifying the way in which the new workspace is to be opened. Must be one of the following: 0 VRI_NODELETE VRI_COPY See definitions under Comments, below.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0. A -1 is returned when an error occurs.

Example The following example duplicates the active document without using the `IpWsDuplicate` function.

```
Dim Vri as integer
ret = IpDocGet(GETDOCVRI, DOCSEL_ACTIVE, Vri)
If Vri >= 0 Then
    ret = IpWsCreateFromVri(Vri, "", VRI_COPY)
End If
```

Comments The *Vri* options are described in the table below.

VALUE	DESCRIPTION
0	This option *assigns* the source VRI to the new workspace. If the new workspace is subsequently closed by *Image-Pro*, the VRI will be destroyed. Note that this method may cause problems if the VRI is closed while it is being shared by several applications.
VRI_NODELETE	This option *assigns* the source VRI to the new workspace. If the workspace is subsequently closed by *Image-Pro*, the VRI will not be destroyed.
VRI_COPY	This option *copies* the source VRI to the new workspace. The original VRI can be destroyed by its owner without causing a problem in *Image-Pro,* and the workspace can be closed by *Image-Pro* without affecting owners of the source VRI.

See Also

IpDocGet

IpWsCutFrames

Syntax

IpWsCutFrames*(lStart, lNumber)*

Description

This function removes the selected frame or frames from the sequence to the Clipboard. Equivalent to using the **Cut Frame** command from Sequence Editing menu to place frames on the Clipboard.

Parameters

lStart	**Long**	Indicates the first frame to cut.
lNumber	**Long**	Indicates the number of frames to cut.

Example

```
ret = IpWsCutFrames(1,3)
```

This statement will cut 3 frames from the active sequence, starting with frame 1, and place them on the Clipboard.

Comments

Cut frames may be used with `IpWsPasteFrames`.

If the `IpWsCutFrames` command results in all of the frames being cut from a sequence, the sequence workspace will be closed automatically.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpWsPasteFrames,IpWsCopyFrames

IpWsDeleteFrames

Syntax	**IpWsDeleteFrames*(lStart, lNumber)***		
Description	This function removes the selected frame or frames from the sequece. Equivalent to using the **Delete Frame** command from the Sequence Editing menu.		
Parameters	*lStart*	**Long**	Indicates the first frame to delete.
	lNumber	**Long**	Indicates the number of frames to delete.

Example

```
ret = IpWsDeleteFrames(1,3)
```

This statement will remove 3 frames, starting with frame 1, from the sequence.

Comments

Deleted frames are permanently removed.

If the `IpWsDeleteFrames` command results in all of the frames being cut from a sequence, the sequence workspace will be closed automatically.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also

IpWsPasteFrames, IpWsCopyFrames, IpWsCutFrames

IpWsDuplicate

Syntax

IpWsDuplicate( )

Description

This function makes an exact copy of the AOI, if there is one, or the active image otherwise. Equivalent to the **Duplicate** command on the *Image* menu.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

IpWsFill

Syntax	**IpWsFill**(*FillType*, *ColorType*, *Transparency*)		
Description	This function fills the active image or AOI with the specified color or pattern. Equivalent to executing the **Fill** command.		
Parameters	*FillType*	**Integer**	An integer from 0 to 4 specifying the fill type. Where: 0 - Selects Color. 1 - Selects Hue. 2 - Selects Tint. 3 - Selects Pattern. 4 - Selects Texture When values 3 or 4 are used, the fill operation will be performed using the currently selected pattern file (see `IpWsFillPattern`).

Parameters	*ColorType*	**Integer**	An integer from 0 to 4 specifying the color. Where: 0 - Selects Foreground Color. 1 - Selects Background Color. 2 - Selects White. 3 - Selects Black. This parameter is ignored if the *FillType* parameter is set to 3 or 4. When this is the case, set *ColorType* to 0.
	Transparency	**Integer**	An integer from 0 to 100 (inclusive), selecting the degree to which the active image will "show through" the applied pattern or color. The higher the value, the more the active image will "show through".

Example

```
ret = IpWsFill(0, 1, 0)
```

The statement above will fill the active image or AOI with the current Background color (as set in the palette window) and apply it with a transparency value of 0.

```
ret = IpWsFillPattern("C:\IPWIN\IMAGES\GRID.TIF")
ret = IpWsFill(3, 0, 80)
```

The set of statements above will select GRID.TIF as the pattern file, then fill the active image or AOI with it using a transparency value of 80. The *ColorType* parameter is ignored, as the image is being filled with a pattern file, not with color.

See Also IpWsFillPattern, IpPalShow

IpWsFillPattern

Syntax **IpWsFillPattern**(*PatternFile*)

Description This function selects the file to be used as the pattern or texture for a fill operation. Equivalent to the **Select** button in the **Fill** command's **Pattern/Texture** group box.

Parameters	*PatternFile*	**String**	A string specifying the name of the file from which the pattern/texture will be read.

Example

```
ret = IpWsFillPattern("C:\IPWIN\GRID.TIF")
```

This statement will select the GRID.TIF file as the pattern/texture file.

Comments This function merely selects the pattern file. It must be followed by the `IpWsFill` command for the fill to take place.

See Also IpWsFill

IpWsGray12To8

Syntax **IpWsGray12To8**(*FromStart, FromEnd, ToStart, ToEnd*)

Description This function converts a *Gray Scale 12* image into an 8-bit *Gray Scale* image with the option of converting a specific intensity range. Equivalent to setting the range in the **Select Range** dialog box when converting a 12-bit image with the **Convert To** command.

Parameters

FromStart	**Integer**	An integer between 0 and 4095 (inclusive) that identifies the beginning of the range of 12-bit values to be converted.
FromEnd	**Integer**	An integer between 0 and 4095 (inclusive) that identifies the end of the range of 12-bit values to be converted.
ToStart	**Integer**	An integer between 0 and 255 (inclusive) that identifies the beginning of the 8-bit range to which the 12-bit values will be converted.
ToEnd	**Integer**	An integer between 0 and 255 (inclusive) that identifies the end of the 8-bit range to which the 12-bit values will be converted.

Example The following statement converts the entire 12-bit range to 8 bits. This would produce the same result as calling `IpWsConvertToGray`.

```
ret = IpWsGray12To8(0, 4095, 0, 255)
```

The following statement converts bits 2 - 9 in the 12-bit image (i.e., values 0 to 1020) to bits 0 -7 (i.e., 0 to 255) in an 8-bit image. In binary notation this is the same as mapping (000000000000, 001111111100) into (00000000, 11111111).

```
ret = IpWsGray12To8(0, 1020, 0, 255)
```

Comments This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

See Also IpWsConvertToGray

IpWsGray16To8

Syntax **IpWsGray16To8***(start16, end16 ,start8, end8)*

Description This function converts a *Gray Scale 16* image into an 8-bit *Gray Scale* image with the option of converting a specific intensity range. Equivalent to setting the range in the **Select Range** dialog box when converting a 16-bit image with the **Convert To** command.

Parameters

Start16	**Integer**	An integer between 0 and 65535 (inclusive) that identifies the beginning of the range of 16-bit values to be converted.
End16	**Integer**	An integer between 0 and 65535 (inclusive) that identifies the end of the range of 16-bit values to be converted.
Start8	**Integer**	An integer between 0 and 255 (inclusive) that identifies the beginning of the 8-bit range to which the 16-bit values will be converted.
End8	**Integer**	An integer between 0 and 255 (inclusive) that identifies the end of the 8-bit range to which the 16-bit values will be converted.

Example

The following statement converts the entire 16-bit range to 8 bits. This would produce the same result as calling `IpWsConvertToGray`.

```
  ret = IpWsGray16To8(0, 65535, 0, 255)
```

The following statement converts bits 2 - in the 16-bit image (i.e., values 0 to 1020) to bits 0 -7 (i.e., 0 to 255) in an 8-bit image. In binary notation this is the same as mapping (0000000000000000, 0000001111111100) into (00000000, 11111111).

```
  ret = IpWsGray16To8(0, 1020, 0, 255)
```

Comments

This function is not supported in *Image-Pro Plus*. It is included for compatiblity with previous versions. New macros should use **IpWsConvertImage**.

See Also

IpWsConvertToGray

IpWsLoad

Syntax

IpWsLoad(*FileName, FileFormat*)

Description

This function opens an image file. Equivalent to the *Open* command.

Parameters

FileName	**String**	A string specifying the name of the file from which the image will be read.
FileFormat	**String**	A string specifying the format in which the image file has been written. See Comments, below, for a list of valid file format strings.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than or equal to 0. A negative return value indicates an error.

Example

```
ret = IpWsLoad("c:\ipwin\images\count.tif","TIF")
```

This statement will open the TIF file called COUNT.TIF, which is located in the \IPWIN7\IMAGES directory on the C: drive.

This function loads the entire image file, whether it is a single-frame image, or a sequence.

Comments

FileFormat strings are as follows:

FileFormat	**DESCRIPTION**
AVI	AVI File Format
BMP	Windows™ Bitmap File Format
CUT	HALO® Device Independent Image File Format
EPS	Encapsulated Postscript® File Format
GIF	CompuServe Graphics Interface Format
HDF	Park Scientific File Format
HFF	HALO File Format
IPW	Image-Pro Workspace File Format
JPG	JPEG File Interchange Format

FileFormat	**DESCRIPTION**
PCD	Kodak Photo CD File Format

PCT	Apple® Macintosh® PICT File Format
PCX	ZSoft™ Image File Format
SEQ	Sequence Format
TIF	Tagged Image File Format
TGA	Truevision® Targa® File Format
FLF	Flat File Format (user defined)

See Also IpWsSave, IpWsSaveAs, IpWsSaveAsEx

IpWsLoadNumber

Syntax **IpWsLoadNumber**(*Number*)

Description This function opens a recently closed image file that is listed with an identifying number at the bottom of the *File* menu.

Parameters

Number	**Integer**	An integer from 1 to 4 (inclusive) specifying the name of the file to be opened, or -1 to invoke the **Open File** dialog box so that the user may select the file.

Return Value This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpWsLoadNumber(2)
```

This statement will return the second file listed at the bottom of the *File* menu.

```
ret = IpWsLoadNumber(-1)
```

This statement will display the **Open File** dialog box, allowing the user to select a file. The macro will continue when the user closes the dialog box.

Comments The number of files listed at the bottom of the *File* menu may be less than four, and the order in which they are listed changes as you open and close files. In a macro, use this function with care.

See Also IpWsLoad

IpWsLoadPreview

Syntax

IpWsLoadPreview(*FileName*, *FileFormat*, *Left*, *Top*, *Right*, *Bottom*)

Description

This function opens the specified portion of an image. Equivalent to clicking the **Preview** button in the **Open File** dialog box, and using the mouse to define a frame around the portion that is to be opened.

Parameters

FileName	**String**	A string specifying the name of the file from which the image is to be read.
FileFormat	**String**	A string specifying the format in which the image file has been written. See `IpWsLoad` for a list of valid file format strings.
Left	**Integer**	An integer specifying the horizontal position, in pixels, of the left edge of the frame.
Top	**Integer**	An integer specifying the vertical position, in pixels, of the top edge of the frame.
Right	**Integer**	An integer specifying the horizontal position, in pixels, of the right edge of the frame.
Bottom	**Integer**	An integer specifying the vertical position, in pixels, of the bottom edge of the frame.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0.

Example

```
ret = IpWsLoadPreview("C:\IMAGES\SLIDE1.BMP","BMP",0,0,50,100)
```

This statement will load the rectangular portion of the SLIDFE1.BMP (a BMP file), where 0,0 defines the x,y coordinates for the upper-left corner of the rectangle, and 50,100 defines the coordinates of the bottom-right corner.

IpWsLoadSetRes

Syntax

IpWsLoadSetRes(*Num*)

Description

This function selects the resolution of the sub-image to be loaded when a multiple-resolution image file is opened (e.g., a Photo-CD image file). Equivalent to selecting a resolution when a multiple-resolution file is opened using the *Open* command.

Parameters

Num	**Integer**	An integer specifying the image to be loaded (where 0 represents the first image in the file), or one of the following values: LOAD_PROMPT LOAD_SMALLEST Where LOAD_PROMPT will prompt the user for the resolution, and LOAD_SMALLEST will automatically load the image with the smallest spatial resolution.

Example

```
ret = IpWsLoadSetRes(LOAD_SMALLEST)
ret = IpWsLoad("D:\image1.pcd", "PCD")
```

This set of statements above directs *Image-Pro* to open the smallest resolution image contained in the IMAGE1.PCD file.

```
ret = IpWsLoadSetRes(2)
ret = IpWsLoad("D:\image1.pcd", "PCD")
```

This set of statements above directs *Image-Pro* to open the third image contained in the IMAGE1.PCD file.

Comments

Note that the `IpWsLoadSetRes` function does not actually open the image, it merely identifies the sub-image that is to be opened when a multiple-image file is encountered by `IpWsLoad`.

See Also

IpWsLoad

IpWsMove

Syntax

IpWsMove(*X*, *Y*)

Description

This function positions the image within the current image window. Equivalent to positioning the image with the **Panning Hand** tool.

Parameters

X	**Integer**	An integer specifying the x-coordinate of the image pixel that is to be moved to the upper-left corner (i.e., window position 0, 0) in the image window.
Y	**Integer**	An integer specifying the y-coordinate of the image pixel that is to be moved to the upper-left corner (i.e., window position 0, 0) in the image window.

Example

```
ret = IpWsMove(9,9)
```

This statement will position the image such that pixel 9, 9 is located in the upper-left corner of the image window. Pixels above and to the left of pixel 9,9 will not be visible.

See Also

IpWsPan

IpWsOrient

Syntax

IpWsOrient(*OrientType*)

Description

This function reorients or rotates the image in the specified increment. Equivalent to the “quick-step” rotation options available with the **Rotate** command.

Parameters

OrientType **Integer** An enumerated integer specifying the type of rotation to be performed. Must be one of the following:

OR_LEFTRIGHT
OR_UPDOWN
OR_TRANSPOSE
OR_ROTATE90
OR_ROTATE270
OR_ROTATE180

See definitions under Comments, below.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpWsOrient(OR_UPDOWN)
```

This statement will flip the image from top to bottom.

Comments

OrientType options are as follows:

VALUE	DESCRIPTION
OR_LEFTRIGHT	Reorients the image from left to right. Equivalent to the **Rotate** command's “Flip Left/Right” option.
OR_UPDOWN	Reorients the image from top to bottom. Equivalent to the **Rotate** command's “Flip Up/Down” option.
OR_TRANSPOSE	Reorients the image from top-right to bottom-left. Equivalent to the **Rotate** command's “Transpose” option.
OR_ROTATE90	Rotates the image 90° counterclockwise. Equivalent to the **Rotate** command's “Left 90” option.
OR_ROTATE270	Rotates the image 90° clockwise. Equivalent to the **Rotate** command's “Right 90” option.
OR_ROTATE180	Rotates the image 180°. Equivalent to the **Rotate** command's “Rotate 180” option.

See Also

IpWsRotate

IpWsOverlay

Syntax **IpWsOverlay** *(sourceName, Transparency, TransparentMode)*

Description This function creates the transparent overlay in the workspace. Equivalent to selecting the Image Overlay option from the Process menu.

Parameters

sourceName	**String**	Name of source image to be overlayed.
Transparency	**Integer**	Percentage of source image to be blended with destination image. 100 = copy image overlay into destination 99-1 = blend overlay with destination
Transparent Mode	**Integer**	Enter single overlay mode, or burn overlay directly into image 0 - immediately paste the overlay image into the destination image. 1 - enter single overlay mode. Overlay can be moved by mouse.

Example This example will immediately overlay the current image with the image named spots.tif in the upper lefthand corner

```
ret = IpWsOverlay("spots.tif", 100, 0)
```

This example will overlay the current image with the image named spots.tif, move the overlay to the coordinates 57, 68 in the destination image, then blend the overlay into the current image with source=60%, destination=40%.

```
ret = IpWsOverlay("spots.tif, 60, 1)
ret = IpWsPaste(57, 68)
```

Comments Destination image is always the currently active image. If writing a macro by hand, and you use TransparentMode = 1, then it must be followed by a IpWsPaste command or the overlay will not be copied into the current image.

See Also IpWsPaste

IpWsOverlayEx

Syntax **IpWsOverlayEx** *(sourceImage,X,Y,Transparency, ApplyType)*

Description This function creates the transparent overlay in the workspace. Equivalent to selecting the Image Overlay option from the Process menu.

Parameters

sourceImage	**Integer**	The document ID of the source image to be overlaid on the active image.
X	**Integer**	The X position of the overlay on the active image.
Y	**Integer**	The Y position of the overlay on the active image
Transparency	**Integer**	Percentage of source image to be blended with destination image. 100 = copy image overlay into destination 99-1 = blend overlay with destination
ApplyType	**Integer**	The ApplyType parameter modifies the overlay so that an pixel-by-pixel intensity comparison is to decide whether to apply the overlay. ApplyType must be one of the following values: PST_APPLY_ALL = All overlaid data will be applied according to the current blending. PST_APPLY_LIGHTER = Only pixels in the pasted data that are lighter than the destination image will be applied. PST_APPLY_DARKER = Only darker pixels will be applied.

Comments This function respects Template mode. In Normal mode, the overlay is placed at the specified position and the macro continues. In Template mode, the overlay is previewed on the image and the user can reposition it. When finished, the user can click the right mouse button or press Enter.

See Also IpWsOverlay, IpWsPaste, IpTemplateMode

IpWsPan

Syntax **IpWsPan**(*X*, *Y*)

Description This function moves the image relative to its current position in the image window. Equivalent to using the scroll bars to move the image up/down and left/right in the window.

Parameters

X	**Integer**	An integer specifying the number of pixels the image is to be shifted in the horizontal direction. A positive value moves the image to the left. A negative value moves it right.
Y	**Integer**	An integer specifying the number of pixels the image is to be shifted in the vertical direction. A positive value moves the image up. A negative value moves it down.

Example

```
ret = IpWsPan(-100, 150)
```

This statement will move the image 100 pixels to the right and 150 up.

See Also IpWsMove

IpWsPaste

Syntax **IpWsPaste**(*X, Y*)

Description

This function copies the contents of the Clipboard to the specified position in the active image. Equivalent to using the **Paste** command or the SHIFT+INS key combination.

Parameters

X	**Integer**	An integer specifying the x-coordinate of the upper-left corner of the area to which the Clipboard data is to be copied.
Y	**Integer**	An integer specifying the y-coordinate of the upper-left corner of the area to which the Clipboard data is to be copied.

Example

```
ret = IpWsPaste(65, 100)
```

This statement will copy the current Clipboard data into the area that originates at pixel position 65, 100 in the active image.

See Also IpWsCopy

IpWsPasteEx

Syntax **IpWsPasteEx**(*Prompt, UndoText)*

Description

This function allows you to paste the contents of the Windows Clipboard interactively on the active image.

Parameters

Prompt	**String**	See comments.
Undo Text	**String**	See comments

Comments

The Prompt parameter specifies a string that is presented to the user while the pasted contents are singleed on the image for positioning. The prompt will typically ask the user to position the contents and right-click or press Enter to paste, and then click **Continue** when done. The function will not return until **Continue is** pressed in the prompt dialog.

The UndoText parameter specifies how the operation will appear in the Undo menu after the contents are applied to the image. This allows the default test ("Paste") to be replaced with Undo text that is more descriptive of the contents that were applied to the image.

Example

```
ret = IpWsPasteEx("The watermark has been placed on the image.
Position it where you want it, right-click to burn it in, and
click Continue when done.", "Watermark")
```

See Also IpWsPaste

IpWsPasteFrames

Syntax **IpWsPasteFrames*(lPosition)***

Description This function places the frames from the clipboard in the sequence.

Parameters

lPosition	**Long**	Indicates where to put the first pasted frame. 0 = beginning of sequence 1 = end of sequence any other value must be within the number of frames in the sequence.

Example

```
ret = IpWsPasteFrames(1)
```

This statement will place the frames in the sequence after frame #1.

Comments Only valid if frames have been previously cut or copied to the clipboard.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

See Also IpWsCutFrames, IpWsCopyFrames

IpWsRedo

Syntax **IpWsRedo**(*Number*)

Description This function reverses an Undo operation. Equivalent to selecting a *(Redo of)* operation from the *Undo* pop-out menu.

Parameters

Number	**Integer**	An integer from 0 to 2 specifying the operation to be reversed, as identified by its position on the “Undo” pop-out menu. Where: 0 - Redoes the most recent action (i.e., the first operation listed in the “Undo” pop-out menu). 1 - Redoes the second, most-recent action (i.e., the second operation listed in the “Undo” pop-out menu). 2 - Redoes the third, most-recent action (i.e., the third operation listed in the “Undo” pop-out menu).

Example

```
ret =  IpWsRedo(0)
```

This statement will redo the first operation on the “Undo” pop-out menu.

IpWsReload

Syntax **IpWsReload**( )

Description This function reloads the active image from its disk file. Equivalent to the **Reload** command.

IpWsRotate

Syntax **IpWsRotate*(Angle, bSize)***

Description This function rotates the active image or AOI by the specified amount. Equivalent to the **Rotate** command's **Any Angle** option.

Parameters

Angle	**Single**	A single point value specifying the number of degrees, in the counterclockwise direction, by which the image is to be rotated.
bSize	**Integer**	Equivalant to checking the box “Maintain image size” 1 = maintain image size 0 = adjust image size

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
Sub IpWsRotate_example()

  ' rotate active image 20 degrees and allow new image to grow
  ' to enclose the entire rotated source image

  ret = IpWsRotate(20.0, 0)

End Sub
```

IpWsSave

Syntax

IpWsSave( )

Description

This function stores the active image to its disk file. Equivalent to the **Save** command.

Comments

If the current image is untitled, you will be prompted to supply a file name via the *Save File As* dialog box during playback. Macro execution will continue when **OK** is clicked.

IpWsSaveAs

Syntax

IpWsSaveAs(*FileName*, *FileFormat*)

Description

This function stores the active image to the specified file in the specified file format using the default compression and BPP values. Equivalent to using the **Save As** command without setting compression and/or BPP options.

Parameters

FileName	**String**	A string specifying the name of the file to which the active image will be written.
FileFormat	**String**	A string specifying the format in which the image file will be written. See Comments for valid file format strings.

Example

```
ret = IpWsSaveAs("C:\IPWIN\IMAGES\APTEST.BMP", "BMP")
```

This statement will save the active image to the APTEST.BMP file in the \IPWIN\IMAGES directory on the C: drive. The file will be written in BMP format.

Comments

If the file specified in *FileName* exists, it will automatically be overwritten.

Allowable *FileFormat* strings are as follows:

FileFormat **String**	**DESCRIPTION**
AVI	AVI File Format
BMP	Windows Bitmap Format
CUT	HALO CUT File Format

EPS	Encapsulated Postscript Format
GIF	CompuServe Graphic Interface Format
HFF	HALO File Format
IPW	Image-Pro Workspace File Format
JPG	Joint Photographic Experts Group (JPEG) Format
PCD	Kodak Photo CD File Format
PCT	Macintosh PICT Format
PCX	ZSoft PCX Format
SEQ	Sequence format
TGA	Truevision Targa Format
TIF	Tagged Image File Format
FLF	User-defined Flat File Format

See Also IpWsSaveEx, IpWsSave

IpWsSaveEx

Syntax **IpWsSaveEx**(*FileName*, *FileFormat*, *Compression*, *BitsPerPlane*)

Description This function stores the active image to the specified file in the specified file format, with the specified compression and conversion options. Equivalent to saving an image with the **Save As** command using selected compression and BPP options.

Parameters

FileName	**String**	A string specifying the name of the file to which the active image will be written.
FileFormat	**String**	A string specifying the format in which the image file will be written. See `IpWsSaveAs` for a list of valid file format strings.
Compression	**Integer**	An integer from 0 to 7 specifying the compression method that is to be applied when storing the image. Where: 0 - No Compression 1 - Default Compression 2 - Run Length Encoding (RLE) 6 - LZW Encoding 7 - LZW and Differencing Encoding Take care to specify a value that is valid for the specified *FileFormat*. To determine which methods are valid, select the file format in the “Save File As” dialog box, and review the options listed in the “Compression” list box.

BitsPerPlane	**Integer**	An integer specifying the number of bits-per-pixel in a monochrome or palette-class image, or the number of bits-per-sample in an RGB image. Take care to specify a compression method that is valid for the specified *FileFormat*. To determine which values are allowed, select the file format in the "Save File As" dialog box, and review the options listed in the "Output BPP" list box.

Example

```
ret = IpWsSaveEx(C:\IPWIN\IMAGES\GRAY.TIF, "TIF",6,8)
```

This statement will save the GRAY.TIF file in 8-BPP TIF format using LZW compression.

Comments

If the file specified in *FileName* exists, it will automatically be overwritten.

See Also

IpWsSave, IpWsSaveAs

IpWsScale

Syntax

IpWsScale(*Width*, *Height*, *bSmooth*)

Description

This function resizes the active image to the specified dimensions. Equivalent to the **Resize** command.

Parameters

Width	**Integer**	An integer specifying the width, in pixels, to which the horizontal dimension is to be scaled.
Height	**Integer**	An integer specifying the height, in pixels, to which the vertical dimension is to be scaled.
bSmooth	**Integer**	An integer value of 0 or 1 specifying whether the image is to be smoothed when it is scaled. Where: 0 - Suppresses smoothing. 1 - Applies smoothing.

Return Value

This function returns the Document ID of the new image, which will be an integer greater than 0. A negative return value indicates an error.

Example

```
ret = IpWsScale(200, 300, 1)
```

This statement will resize the image to dimensions of 200 pixels wide by 300 pixels tall. Smoothing will be applied during the scaling process.

Comments

This function actually changes the spatial resolution of the active image. If you want to magnify or reduce the size of the image for display purposes, use the `IpWsZoom` function.

See Also

IpWsZoom

IpWsSelectFrames

Syntax

IpWsSelectFrames*(lStart, lNumber)*

Description

This function selects a frame or frames in the sequece.

Parameters

lStart	**Long**	Indicates the first frame to select, -1 to select the active frame
lNumber	**Long**	Indicates the number of frames to selecte, -1 to select all.

Example

```
ret = IpWsSelectFrames(0, -1)
```

This statement selects all the frames in the sequence.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

Comments

Selected frames become the active portion of a sequence.

See Also

IpWsPasteFrames, IpWsCopyFrames, IpWsCutFrames

IpWsStretchLut

Syntax

IpWsStretchLut*(Mode)*

Description

This function sets or unsets the **Best Fit** display option in the **File/Open** dialog box.

Parameters

Mode	**Integer**	1 = set Stretch option 0 = unset Stretch option

Comments

The Best Fit option in the **File/Open** dialog box allows the user to attach a "best fit" LUT to the image when opening it. For example, if a user has 12-bit image data written into a 16-bit TIFF file, selecting the **Best Fit** option will display the image with a LUT modified to fit the actual dynamic range of the image.

IpWsSubSampleFrames

Syntax **IpWsSubSampleFrames*(lStartNumber, lSampleInterval)***

Description This function creates a new sub-sampled sequence from the original sequence.

Parameters

lStartNumer	**Long**	Indicates the first frame in the active sequence to select, from 0 to the number of the last frame in the sequence.
lSample Inteval	**Long**	Specifies the sample interval , i.e. every X number of frames, from 2 to the number of frames in the sequence.

Example

```
ret = IpWsSubSampleFrames(0, 4)
```

This statement selects every 4th frame in the sequence, starting with the first frame.

Comments If apply to sequence is selected, only the active portion of the sequence will be sampled. Otherwise the entire sequence will be sampled.

Note that **`IpSeq`** and **`IpWs`** Auto-Pro functions number frames in a sequence starting with 0 (zero), but the workspace title bar and the sequencer tool bar start frame numbers with frame 1.

IpWsTestStrips

Syntax

IpWsTestStrips(*HorzPage*, *VertPage*, *Type*, *MinValue*, *MaxValue*, *Reduction*, *bRed*, *bGreen*, *bBlue*)

Description This function generates a test strip for a single intensity characteristic. Equivalent to the **Gamma, Brightness** and **Contrast** options on the *Test Strips* pop-out menu.

Parameters

HorzPage	**Integer**	An integer specifying the number of test images to be generated in the horizontal direction.
VertPage	**Integer**	An integer specifying the number of test images to be generated in the vertical direction.
Type	**Integer**	An enumerated integer specifying the type of test strip that is to be generated. Must be one of the following: LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA These options correspond to the **Brightness, Contrast** and **Gamma** test strip options, respectively.
MinValue	**Integer**	An integer specifying the first value in the range of *Type,* for which a set of test images are to be generated. When *Type* is set to LUT_BRIGHTNESS or LUT_CONTRAST, this parameter can contain an integer from 0 to 100 (inclusive), where 50 represents no change to the selected characteristic, values > 50 increase it and values < 50 reduce it. When *Type* is set to LUT_GAMMA, this parameter can contain an integer from 10 to 970 (inclusive), where 100 represents no change to Gamma, values > 100 increase Gamma and values < 100 reduce Gamma.

MaxValue	**Integer**	An integer specifying the last value in the range of *Type,* for which a set of test images are to be generated. When *Type* is set to LUT_BRIGHTNESS or LUT_CONTRAST, this parameter can contain an integer from 0 to 100 (inclusive), where 50 represents no change to the selected characteristic, values > 50 increase it and values < 50 reduce it. When *Type* is set to LUT_GAMMA, this parameter can contain an integer from 10 to 970 (inclusive), where 100 represents no change to Gamma, values > 100 increase Gamma and values < 100 reduce Gamma.
Reduction	**Integer**	An integer from 5 to 100 (inclusive) specifying the size, expressed as a percentage of the original image, at which each test image is to be rendered.
bRed	**Integer**	An integer value of 0 or 1 specifying whether *Type* is to be adjusted in the Red channel of a *True Color* test strip. Where: 0 - Ignores the Red channel. 1 - Adjusts the Red channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bRed* to 0.
bGreen	**Integer**	An integer value of 0 or 1 specifying whether *Type* is to be adjusted in the Green channel of a *True Color* test strip. Where: 0 - Ignores the Green channel. 1 - Adjusts the Green channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bGreen* to 0.
bBlue	**Integer**	An integer value of 0 or 1 specifying whether *Type* is to be adjusted in the Blue channel of a *True Color* test strip. Where: 0 - Ignores the Blue channel. 1 - Adjusts the Blue channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bBlue* to 0.

Example

```
ret = IpWsTestStrips(2, 3, LUT_GAMMA, 100, 970, 25, 1, 1, 1)
```

This statement will generate a 6-image, Gamma test strip, arranged in three rows of 2 images, with Gamma values ranging from 1 to 9.7. The test images will be 25% of the original size, and the Gamma adjustment will be applied to all 3 color channels.

Comments

To create a test strip showing the results of two intensity enhancements combined, use the `IpWsTestStrips2` function.

See Also

IpWsTestStrips2

IpWsTestStrips2

Syntax

IpWsTestStrips2(*HorzPage*, *VertPage*, *Type1*, *MinValue1*, *MaxValue1*, *Type2*, *MinValue2*, *MaxValue2*, *Reduction*, *bRed*, *bGreen*, *bBlue*)

Description

This function generates a test strip of two intensity enhancements, combined. Equivalent to the **Gamma*Brightness, Gamma*Contrast and Brightness*Contrast** options on the *Test Strips* pop-out menu.

Parameters

HorzPage	**Integer**	An integer specifying the number of test images to be generated in the horizontal direction.
VertPage	**Integer**	An integer specifying the number of test images to be generated in the vertical direction.
Type1	**Integer**	An enumerated integer specifying the first of two intensity characteristics that are to be adjusted. Must be one of the following: LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA See `IpWsTestStrips` for definitions. To produce a meaningful result, this parameter should contain a value different than that in *Type2.*
MinValue1	**Integer**	An integer specifying the first value in the range of *Type1,* for which a set of test images are to be generated. See Comments, below, for valid ranges.
MaxValue1	**Integer**	An integer specifying the last value in the range of *Type1,* for which a set of test images are to be generated. See Comments, below, for valid ranges.
Type2	**Integer**	An enumerated integer specifying the second of two intensity characteristics that are to be adjusted. Must be one of the following: LUT_BRIGHTNESS LUT_CONTRAST LUT_GAMMA See `IpWsTestStrips` for definitions. To produce a meaningful result, this parameter should contain a value different than that in *Type1.*
MinValue2	**Integer**	An integer specifying the first value in the range of *Type2,* for which a set of test images are to be generated. See Comments, below, for valid ranges.
MaxValue2	**Integer**	An integer specifying the last value in the range of *Type2,* for which a set of test images are to be generated. See Comments, below, for valid ranges.
Reduction	**Integer**	An integer from 5 to 100 (inclusive) specifying the size, expressed as a percentage of the original image, at which each test image is to be rendered.

bRed	**Integer**	An integer value of 0 or 1 specifying whether the intensity characteristics specified in *Type1* and *Type2,* are to be applied to the Red channel of a *True Color* test strip. Where: 0 - Ignores the Red channel. 1 - Adjusts the Red channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bRed* to 0.
bGreen	**Integer**	An integer value of 0 or 1 specifying whether the intensity characteristics specified in *Type1* and *Type2* are to be applied to the Green channel of a *True Color* test strip. Where: 0 - Ignores the Green channel. 1 - Adjusts the Green channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bGreen* to 0.
bBlue	**Integer**	An integer value of 0 or 1 specifying whether the intensity characteristics specified in *Type1* and *Type2* are to be applied to the Blue channel of a *True Color* test strip. Where: 0 - Ignores the Blue channel. 1 - Adjusts the Blue channel. If the active image is not *True Color*, this parameter is ignored. When this is the case, just set *bBlue* to 0.

Example

```
ret = IpWsTestStrips2(2,3,LUT_GAMMA,100,970,LUT_CONTRAST,30,70, 25,1, 1, 1)
```

This statement will generate a 6-image, Gamma*Contrast test strip, arranged in three rows of 2 images, with Gamma values ranging from 1 to 9.7 and Contrast values from 30 to 70. The test images will be 25% of the original size, and the Gamma/Contrast adjustments will be applied to all 3 color channels.

Comments

If you want to create a test strip for a single intensity characteristic, use the `IpWsTestStrips` function.

If a type parameter is set to LUT_BRIGHTNESS or LUT_CONTRAST, its associated min and max parameters can contain integers from 0 to 100 (inclusive), where 50 represents no change to the selected characteristic, values > 50 increase it and values < 50 reduce it.

If a type parameter is set to LUT_GAMMA, its associated min and max parameters can contain integers from 10 to 970 (inclusive), where 100 represents no change to Gamma, values > 100 increase Gamma and values < 100 reduce Gamma.

See Also

IpWsTestStrips

IpWsTestStripsHalftone

Syntax

IpWsTestStripsHalftone(*AllTypes*, *Color*, *ipHalfTypes*, *ipHalfScreens*, *OutputDpi*, *Reduction*)

Description

This function creates a test strip of the selected halftone options. Equivalent to the **Halftone** option on the *Test Strips* pop-out menu.

Parameters

AllTypes	**Integer**	An integer value of 0 or 1 specifying whether the test strip is to be of a single halftone type, or of all halftone types. Where: 0 - Specifies single halftone type. 1 - Specifies all halftone types.
Color	**Integer**	An integer value of 0 or 1 specifying whether a Black & White or Color test strip is to be created. Where: 0 - Creates Black & White strip. 1 - Creates Color strip.
ipHalfTypes	**Integer (Basic)** **LPSHORT (C)**	The name and first element of an array of integers representing the halftone types for which a strip is to be generated. By default this array is defined as `ipHalfTypes(0)`. When *AllTypes* is set to 0, the `ipHalfTypes` array must contain a single integer, which specifies the one halftone type for which a strip is to be generated. Integers 0 to 5 represent the following types: 0 - Angle Dot Screen 1 - Flat Dot Screen 2 - Angle Line Screen 3 - Horz Line Screen 4 - Vert Line Screen 5 - Error Diffusion

		When the macro is executed, *Image-Pro* will create a test image of this type, for each resolution specified in the ipHalfScreens array (see *ipHalfScreens* below). When *AllTypes* is set to 1, the ipHalfTypes array must contain 6 elements, each element specifying the halftone type for which a test image is to be generated. By default, the array is filled with values from 0 to 5, representing the 6 halftone types as described above. When the macro is executed, *Image-Pro* will create a test image for each type specified in array ipHalfTypes, using the screen specified by the corresponding element in the array, ipHalfScreens (see *ipHalfScreens* below).
ipHalfScreens	**Integer (Basic)** **LPSHORT (C)**	The name and first element of an array of integers representing the halftone screens to be used when creating the test strip. By default this array is defined as ipHalfScreens(0). When *AllTypes* is set to 0, the ipHalfScreens array must contain 4 elements, each element specifying the screen to be used with the type defined in the single-element ipHalfTypes array. Where: For *ipHalftoneTypes* values of 0 - 4: 0 - Largest LPI value 1 - Second-largest LPI value 2 - Second-smallest LPI value 3 - Smallest LPI value For *ipHalftoneTypes* value of 5: 0 - 4 Weights 1 - 12 Weights 2 - Fuzzy 3 - Random When *AllTypes* is set to 1, the ipHalfScreens array must contain 6 elements, each element containing an integer specifying the screen to be used with the corresponding halftone type specified in the ipHalfTypes array (see *ipHalfTypes* above).
OutputDpi	**Integer**	An integer specifying the dots-per-inch value at which the image is to be halftoned.
Reduction	**Integer**	An integer from 5 to 100 (inclusive) specifying the size, expressed as a percentage of the original image, at which each test image is to be rendered.

Example

```
ipHalfScreens(0) = 0
ipHalfScreens(1) = 1
ipHalfScreens(2) = 2
ipHalfScreens(3) = 3
ipHalfTypes(0) = 2
ret = IpWsTestStripsHalftone(0, 0, ipHalfTypes(0), ipHalfScreens(0), 150, 10)
```

The set of statements above will create a test strip of all screen resolutions for the Angle Line halftone type.

```
ipHalfScreens(0) = 0
ipHalfScreens(1) = 1
ipHalfScreens(2) = 1
ipHalfScreens(3) = 0
ipHalfScreens(4) = 1
ipHalfScreens(5) = 2
ipHalfTypes(0) = 0
ipHalfTypes(1) = 1
ipHalfTypes(2) = 2
ipHalfTypes(3) = 3
ipHalfTypes(4) = 4
ipHalfTypes(5) = 5
ret = IpWsTestStripsHalftone(1, 0, ipHalfTypes(0), ipHalfScreens(0), 150, 10
```

The set of statements above will create a test strip of all halftone types using the screen specified in the corresponding element of array `ipHalfScreens` — e.g., the smallest resolution (0) for the Angle Dot type, the smallest resolution (0) for the Horz Line type, and Fuzzy screen (2) for the Error Diffusion type.

IpWsUndo

Syntax

IpWsUndo(*Number*)

Description

This function reverses the specified operation. Equivalent to the **Undo** command.

Parameters

Number	**Integer**	An integer from 0 to 2 specifying the operation to be reversed, as identified by its position on the “Undo” pop-out menu. Where: 0 - Reverses the most recent action (i.e., the first operation listed in the pop-out menu). 1 - Reverses the second-most-recent action (i.e., the second operation listed in the pop-out menu). 2 - Reverses the third-most-recent action (i.e., the third operation listed in the pop-out menu). Remember that not all *Image-Pro* operations are reversible.

Example

```
ret = IpWsUndo(2)
```

This statement will reverse the oldest action in the “Undo” list.

See Also

IpWsRedo

IpWsZoom

Syntax

IpWsZoom(*PercentZoom*)

Description

This function magnifies/reduces the active image by the specified amount. Equivalent to using the **Magnifying Glass** tool or the **Zoom** command on the image window's Control menu.

Parameters	*PercentZoom*	**Integer**	An integer specifying the amount by which the image dimensions are to be increased or reduced. Must be one of the following: 10 - Displays image at 10% of image size 25 - Displays image at 25% of image size 50 - Displays image at 50% of image size 100 - Displays image at actual size 200 - Displays image at twice its actual size 400 - Displays image at 4 times its actual size 800 - Displays image at 8 times its actual size 1600 - Displays image at 16 times its actual size -1 - Displays image at the next smaller zoom factor (equivalent to clicking right mouse button when the “Magnifying Glass” tool is selected). +1 - Displays image at the next larger zoom factor (equivalent to clicking left mouse button when the “Magnifying Glass” tool is selected).

Example

```
IpWsZoom(100)
IpDocMaximize()
```

This set of statements will return the image to its actual size and maximize the image window to ensure that the image is fully visible within the window.

Section 3 - IPBasic Commands

The IPBasic Language provides the core language definition. It is Visual Basic for Applications™ compatible.

Language reference by group:

- Declaration, Data Type, Assignment
- Flow Control, Error Handling
- Conversion, Variable Info
- Constant
- Math, String, Object, Time/Date
- File
- User Input, User Dialog, Dialog Function
- DDE
- Settings
- Miscellaneous
- Operator .

For complete definitions for the IPBasic commands, please refer to the online help.

Appendix A - Function & Command Summary

Auto-Pro Functions

3D Filters Command

IpFlt3DApplytoBuffer
IpFlt3DApplytoFrames
IpFlt3DBranchEnd
IpFlt3DConv
IpFlt3DData
IpFlt3DDistance
IpFlt3DGet
IpFlt3DKernel
IpFlt3DMorph
IpFlt3DMorphKernel
IpFlt3DPrune
IpFlt3DRank
IpFlt3DReduce
IpFlt3DSet
IpFlt3DShow
IpFlt3DThin
IpFlt3dVectGet
IpFlt3dVectGetData
IpFlt3DVectorize
IpFlt3DWatershed

3D Viewer Command

IpView3DCopy
IpView3DCreate
IpView3DCreateAnimation
IpView3DLoad
IpView3DMove
IpView3DReload
IpView3DSet
IpView3DSetCamera
IpView3DSize
IpView3DShow

Acquire Command

IpAcqAverage
IpAcqControl
IpAcqDynIntSnap
IpAcqMultiSnap
IpAcqSelectDriver
IpAcqSettings
IpAcqShow
IpAcqSnap
IpAcqTimed
IpAcqTimedEx
IpAcqSeqIntSnap

AFA Commands

IpAFAAddChan
IpAFADelChan
IpAFADelChanStr
IpAFAGet
IpAFAGetStr
IpAFALoad
IpAFAMacroGet
IpAFAMacroSet
IpAFANew
IpAFASave
IpAFASaveAs
IpAFASetInt
IpAFASetStr
IpAFASetEx
IpAFASetSingle
IpAFAShow
IpAFASnap

Alignment Command

IpAlignAdd
IpAlignApply
IpAlignCalculate
IpAlignFindPattern
IpAlignGet
IpAlignOpen
IpAlignRemove
IpAlignSave
IpAlignSetEx
IpAlignSetInt
IpAlignSetSearchPattern
IpAlignSetSingle
IpAlignShow
IpAffine

AOI Operations

IpAoiChangeName
IpAoiCreateBox
IpAoiCreateDonut
IpAoiCreateEllipse
IpAoiCreateIrregular
IpAoiGet
IpAoiGetStr
IpAoiManager
IpAoiMove
IpAoiMultAppend
IpAoiMultShow
IpAoiShow
IpAoiValidate
IpLstPts
IpMorePts

Application Window

IpAppArrange
IpAppCloseAll
IpAppCtl
IpAppCtlText
IpAppExit
IpAppGet
IpAppGetStr
IpAppHide
IpAppMaximize
IpAppMenuSelect
IpAppMinimize
IpAppMove
IpAppRestore
IpAppRun
IpAppSelectDoc
IpAppSet
IpAppSize
IpSnap
IpTrim
IpAppUpdateDoc
IpAppWindow
IpAppWndPos
IpAppWndState
IpTrackBar

Background Correction Command

IpOpBkgndCorrect
IpOpBkgndSubtract

Batch Conversion Command

IpWsConvertFile

Bayer Interpolation Command

IpBayerInterpolate
IpBayerGetInt
IpBayerSetInt
IpBayerShow

BCG and Color Map

IpLutApply
IpLutBinarize
IpLutData
IpLutLoad
IpLutReset
IpLutSave
IpLutSetAttr
IpLutSetControl
IpLutShow
IpWsStretchLut

Bitmap Analysis

IpBitAttr
IpBitSaveData
IpBitShow

Calibration Command

IpCalGet
IpCalLoad
IpCalSave
IpCalSaveAll
IpCalSaveEx
IpICalCalibValues
IpICalCreate
IpICalDestroy
IpICalDestroyEx
IpICalGetLong
IpICalGetSng
IpICalGetStr
IpICalGetSystem
IpICalLinearize
IpICalLoad
IpICalMove
IpICalReset
IpICalSave
IpICalSelect
IpICalSetLong
IpICalSetSng
IpICalSetStr
IpICalSetSystem
IpICalSetSystemByName
IpICalSetName
IpICalSetOptDens
IpICalSetPoints
IpICalSetSamples
IpICalSetUnitName
IpICalShow
IpICalShowFormat
IpSCalCalibValues
IpSCalCreate
IpSCalDestroy
IpSCalDestroyEx
IpSCalGetLong
IpSCalGetSng
IpSCalGetStr
IpSCalLoad
IpSCalMove
IpSCalReset
IpSCalSave
IpSCalSelect
IpSCalSetAngle
IpSCalSetAspect
IpSCalSetLong
IpSCalSetName
IpSCalSetOrigin
IpSCalSetSng
IpSCalSetStr
IpSCalSetUnit
IpSCalSetUnitName
IpSCalShow

Caliper Command

IpClprClipboard
IpClprCreateDerivativeEdge
IpClprCreateMeas
IpClprCreatePatternMatchEdge
IpClprCreateSampler
IpClprDeleteEdge
IpClprDeleteMeas
IpClprDeleteSampler
IpClprDetGetInt
IpClprDetGetSng
IpClprEditSampler
IpClprGet
IpClprGetData
IpClprGetDataEx
IpClprGetIntEx
IpClprGetStr
IpClprGetSngEx
IpClprSave
IpClprSelectEdge
IpClprSelectSampler
IpClprSet
IpClprSetStr
IpClprSettings
IpClprShow
IpClprToggleMarker
IpClprTool

Chart Controls

IpChrt2DCreate
IpChrt2DGet
IpChrt2DGraphtoClipboard
IpChrt2DMove
IpChrt2DSetArr
IpChrt2DSet
IpChrt2DSetStr
IpChrt2DShow
IpChrt2DSize

Clipboard Operations

IpWsCopy
IpWsCopyFrames
IpWsCutFrames
IpWsDeleteFrames
IpWsPaste
IpWsPasteEx
IpWsPasteFrames

Color Composite Command

IpCmpAdd
IpCmpAddEx
IpCmpAddTint
IpCmpAddTintPos
IpCmpDel
IpCmpGet
IpCmpNew
IpCmpNewTint
IpCmpSet
IpCmpShow

Color Correction Command

IpColCalAdd
IpColCalConvert
IpColCalCorrect
IpColCalCreate
IpColCalGet
IpColCalGetRGB
IpColCalLoad
IpColCalNew
IpColCalSave
IpColCalSet
IpColCalShow
IpColExtract

IpColShow
IpGetConvertColor

Color Segmentation Command

IpSegCreateMask
IpSegLoad
IpSegDelete
IpSegGetRange
IpSegMerge
IpSegNew
IpSegPreview
IpSegRename
IpSegReset
IpSegSave
IpSegSelect
IpSegSelectArea
IpSetSetAttr
IpSegSetRange
IpSegShow

Color Management Command

IpCmmCorrectColors
IpCmmGet
IpCmmSelectCamera Profile
IpCmmSetInt
IpCmmSetStr
IpCmmShow

Color Transform Command

IpCmChannelExtract
IpCmChannelMerge
IpCmChannelMerge3
IpCmTransform

Co-Localization Command

IpCoLocForward
IpCoLocGetDocument
IpCoLocGetForward
IpCoLocGetInverse
IpCoLocInverse
IpCoLocShow

Convert To Command

IpWsConvertImage
IpWsConvertToBilevel
IpWsConvertToFloat
IpWsConvertToGray
IpWsConvertToGray12
IpWsConvertToGray16
IpWsConvertToGrayEx
IpWsConvertToPaletteMColor
IpWsConvertToPaletteMedian
IpWsConvertToRGB
IpWsGray12To8
IpWsGray16To8

Count/Size Command

IpBlbCount
IpBlbCreateMask
IpBlbData
IpBlbDelete
IpBlbEnableMeas
IpBlbFilter
IpBlbFromAOI
IpBlbGet
IpBlbGetStr
IpBlbHideObject
IpBlbHitTest
IpBlbLoadOutline
IpBlbLoadSetting
IpBlbMeasure
IpBlbMultiRanges
IpBlbRange
IpBlbRemoveHoles
IpBlbSaveClasses
IpBlbSaveData
IpBlbSaveOutline
IpBlbSavePopDensities
IpBlbSaveSetting
IpBlbSetAttr
IpBlbSetFilterRange
IpBlbSetRange
IpBlbSetRangeEx
IpBlbShow
IpBlbShowAutoClass
IpBlbShowCluster
IpBlbShowData
IpBlbShowHistogram
IpBlbShowObjectWindow
IpBlbShowPopDens
IpBlbShowScattergram
IpBlbShowSingleClass
IpBlbShowStatistics
IpBlbSmoothObjects
IpBlbSplitObjects
IpBlbUpdate

Data Collector Command

IpDcAddCol
IpDcAddSng
IpDcAddStr
IpDcCreateChart
IpDcDeleteCol
IpDcGet
IpDcGetStr
IpDcMeasList
IpDcSaveData
IpDcSelect
IpDcSet
IpDcSetStr
IpDcSetVarName
IpDcShow
IpDcUnSelect
IpDcUpdate

Deconvolution (SharpStack) Commands

IpDCnvCalculateSA
IpDCnvDeconvolve
IpDCnvGet
IpDCnvGetStr
IpDCnvResultsShow
IpDCnvSet
IpCDnvSettings
IpDCnvSetStr
IpDCnvSetSng
IpDCnvShow

Demo Macro Command

IpDemoGetStr
IpDemoSetStr
IpDemoShow

Display Range Command

IpDrGet
IpDrSet
IpDrShow

Duplicate Command

IpWsDuplicate

Dye Information Command

IpDyeAdd
IpDyeDelete

IpDyeEdit
IpDyeGet
IpDyeGetStr
IpDyeSelect
IpDyeSetStr

Dynamic Data Exchange Command

IpDde

Extended Depth of Field Command

IpEDFAdd
IpEDFCreate
IpEDFGet
IpEDFGetConf
IpEDFNew
IpEDFRemove
IpEDFSet
IpEDFShow
IpEDFTopoMap

FFT Command

IpFftForward
IpFftHiPass
IpFftInverse
IpFftLoad
IpFftLoPass
IpFftSave
IpFftShow
IpFftSpikeBoost
IpFftSpikeCut
IpFftTag

File Name Operations

IpStAutoName
IpStGetName
IpStSearchDir
IpStSortedList

File Signature Command

IpFsGet
IpFsGetStr

Fill Command

IpWsFill
IpWsFillPattern

Filtering Command

IpFltBranchEnd
IpFltClose
IpFltConvolveKernel
IpFltDespeckle
IpFltDilate
IpFltDistance
IpFltErode
IpFltExtractBkgnd
IpFltFlatten
IpFltGauss
IpFltHiPass
IpFltLaplacian
IpFltLocHistEq
IpFltLoPass
IpFltMedian
IpFltOpen
IpFltPhase
IpFltPrune
IpFltRank
IpFltReduce
IpFltRoberts
IpFltRstrDilate
IpFltRstrDilateShow
IpFltSharpen
IpFltShow
IpFltSobel
IpFltThin
IpFltThinEx
IpFltUserDilate
IpFltUserErode
IpFltVariance
IpFltWatershed
IpFltWatershedEx

Grid Mask Command

IpGridApply
IpGridCreateMask
IpGridSelect
IpGridShow

Histogram Command

IpHstCreate
IpHstDestroy
IpHstEqualize
IpHstGet
IpHstMaximize
IpHstMinimize
IpHstMove
IpHstRestore
IpHstSave
IpHstScale
IpHstSelect
IpHstSetAttr
IpHstSize
IpHstUpdate

Image Database Commands

IpDbAddField
IpDbFind
IpDbGoTo
IpDbLoadView
IpDbOpenFolder
IpDbPrint
IpDbReadStr
IpDbSearch
IpDbSetAttr
IpDbViewAll
IpDbViewFolder
IpDbWrite
IpGalAdd
IpGalChangeDescription
IpGalClose
IpGalDelete
IpGalImageOpen
IpGalOpen
IpGalRemove
IpGalSetActive
IpGalShow
IpGalSort
IpGalTag
IpGalUpdate

Image Overlay Command

IpWsOverlay
IpWsOverlayEx
IpIOvrApply
IpIOvrGet
IpIOvrSet
IpIOvrSetStr
IpIOvrShow

Image Window

IpAnActivateAll
IpAnActivateDefaultObj
IpAnActivateObjId
IpAnActivateObjXY
IpAnAddText
IpAnBurn
IpAnCreateObj
IpAnDeleteAll
IpAnDeleteObj
IpAnGet
IpAnGetFontName

IpAnMove
IpAnPolyAddPtArray
IpAnPolyAddPtString
IpAnSet
IpAnSetFontName
IpAnShowAnnot
IpAnText
IpAnotAttr
IpAnotBox
IpAnotEllipse
IpAnotLine
IpDraw
IpDrawClear
IpDrawClearDoc
IpDrawGet
IpDrawSet
IpDrawText
IpDocClick
IpDocClose
IpDocCloseEx
IpDocCloseVri
IpDocFind
IpDocGet
IpDocGetArea
IpDocGetAreaSize
IpDocGetLine
IpDocGetPropDate
IpDocGetPropDbl
IpDocGetPropStr
IpDocGetPosition
IpDocGetStr
IpDocMaximize
IpDocMinimize
IpDocMove
IpDocOpenAoi
IpDocOpenVri
IpDocPutArea
IpDocPutLine
IpDocRestore
IpDocGetPropDate
IpDocSetPropDbl
IpDocSetPropStr
IpDocSetPosition
IpDocSize
IpGetLine
IpPlotCreate
IpPlotData
IpPlotDestroy
IpPlotRange
IpPlotSet
IpPlotShow
IpPlotUpdate
IpTextBurn
IpTextFont
IpTextGetAttr
IpTextSetAttr
IpTextShow
IpTrim
IpWsCreateFromVri

Image Signature Command

IpIsGet
IpIsGetStr
IpIsShow

Info Command

IpWsChangeDescription
IpWsChangeInfo

Internet Access Commands

IpFTPOpen
IpFTPSave
IpMail

Large Spectral Filters Command

IpLFltShow
IpLFltApply

Lens Information Command

IpLensAdd
IpLensDelete
IpLensEdit
IpLensGetLong
IpLensGetSng
IpLensGetStr
IpLensSelect
IpLensSetStr

Live EDF and Tiling Commands

IpLiveEDFSetInt
IpLiveEDFGet
IpLiveTilingSetInt

Line Profile Command

IpProfCreate
IpProfDestroy
IpProfGet
IpProfLineMove
IpProfMaximize
IpProfMinimize
IpProfMove
IpProfRestore
IpProfSave
IpProfSelect
IpProfSetAttr
IpProfSetFreeForm
IpProfSize
IpProfUpdate

Local Zoom Command

IpLocZoomMove
IpLocZoomSet
IpLocZoomSetPos
IpLocZoomShow
IpLocZoomSize

Macro Operations

IpDemoShow
IpIniFile
IpIniFileStr
IpMacroLoad
IpMacroPause
IpMacroRun
IpMacroStop
IpMacroWait
IpMacroProgSet
IpMacroProgGetStr
IpMacroProgSetInt
IpMacroProgSetStr
IpMacroProgShow

Manual Tagging Commands

IpTagAddClass
IpTagAttr
IpTagDelete
IpTagDeleteClass
IpTagGet
IpTagLoadEnv
IpTagLoadPoints
IpTagPt
IpTagSaveData
IpTagSaveEnv
IpTagSavePoints
IpTagShow
IpTagUpdate

Measurements Command

IpMeasAdd
IpMeasAddMeasure
IpMeasAttr
IpMeasAttrStr
IpMeasDelete
IpMeasDelMeasure
IpMeasGet
IpMeasGetHit
IpMeasGetStr
IpMeasLoad
IpMeasLoadOutline
IpMeasMove
IpMeasRestore
IpMeasSave
IpMeasSaveData
IpMeasSaveOutline
IpMeasShow
IpMeasSize
IpMeasTag
IpMeasTool
IpMeasUpdate

Measure Distances Command

IpDistDelete
IpDistGetLong
IpDistGetStr
IpDistGetSng
IpDistSetLong
IpDistSetStr
IpDistShow
IpDistTag
IpDistTool

Memory Monitor Command

IpMmonGet
IpMmonSet
IpMmonShow

Mosaic Command

IpMosaicCreate
IpMosaicGet
IpMosaicSet
IpMosaicShow

New Command

IpWsCreate
IpWsCreateEx
IpWsCreateFromClipboard
IpWsCreateFromVri

Open Command

IpWsLoad
IpWsLoadNumber
IpWsLoadPreview
IpWsLoadSetRes

Operations Command

IpOpImageArithmetics
IpOpImageLogic
IpOpNumberArithmetics
IpOpNumberLogic
IpOpNumberRGB
IpOpShow

Output Window Command

IpOutput
IpOutputClear
IpOutputSave
IpOutputShow
IpOutputSet

Palette Window

IpPalSetGrayBrush
IpPalSetPaletteBrush
IpPalSetPaletteColor
IpPalSetRGBBrush
IpPalShow

Port Configuration Command

IpPortIOGetInt
IpPortIOOpenConfig
IpPortIORead
IpPortIOSaveConfig
IpPortIOSetInt
IpPortIOShow
IpPortIOWrite

Print Command

IpPrtHalftone
IpPrtPage
IpPrtSize
IpPrtScreen

Pseudo-Color Command

IpPcDefineColorSpread
IpPcDyeTint
IpPcLoad
IpPcSave
IpPcSaveData
IpPcSetColor
IpPcSetColorSpread
IpPcSetDivisions
IpPcSetRange
IpPcShow
IpPcTint

Registration Command

IpRegister
IpRegShow

Reload Command

IpWsReload

Rendering Commands

IpRendAnimation
IpRendAnimationFile
IpRendConvertCoord
IpRendConvertRotation
IpRendElem
IpRendElemGet
IpRendElemSet
IpRendElemSetStr
IpRendLoad
IpRendManualMeasurementsFile
IpRendMeasGraphSet
IpRendMMeas
IpRendMMeasGetStr
IpRendMMeasSet
IpRendMMeasSetStr
IpRendMove
IpRendReload
IpRendSaveData
IpRendPaletteFile
IpRendSet
IpRendSettingsFile
IpRendSize
IpRendShow
IpRendVMeas
IpRendVMeasGetStr
IpRendVMeasHist
IpRendVMeasHistSet
IpRendVMeasSet
IpRendVMeasSetStr

Report Generator Command

IpRptClose
IpRptNew
IpRptOpen
IpRptPrint
IpRptSave
IpRptShow

Resize Command

IpWsScale

Rotate Command

IpWsOrient
IpWsRotate

Save/Save As Command

IpWsSave
IpWsSaveAs
IpWsSaveEx

Scanning Command

IpScanSelect
IpScanShow

Screen Capture Command

IpCapArea
IpCapFile
IpCapHotKey
IpCapWindow

Scope-Pro Commands

IpScopeAcquire
IpScopeComponent Present
IpScopeControl
IpScopeDocGet
IpScopeEnumSettings
IpScopeGetCount
IpScopeGetPosition
IpScopeRead
IpScopeSettings
IpScopeSetPosition
IpScopeShow
IpScopeWrite

Scrolling/Panning Operations

IpWsMove
IpWsPan

Sequencer Command

IpSeqAverage
IpSeqDifference
IpSeqDifferenceEx
IpSeqExtractFrames
IpSeqGet
IpSeqMerge
IpSeqMergeDoc
IpSeqOpen
IpSeqPlay
IpSeqReslice
IpSeqRunningAvg
IpSeqSave
IpSeqSet
IpSeqShow
IpWsCopyFrames
IpWsCutFrames
IpWsDeleteFrames
IpWsPasteFrames
IpWsSelectFrames
IpWsSubSampleFrames

Sequence Gallery Command

IpSeqGGet
IpSeqGCreate
IpSeqGSet
IpSeqGShow
IpSeqGUpdate

Set Manager Command

IpDocGetPropDate
IpDocGetPropDbl
IpDocGetPropLong
IpDocGetPropStr
IpDocSetPropDate
IpDocSetPropDbl
IpDocSetPropLong
IpDocSetPropStr
IpSmAdd
IpSmAddFrame
IpSmBackgroundCorr
IpSmBackgroundCorrShow
IpSmDelete
IpSmDespeckle
IpSmDespeckleShow
IpSmExtract
IpSmGet
IpSmGetStr
IpSmInfo
IpSmNew
IpSmNormalize
IpSmNormalizeShow
IpSmOpen
IpSmPlay
IpSmRemoveFrame
IpSmRemove Image
IpSmSave
IpSmSet
IpSmSetStr
IpSmShow
IpSmShowNav
IpSmSetEx

Sort Objects Command

IpSortAttr
IpSortObjects
IpSortShow

Stage-Pro Commands

IpStageAbsZ
IpStageAbsZEx
IpStageAcq
IpStageAcqFrame
IpStageAddListPoint
IpStageAddListPointEx
IpStageControl
IpStageCreateList
IpStageDeleteList
IpStageDeletePoint
IpStageDocGet
IpStageDocGetStr
IpStageField
IpStageFocusLimits
IpStageGet
IpStageGetAbsPoint
IpStageGetAbsPointEx
IpStageGetAbsPosition
IpStageGetAbsPositionEx
IpStageGetListLength
IpStageGetListLocked
IpStageGetListModified
IpStageGetListName
IpStageGetNumLists
IpStageGoToListPos
IpStageModifyListPoint
IpStageModifyListPointEx

IpStagePlane
IpStageSampleGroupbyName
IpStageSampleGroupbyNum
IpStageSamplePattern byName
IpStageSamplePatternByNum
IpStageSetListLocked
IpStageSetListModified
IpStageSetListName
IpStageScanPatternByName
IpStageScanPatternbyNum
IpStageSetArea
IpStageShow
IpStageShowTab
IpStageSettings
IpStageSortList
IpStageStepXY
IpStageStepZ
IpStageWell
IpStageXY
IpStageXYRead
IpStageXYWrite
IpStageZ
IpStageZRead
IpStageZWrite

Surface Plot Command

IpSurfAutoRefresh
IpSurfGet
IpSurfOutput
IpSurfSet
IpSurfShow

Template Mode

IpTemplateMode

Test Strips Command

IpWsTestStrips
IpWsTestStrips2
IpWsTestStripsHalftone

Third-Party Plug-in Command

IpPlFilter
IpPlImport
IpPlShow

Tiling Command

IpTileAdd
IpTileApply
IpTileCalculate
IpTileGet
IpTileOpen
IpTileRemove
IpTileSave
IpTileSetEx
IpTileSetInt
IpTileSetSingle
IpTileShow

Trace Objects Command

IpTraceAttr
IpTraceDo
IpTraceShow

Tracking Command

IpTrackFile
IpTrackMeas
IpTrackMeasGetStr
IpTrackMeasSet
IpTrackMeasSetStr
IpTrackMove
IpTrackOptionsFile
IpTrackSaveData
IpTrackShow
IpTrackSize

Undo Command

IpWsRedo
IpWsUndo

User Input

IpStGetFloat
IpStGetInt
IpStGetString
IpStGetName
IpStSearchDir

Workflow Toolbar Commands

IpToolbarGetStr
IpToolbarSelect
IpToolbarShow

Zoom Operations

IpWsZoom

Appendix B - Auto-Pro Keywords

This appendix contains a list of the reserved words for *Auto-Pro*. This list includes function names, IPBasic commands, operators, predefined variables and other key words that belong to *Auto-Pro*.

A

- Abs
- ACCUMULATE
- ACQ_AVG
- ACQ_CURRENT
- ACQ_FILE
- ACQ_GETCURRENT
- ACQ_ISLIVE
- ACQ_ISSHOWN
- ACQ_LIVE
- ACQ_LOAD
- ACQ_MULTI
- ACQ_NEW
- ACQ_SAVE
- ACQ_SEQUENCE
- ACQ_SETTINGS
- ACQ_SETUP
- ACQ_SHOWLAST
- ACQ_SNAP
- ACQ_TIMED
- ADVANCED
- AFF_AOI
- AFF_CLIP
- AFF_FLOAT
- AFF_NOBILINEAR
- AFF_NOSCALE
- AFF_NOTILT
- ALL_B_T
- ALL_B_W
- ALL_C_B
- ALL_C_T
- ALL_C_W
- ALL_T_B
- ALL_T_W
- ALL_W_B
- And
- AOI_AOI
- AOI_BOX
- AOI_CIRCLE
- AOI_ELLIPSE
- AOI_MULTIPLE
- AOI_POLYGON
- AOI_POWER2
- AOI_SCANLIST
- AOI_SQUARE
- AOIADD
- AOICMD_GETAREA
- AOICMD_GETBOUNDS
- AOICMD_GETELLIPSE
- AOICMD_GETNUMPOINTS
- AOICMD_GETPOINTS
- AOICMD_GETTYPE
- AOICMD_SETBOUNDS
- AOICMD_SETELLIPSE
- AOICMD_SETPOINTS
- AOIDELETE
- AOIHIDEDLG
- AOILOAD
- AOISAVE
- AOISET
- AOISHOWDLG
- APC_CLICK
- APC_GETCHECK
- APC_GETCURSEL
- APC_GETFOCUSID
- APC_GETHWND
- APC_GETSCROLL
- APC_SETCHECK
- APC_SETCURSEL
- APC_SETFOCUSID
- APC_SETPOSX
- APC_SETPOSY
- APC_SETSCROLL
- APW_ACTIVATEHWND
- APW_ACTIVATEID
- APW_ACTIVATENAME
- APW_GETHWND
- APW_GETID
- APW_GETNAME
- ARG_IN
- ARG_INSTR
- ARG_IO
- ARG_IOSTR
- ARG_OUT
- ARG_OUTSTR
- ARG_STR
- ARG_VAL
- As
- Asc
- Atn
- ATT_CALIPER
- ATT_CONTROLS
- ATT_FIXED
- ATT_FIXEDX
- ATT_FIXEDY
- ATT_NOCOPY
- ATTRIBUTE_1
- AUTOUPDATE

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IpAFANew
IpAFASave
IpAFASaveAs
IpAFASetInt
IpAFASetStr
IpAFASetEx
IpAFASetSingle
IpAFAShow
IpAFASnap
IpAnActivateAll
IpAnActivateDefaultObj
IpAnActivateObjID
IpAnActivateObjXY
IpAnAddText
IpAnBurn
IpAnCreateObj
IpAnDeleteAll
IpAnDeleteObj
IpAnGet
IpAnGetFontName
IpAnGetStr
IpAnMove
IpAnotAttr
IpAnotBox
IpAnotEllipse
IpAnotLine
IpAnPolyAddPtArray
IpAnPolyAddPtString
IpAnSet
IpAnSetFontName
IpAnShowAnnot
IpAnText
IpAoiChangeName
IpAoiCreateBox
IpAoiCreateDonut
IpAoiCreateEllipse
IpAoiCreateIrregular
IpAoiGet
IpAoiManager
IpAoiMove
IpAoiMultAppend
IpAoiMultShow
IpAoiShow
IpAoiValidate
IpAppArrange
IpAppCloseAll
IpAppCtl
IpAppCtlText
IpAppExit
IpAppGet
IpAppGet2
IpAppGetStr
IpAppHide
IpAppMaximize
IpAppMenuSelect
IpAppMinimize
IpAppMove
IpAppRestore
IpAppRun
IpAppSelectDoc
IpAppSet
IpAppSize
IpAppUpdateDoc
IpAppWindow
IpAppWndPos
IpAppWndState
IpBayerInterpolate
IpBayerGetInt
IpBayerSetInt
IpBayerShow
IpBitAttr
IpBitSaveData
IpBitShow
IpBlbCount
IpBlbCreateMask
IpBlbData
IpBlbDelete
IpBlbEnableMeas
IpBlbFilter
IpBlbFromAoi
IpBlbGet
IpBlbGetStr
IpBlbHideObject
IpBlbLoadOutline
IpBlbLoadSetting
IpBlbMeasure
IpBlbMultiRanges
IpBlbRange
IpBlbRemoveHoles
IpBlbSaveClasses
IpBlbSaveData
IpBlbSaveOutline
IpBlbSavePopDensities
IpBlbSaveSetting
IpBlbSetAttr
IpBlbSetFilterRange
IpBlbSetRange
IpBlbSetRangeEx
IpBlbShow
IpBlbShowAutoClass
IpBlbShowCluster
IpBlbShowData
IpBlbShowHistogram
IpBlbShowObjectWindow
IpBlbShowPopDens
IpBlbShowScattergram

IpBlbShowSingleClass
IpBlbShowStatistics
IpBlbSmoothObjects
IpBlbSplitObjects
IpBlbUpdate
IPC_CANCEL_MACRO
IPC_EXEC
IPC_MACRO_KEY
IPC_MESSAGE
IPC_PLAY
IPC_PLAY_MACRO
IPC_PLAY2
IPC_RECORD
IPC_SIZECLASSIFIERS
IPC_SIZEICAL
IPC_START_RECORD
IPC_STOP_MACRO
IPC_STOP_MACROSET
IPC_STOP_RECORD
IpCalGet
IpCalLoad
IpCalSave
IpCalSaveAll
IpCalSaveEx
IpCapArea
IpCapFile
IpCapHotKey
IpCapWindow
IPCERR_APPINACTIVE
IPCERR_BUSY
IPCERR_DLLNOTFOUND
IPCERR_EMPTY
IPCERR_FUNC
IPCERR_FUNCARG
IPCERR_FUNCNOTFOUND
IPCERR_INVARG
IPCERR_INVCOMMAND
IPCERR_MEMORY
IPCERR_NODOC
IPCERR_NOTASET
IPCERR_NONE
IPCERR_NOTFOUND
IPCFUNC
IpClprClipboard
IpClprCreateDerivativeEdge
IpClprCreateMeas
IpClprCreatePatternMatchEdge
IpClprCreateSampler
IpClprDeleteEdge
IpClprDeleteMeas
IpClprDeleteSampler
IpClprDetGetInt
IpClprDetGetSng
IpClprEditSampler
IpClprGet
IpClprGetData
IpClprGetDataEx
IpClpGetIntEx
IpClprGetStr
IpClprGetSngEx
IpClprSave
IpClprSelectEdge
IpClprSelectSampler
IpClprSet
IpClprSetStr
IpClprSettings
IpClprShow
IpClprToggleMarker
IpClprTool
IpCmChannelExtract
IpCmChannelMerge
IpCmChannelMerge3
IpCmpAdd
IpCmpDel
IpCmpGet
IpCmpNew
IpCmpSet
IpCmpShow
IpCmmCorrectColors
IpCmmGet
IpCmmSelectCameraProfile
IpCmmSetInt
IpCmmSetStr
IpCmTransform
IpColcForw
IpColocGetDocument
IpColcGetForw
IpColcGetInv
IpColcInv
IpColcShow
IpCoLocForward
IpCoLocGetForward
IpCoLocGetInverse
IpCoLocInverse
IpCoLocShow
IPCSETUP1
IPCSETUP10
IPCSETUP2
IPCSETUP3
IPCSETUP4
IPCSETUP5
IPCSETUP6
IPCSETUP7
IPCSETUP8
IPCSETUP9
IPCX_RECORD
IPCX_RECORDASK
IPCX_RECORDLINE
IpDbAddAppRecord
IpDbAddField
IpDbClose
IpDbCreateAppItem
IpDbDeleteAppItem
IpDbFind
IpDbFindStr
IpDbGetActive
IpDbGetAppID
IpDbGetAppItemID
IpDbGetAppRecords
IpDbGoto
IpDbIsRunning
IpDbLoadView
IpDbNewFolder
IpDbOpen
IpDbOpenFolder
IpDbPrint
IpDbRead
IpDbReadAppItem
IpDbReadNum
IpDbReadStr
IpDbRegisterApp
IpDbSearch
IpDbSearchStr
IpDbSetAttr
IpDbShowAppSearch
IpDbStart
IpDbStop
IpDbUnregisterApp
IpDbViewAll
IpDbViewFolder
IpDbWrite
IpDbWriteAppItem
IpDbWriteNum
IpDbWriteStr
IpDcAdd
IpDcAddCol
IpDcAddSng
IpDcAddStr
IpDcDeleteCol
IpDcGet
IpDcGetStr
IpDcSave
IpDcSaveData
IpDcSelect
IpDcSet
IpDcShow
IpDcUnSelect
IpDcUpdate
IpDCnvCalculateSA
IpDCnvDeconvolve
IpDCnvGet
IpDCnvGetStr
IpDCnvResultsShow
IpDCnvSet
IpCDnvSettings
IpDCnvSetStr
IpDCnvSetSng
IpDCnvShow
IpDde
IpDemoShow
IpDistDelete
IpDistGetLong
IpDistGetStr
IpDistGetSng
IpDistSetLong
IpDistSetStr
IpDistShow
IpDistTag
IpDistTool
IpDocClick
IpDocClose
IpDocCloseEx
IpDocCloseVri
IpDocFind
IpDocGet
IpDocGetArea
IpDocGetAreaSize
IpDocGetLine
IpDocGetPropDate
IpDocGetPropDbl
IpDocGetPropStr
IpDocGetPosition

IpDocGetStr
IpDocMaximize
IpDocMinimize
IpDocMove
IpDocOpenAoi
IpDocOpenVri
IPDOCPOS
IpDocPutArea
IpDocPutLine
IpDocRestore
IpDocSetPosition
IpDocSetPropDate
IpDocSetPropDbl
IpDocSetPropStr
IpDocSize
IpDraw
IpDrawClear
IpDrawClearDoc
IpDrawGet
IpDrawSet
IpDrawText
IpDrGet
IpDrSet
IpDrShow
IpDsGet
IpDsGetStr
IpDsShow
IpDyeAdd
IpDyeDelete
IpDyeEdit
IpDyeGet
IpDyeGetStr
IpDyeSelect
IpDyeSetStr
IpEDFAdd
IpEDFCreate
IpEDFGet
IpEDFNew
IpEDFRemove
IpEDFSet
IpEDFShow
IpEDFTopoMap
IpFftForward
IpFftHiPass
IpFftInverse
IpFftLoad
IpFftLoPass
IpFftSave
IpFftShow
IpFftSpikeBoost
IpFftSpikeCut
IpFftTag
IpFlt3DApplytoBuffer
IpFlt3DApplytoFrames
IpFlt3DBranchEnd
IpFlt3DConv
IpFlt3DData
IpFlt3DDistance
IpFlt3DGet
IpFlt3DKernel
IpFlt3DMorph
IpFlt3DMorphKernel
IpFlt3DPrune
IpFlt3DRank
IpFlt3DReduce
IpFlt3DSet
IpFlt3DShow
IpFlt3DThin
IpFlt3dVectGet
IpFlt3dVectGetData
IpFlt3DVectorize
IpFlt3DWatershed
IpFltBranchEnd
IpFltClose
IpFltConvolveKernel
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IpFltDilate
IpFltDistance
IpFltErode
IpFltExtractBkgnd
IpFltFlatten
IpFltGauss
IpFltHiPass
IpFltLaplacian
IpFltLocHistEq
IpFltLoPass
IpFltMedian
IpFltOpen
IpFltPhase
IpFltPrune
IpFltRank
IpFltReduce
IpFltRoberts
IpFltRstrDilate
IpFltRstrDilateShow
IpFltSharpen
IpFltShow
IpFltSobel
IpFltThin
IpFltThinEx
IpFltUserDilate
IpFltUserErode
IpFltVariance
IpFltWatershed
IpFltWatershedEx
IpFsGet
IpFsGetStr
IpFsShow
IpFTPOpen
IpFTPSave
IpGalAdd
IpGalChangeDescription
IpGalClose
IpGalDelete
IpGalImageOpen
IpGalNew
IpGalOpen
IpGalOpenPhotoCD
IpGalRemove
IpGalSetActive
IpGalShow
IpGalSort
IpGalTag
IpGalUpdate
IpGetLine
IpGridApply
IpGridCreateMask
IpGridSelect
IpGridShow
IpHstCreate
IpHstDestroy
IpHstEqualize
IpHstGet
IpHstMaximize
IpHstMinimize
IpHstMove
IpHstRestore
IpHstSave
IpHstScale
IpHstSelect
IpHstSetAttr
IpHstSize
IpHstUpdate
IpICalCalibValues
IpICalCreate
IpICalDestroy
IpICalDestroyEx
IpICalGetLong
IpICalGetSng
IpICalGetStr
IpICalGetSystem
IpICalLinearize
IpICalLoad
IpICalMove
IpICalReset
IpICalSelect
IpICalSetLong
IpICalSetName
IpICalSetOptDens
IpICalSetPoints
IpICalSetSamples
IpICalSetSng
IpICalSetStr
IpICalSetSystem
IpICalSetSystemByName
IpICalSetUnitName
IpICalShow
IpICalShowFormat
IpIOvrApply
IpIOvrGet
IpIOvrSet
IpIOvrSetStr
IpIOvrShow
IpIniFile
IpIniFileStr
IpIsGet
IpIsGetStr
IpIsShow
IpLensAdd
IpLensDelete
IpLensEdit
IpLensGetLong
IpLensGetSng
IpLensGetStr
IpLensSelet
IpLensSetStr
IpListPts/IpMorePts
IpLiveEDFSetInt
IpLiveEDFGet
IpLiveTilingSetInt
IpLFltApply
IpLFltShow

IpListPts
IpLFltApply
IpLFltShow
IpLutApply
IpLutBinarize
IpLutData
IpLutLoad
IpLutReset
IpLutSave
IpLutSetAttr
IpLutSetControl
IpLutShow
IpMacroLoad
IpMacroPause
IpMacroRun
IpMacroStop
IpMacroWait
IpMacroProgGet
IpMacroProgGetStr
IpMacroProgSetInt
IpMacroProgSetStr
IpMacroProgShow
IpMail
IpMeasAdd
IpMeasAddMeasure
IpMeasAttr
IpMeasAttrStr
IpMeasDelete
IpMeasDelMeasure
IpMeasGet
IpMeasGetHit
IpMeasGetStr
IpMeasLoad
IpMeasLoadOutline
IpMeasMove
IpMeasRestore
IpMeasSave
IpMeasSaveData
IpMeasSaveOutline
IpMeasShow
IpMeasSize
IpMeasTag
IpMeasTool
IpMeasUpdate
IpMmonGet
IpMmonSet
IpMmonShow
IpMorePts
IpMosaicCreate
IpMosaicGet
IpMosaicSet
IpOpBkgndCorrect
IpOpBkgndSubtract
IpOpImageArithmetics
IpOpImageLogic
IpOpNumberArithmetics
IpOpNumberLogic
IpOpNumberRgb
IpOpShow
IpOutput
IpOutputClear
IpOutputSave
IpOutputSet
IpOutputShow
IpPalSetGrayBrush
IpPalSetPaletteBrush
IpPalSetPaletteColor
IpPalSetRGBBrush
IpPalShow
IpPcDefineColorSpread
IpPcDyeTint
IpPcLoad
IpPcSave
IpPcSaveData
IpPcSetColor
IpPcSetColorSpread
IpPcSetDivisions
IpPcSetRange
IpPcShow
IpPcTint
IpPlFilter
IpPlImport
IpPlotCreate
IpPlotData
IpPlotDestroy
IpPlotRange
IpPlotSet
IpPlotShow
IpPlotUpdate
IpPlShow
IpPortIOGetInt
IpPortIOOpenConfig
IpPortIOSaveConfig
IpPortIOSetInt
IpPortIOShow
IpPortIORead
IpPortIOWrite
IpProfCreate
IpProfDestroy
IpProfGet
IpProfLineMove
IpProfMaximize
IpProfMinimize
IpProfMove
IpProfRestore
IpProfSave
IpProfSelect
IpProfSetAttr
IpProfSize
IpProfUpdate
IpPrtHalftone
IpPrtPage
IpPrtScreen
IpPrtSize
IpRegister
IpRegShow
IpRendAnimation
IpRendAnimationFile
IpRendConvertCoord
IpRendConvertRotation
IpRendElem
IpRendElemGet
IpRendElemSet
IpRendElemSetStr
IpRendLoad
IpRendManualMeasurementsFile
IpRendMeasGraphSet
IpRendMMeas
IpRendMMeasGetStr
IpRendMMeasSet
IpRendMMeasSetStr
IpRendMove
IpRendReload
IpRendSaveData
IpRendPaletteFile
IpRendSet
IpRendSettingsFile
IpRendSize
IpRendShow
IpRendVMeas
IpRendVMeasGetStr
IpRendVMeasHist
IpRendVMeasHistSet
IpRendVMeasSet
IpRendVMeasSetStr
IpRptClose
IpRptNew
IpRptOpen
IpRptPrint
IpRptSave
IpRptShow
IpSCalCalibValues
IpSCalCreate
IpSCalDestroy
IpSCalDestroyEx
IpSCalGetLong
IpSCalGetSng
IpSCalGetStr
IpSCalLoad
IpSCalMove
IpSCalReset
IpSCalSave
IpSCalSelect
IpSCalSetAngle
IpSCalSetAspect
IpSCalSetLong
IpSCalSetName
IpSCalSetOrigin
IpSCalSetUnit
IpSCalSetUnitName
IpSCalShow
IpScanSelect
IpScanShow
IpScopeAcquire
IpScopeComponent Present
IpScopeControl
IpScopeDocGet
IpScopeEnumSettings
IpScopeGetCount
IpScopeGetPosition
IpScopeRead
IpScopeSettings
IpScopeSetPosition
IpScopeShow
IpScopeWrite
IpSegCreateMask
IpSegLoad
IpSegDelete
IpSegGetRange
IpSegMerge
IpSegNew

IpSegPreview
IpSegRename
IpSegReset
IpSegSave
IpSegSelect
IpSegSelectArea
IpSegSetAttr
IpSegSetRange
IpSegShow
IpSeqAverage
IpSeqDifference
IpSeqExtractFrames
IpSeqGCreate
IpSeqGet
IpSeqGGet
IpSeqGSet
IpSeqGShow
IpSeqGUpdate
IpSeqMerge
IpSeqMergeDoc
IpSeqOpen
IpSeqPlay
IpSeqReslice
IpSeqRunningAvg
IpSeqSave
IpSeqSet
IpSeqShow
IpSmAdd
IpSmAddFrame
IpSmBackgroundCorr
IpSmBackgroundCorrShow
IpSmDelete
IpSmDespeckle
IpSmDespeckleShow
IpSmExtract
IpSmGet
IpSmGetStr
IpSmInfo
IpSmNavigator
IpSmNew
IpSmNormalize
IpSmNormalizeShow
IpSmOpen
IpSmPlay
IpSmRemoveFrame
IpSmRemove Image
IpSmSave
IpSmSet
IpSmSetStr
IpSmShow
IpSortAttr
IpSortObjects
IpSortShow
IpStAutoName
IpStGetFloat
IpStGetInt
IpStGetName
IpStGetString
IpStSearchDir
IpStSortedList
IpStageAbsZ
IpStageAbsZEx
IpStageAcq
IpStageAcqFrame
IpStageAddListPoint
IpStageAddListPointEx
IpStageControl
IpStageCreateList
IpStageDeleteList
IpStageDeletePoint
IpStageDocGet
IpStageDocGetStr
IpStageField
IpStageFocusLimits
IpStageGet
IpStageGetAbsPoint
IpStageGetAbsPointEx
IpStageGetAbsPosition
IpStageGetAbsPositionEx
IpStageGetListLength
IpStageGetListLocked
IpStageGetListModified
IpStageGetListName
IpStageGetNumLists
IpStageGoToListPos
IpStageModifyListPoint
IpStageModifyListPointEx
IpStagePlane
IpStageSampleGroupbyName
IpStageSampleGroupbyNum
IpStageSamplePattern
byName
IpStageSamplePatternByNum
IpStageSetListLocked
IpStageSetListModified
IpStageSetListName
IpStageScanPatternByName
IpStageScanPatternbyNum
IpStageSetArea
IpStageShow
IpStageShowTab
IpStageSettings
IpStageSortList
IpStageStepXY
IpStageStepZ
IpStageWell
IpStageXY
IpStageXYRead
IpStageXYWrite
IpStageZ
IpStageZRead
IpStageZWrite
IpSurfAutoRefresh
IpSurfGet
IpSurfOutput
IpSurfSet
IpSurfShow
IpTagAddClass
IpTagAttr
IpTagDelete
IpTagDeleteClass
IpTagGet
IpTagLoadEnv
IpTagLoadPoints
IpTagPt
IpTagSaveData
IpTagSaveEnv
IpTagSavePoints
IpTagShow
IpTagUpdate
IpTemplateMode
IpTextBurn
IpTextFont
IpTextSetAttr
IpTextShow
IpTileAdd
IpTileApply
IpTileCalculate
IpTileGet
IpTileOpen
IpTileRemove
IpTileSave
IpTileSetEx
IpTileSetInt
IpTileSetSingle
IpTileShow
IpToolbarGetStr
IpToolbarSelect
IpToolbarShow
IpTraceAttr
IpTraceDo
IpTraceShow
IpTrackBar
IpTrackFile
IpTrack Meas
IpTrackMeasGetStr
IpTrackMeasSet
IpTrackMeasSetStr
IpTrackMove
IpTrackOptionsFile
IpTrackSaveData
IpTrackShow
IpTrackSize
IpWsChangeDescription
IpWsChangeInfo
IpWsConvertFile
IpWsConvertImage
IpWsConvertToBilevel
IpWsConvertToFloat
IpWsConvertToGray
IpWsConvertToGray12
IpWsConvertToGray16
IpWsConvertToGrayEx
IpWsConvertToPaletteMColor
IpWsConvertToPaletteMedian
IpWsConvertToRGB
IpWsConvertToRGB36
IpWsConvertToRGB48
IpWsConvertToRGBEx
IpWsCopy
IpWsCopyFrames
IpWsCreate
IpWsCreateEx
IpWsCreateFromClipboard
IpWsCreateFromVri
IpWsCutFrames
IpWsDeleteFrames
IpWsDuplicate
IpWsFill
IpWsFillPattern
IpWsGray12To8
IpWsGray16To8

IpWsLoad
IpWsLoadNumber
IpWsLoadPreview
IpWsLoadSetRes
IpWsMove
IpWsOrient
IpWsOverlay
IpWsOverlayEx
IpWsPan
IpWsPaste
IpWsPasteEx
IpWsPasteFrames
IpWsRedo
IpWsReload
IpWsRotate
IpWsRulerShow
IpWsRulerType
IpWsSave
IpWsSaveAs
IpWsSaveEx
IpWsScale
IpWsSelectFrames
IpWsStretchLut
IpWsSubSampleFrames
IpWsTestStrips
IpWsTestStrips2
IpWsTestStripsHalftone
IpWsUndo
IpWsZoom
Is
IS_COMPARE
IS_COMPARE_STR
IS_SIGNATURE
IS_SIGNATURE_STR
ISMULTICHANNEL
ISTRUECOLOR
ISZ_STR

L

Len
Let
LF_BANDPASS
LF_EDGEMN
LF_EDGEPL
LF_HIPASS
LF_LOPASS
Like
LINEGEOMETRY
LINETYPE
LOAD_PROMPT
LOAD_SMALLEST
LOCEQ_BELL
LOCEQ_BESTFIT
LOCEQ_EXP
LOCEQ_LINEAR
LOCEQ_LOG
LOCEQ_STDDEV
LOCH_BELL
LOCH_BESTFIT
LOCH_EXP
LOCH_LI
LOCH_LOG
LOCH_STDDEV
Log
Long
Loop
Lut
LUT_4TONES
LUT_8TONES
LUT_ALL
LUT_BRIGHTNESS
LUT_CONTRAST
LUT_FREEFORM
LUT_GAMMA
LUT_HISHAD

M

MA_AUTOGRID
MA_CAPTION
MA_COLUMNS
MA_FONT
MA_FONTSIZE
MA_FOOTER
MA_IMAGECLASS
MA_IMAGEHEIGHT
MA_IMAGESIZE
MA_IMAGEWIDTH
MA_PAGENUMBERS
MA_ROWS
MA_SPACING
MA_TITLE
MAC_DATETIME
MAC_DESCRIPTION
MAC_FILENAME
MAC_FRAMENUMBER
MAC_IMAGENAME
MAC_NONE
MACRO_FUNC
MACRO_NAME_LEN
MAIL_DUMMY
MASK_BACKGROUND
MASK_BILEVELINPLACE
MASK_BILEVELNEW
MASK_COLORNEW
MASK_FOREGROUND
MAX_APP_KEY
MAX_IMAGE_WIDTH
MAX_MACRO_ARG
MAX_MACRO_TEXT
MAX_MACRO_TEXT
MAX_NEWWSFILE_LEN
MAX_OUTPUT_STRING
MAX_RC_STRING
MAX_TASKS
MAXCALNAME
MAXDISPPATH
MCM_PLUGIN
MDATA_ANGLE
MDATA_AREA
MDATA_AVGDIST
MDATA_CTRDIST
MDATA_END
MDATA_ENDY
MDATA_LEN
MDATA_MAXDIST
MDATA_MINDIST
MDATA_PERPDIST
MDATA_POS
MDATA_POSY
MDATA_RADIUS
MDATA_START
MDATA_STARTY
MEAS_ALL
MEAS_ANGLE
MEAS_ANGLE180
MEAS_AREA
MEAS_BFARC
MEAS_BFCIRCLE
MEAS_BFLINE
MEAS_CIRCLE
MEAS_CLICK
MEAS_CTHICK
MEAS_DISPBFPTS
MEAS_DISPCOLOR
MEAS_DIST
MEAS_HIDE
MEAS_HTHICK
MEAS_LABELCOLOR
MEAS_LENGTH
MEAS_MAXARCPTS
MEAS_MAXCIRCLEPTS
MEAS_MAXLINEPTS
MEAS_MEASCOLOR
MEAS_NEWANGLE
MEAS_PASSFAILTYPE
MEAS_POINT
MEAS_PROMPTS
MEAS_RECT
MEAS_REPEAT
MEAS_SHOW
MEAS_SHOWADVANCED
MEAS_SHOWBASIC
MEAS_SHOWLAYOUT
MEAS_STATS
MEAS_TAG
MEAS_THICK
MEAS_THICKMODE
MEAS_TRACE
MEAS_UPDATE
MEAS_VTHICK
MENU_COORD
MENU_DLL
MENU_FUNC
MENU_ID
MENU_NAME
MIF_BITMAP
MIF_COLUMN
MIF_COMNAME
MIF_DLL
MIF_FLAGS
MIF_FUNCID
MIF_HELP
MIF_HELPFILE
MIF_MACRO
MIF_MENUID
MIF_SCRIPT
MIF_TYPE
MIPCCALL
MIPCEXIT
MIS_PRINTER
MIS_PRINTERQTRSIZE
MIS_USER

MLOAD_INTERACTIVE
MODELESS_INIT
MORPHO_11x11OCTAGON
MORPHO_1x3COLUMN
MORPHO_2x2SQUARE
MORPHO_3x1ROW
MORPHO_3x3CROSS
MORPHO_5x5OCTAGON
MORPHO_7x7OCTAGON
MORPHO_CUSTOM
MPF_MINMAX
MPF_NONE
MPF_TOLERANCES
MS_DEF2
MS_DEF3
MS_EXCLAM
MS_MODAL
MS_OKCAN
MS_QUEST
MS_STOP
MS_YESNO
MS_YESNOCAN

N

New
Next
NONAME
NOSYSTEM
Not
Null
NULLAOI

O

On
ON_CL_AOICHANGED
ON_CL_APPCLOSING
ON_CL_APPSHUTDOWN
ON_CL_CLIENTCLOSE
ON_CL_FRAMECHANGED
ON_CL_IMAGECHANGED
ON_CL_LUTCHANGED
ON_CL_NEWCLIENT
ON_CL_PLUGINMESSAGE
ON_CL_PRINTOVERLAY
ON_CL_SERVERCLOSE
ON_CL_SERVERCLOSING
ON_CL_WSDOCFILEIO
OP_EQUAL
OP_GE
OP_GT
OP_LE
OP_LIKE
OP_LT
OP_NOTLIKE
OPA_ACC
OPA_ADD
OPA_AVG
OPA_DIFF
OPA_DIV
OPA_EXP
OPA_INV
OPA_LOG
OPA_MAX
OPA_MIN
OPA_MULT
OPA_SET
OPA_SQR
OPA_SUB
OPA_X2
OPA_X2Y
OPL_AND
OPL_COPY
OPL_NAND
OPL_NOR
OPL_NOT
OPL_OR
OPL_XOR
Option
Or
OR_LEFTRIGHT
OR_ROTATE180
OR_ROTATE270
OR_ROTATE90
OR_TRANSPOSE
OR_UPDOWN
ORIGIN

P

P_GRAPH
P_IMAGE
P_TABLE
PackDDElParam
PCLR_ERRDIFF
PCLR_ERRDIFFFAST
PCLR_LOOKUP
PDT_DFLOAT
PDT_FLOAT
PDT_INT16
PDT_INT32
PDT_WORD16
PDT_WORD32
PIXELS
PLUGM_ACTIVATEAOIBUTTON
PLUGM_ALLOCPALETTEUNDO
PLUGM_ALLOCUNDO
PLUGM_AOIBUTTON
PLUGM_AOIMOVE
PLUGM_APPENDWSPOPUPMENU
PLUGM_BALLOONHELP
PLUGM_BCGUPDATE
PLUGM_CALIBCHANGED
PLUGM_CANCELPASTE
PLUGM_CHECKPLUG
PLUGM_CLIENTTOVIR
PLUGM_CLOSEMODELESS
PLUGM_CLOSETWAIN
PLUGM_CLOSEUNDO
PLUGM_CLOSING
PLUGM_CONVERTBMPTOVRI
PLUGM_CONVERTVRITOBMP
PLUGM_CREATECLIENT
PLUGM_CREATEWS
PLUGM_CSEGCHANGED
PLUGM_DESTROYCLIENT
PLUGM_DRAGFILE
PLUGM_DROPEFFECT
PLUGM_FILEGET
PLUGM_FILEGETMULTISELECT
PLUGM_FILEGETNOTRACK
PLUGM_FILEIMPORT
PLUGM_FILEIMPORTNOTRACK
PLUGM_FILELOAD
PLUGM_FILELOADNOTRACK
PLUGM_FILEPUT
PLUGM_FILEPUTNOTRACK
PLUGM_FRAMESETTYPE
PLUGM_GET332PALETTE
PLUGM_GETACTIVEVRI
PLUGM_GETACTIVEWND
PLUGM_GETAOI
PLUGM_GETAPPKEY
PLUGM_GETAPPNAME
PLUGM_GETAPPTRACKPROC
PLUGM_GETBACKCOLOR
PLUGM_GETDOCINFO
PLUGM_GETEDITORTOOLBAR
PLUGM_GETFORECOLOR
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PLUGM_GETHWNDFROMID
PLUGM_GETHWNDVRI
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PLUGM_GETININAME
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PLUGM_ISTEMPLATEMODE
PLUGM_LOADIPCPLUGIN
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PLUGM_MCCREATEFROMVRI
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PLUGM_PASTE
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PLUGM_STATUSTEXT2
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PLUGM_VIRTOPHY
PLUGM_VRIFROMBITMAP
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PLUGX_CREATEWS
PLUGX_CREATEWS
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PROFTYPE_LINE
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RA_BOTTOMRIGHT
RA_CENTER
RA_LEFT
RA_RIGHT
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REDUCE_4NEIGHBOR
REDUCE_8NEIGHBOR
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Rem
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RGE_FIXED
RGE_FIXEDMAX
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RPT_DUMMY
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S_MEAS
S_NEW
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S_PRINT_GRAPH
S_PRINT_TABLE
S_PRINTER
S_RANGE
S_RECORD
S_STATS
S_TABLE
S_X_AXIS
S_Y_AXIS
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SCAL_DESTROY
SCAL_GETANGLEOFF
SCAL_GETAREA
SCAL_GETCUNAME
SCAL_GETCUPERPIX
SCAL_GETHANDLE
SCAL_GETNAME
SCAL_GETNEXT
SCAL_GETORIGIN
SCAL_GETPIXPERCU
SCAL_GETSYSTEM
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SCAL_SETCUNAME
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SORT_MEAS
SORT_ROTATE
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SP_COLORIZED_FROM
SP_COLORIZED_FROM_COLOR
SP_COLORIZED_TO
SP_COLORIZED_TO_COLOR
SP_DEFAULT
SP_DIFFUSE_REFLECTANCE
SP_GLOSS
SP_LIGHT_COLOR
SP_LIGHT_ELEVATION
SP_LIGHT_ROTATION
SP_MATERIAL
SP_SHADOW_DEPTH
SP_SPECULAR_REFLECTANCE
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SP_STYLE_DRAWEDGES
SP_STYLE_TEXTURED
SP_STYLE_TYPE
SP_STYLE_WIREFRAME_SPAN
SP_STYLE_ZSCALE
SP_SURFACE_COLOR_SPIN
SP_SURFACE_COLOR_SPREAD
SP_TEXTURE_ID
SP_VIEW_ELEVATION
SP_VIEW_ROTATION
SPO_CLIPBOARD
SPO_NEW
SPO_NEW_WITH_ISCALE
SPO_PRINTER
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TAG_MEAS_GREEN
TAG_MEAS_INTENSITY
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TAG_MEAS_XPOS
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THICKHORZ
THICKNORMAL
THICKSTDDEV
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Xor

Y

YAXIS

Z

ZAXIS

Appendix C - ANSI Characters

0	▨	37	%	74	J	111	o	148	▨	185	¹
1	▨	38	&	75	K	112	p	149	▨	186	º
2	▨	39	'	76	L	113	q	150	▨	187	»
3	▨	40	(	77	M	114	r	151	▨	188	¼
4	▨	41	)	78	N	115	s	152	▨	189	½
5	▨	42	*	79	O	116	t	153	▨	190	¾
6	▨	43	+	80	P	117	u	154	▨	191	¿
7	▨	44		81	Q	118	v	155	▨	192	À
8	bksp	45	-	82	R	119	w	156	▨	193	Á
9	tab	46	.	83	S	120	x	157	▨	194	Â
10	LF	47	/	84	T	121	y	158	▨	195	Ã
11	▨	48	0	85	U	122	z	159	▨	196	Ä
12	▨	49	1	86	V	123	{	160		197	Å
13	CR	50	2	87	W	124		161	¡	198	Æ
14	▨	51	3	88	X	125	}	162	¢	199	Ç
15	▨	52	4	89	Y	126	~	163	£	200	È
16	▨	53	5	90	Z	127	▨	164	†	201	É
17	▨	54	6	91	[	128	▨	165	¥	202	Ê
18	▨	55	7	92	\	129	▨	166	¦	203	Ë
19	▨	56	8	93	]	130	▨	167	§	204	Ì
20	▨	57	9	94	^	131	▨	168	¨	205	Í
21	▨	58	:	95	_	132	▨	169	©	206	Î
22	▨	59	;	96	`	133	▨	170	ª	207	Ï
23	▨	60	<	97	a	134	▨	171	«	208	Ð
24	▨	61	=	98	b	135	▨	172	¬	209	Ñ
25	▨	62	>	99	c	136	▨	173	-	210	Ò
26	▨	63	?	100	d	137	▨	174	®	211	Ó
27	▨	64	@	101	e	138	▨	175	¯	212	Ô
28	▨	65	A	102	f	139	▨	176	°	213	Õ
29	▨	66	B	103	g	140	▨	177	±	214	Ö
30	▨	67	C	104	h	141	▨	178	²	215	×
31	▨	68	D	105	i	142	▨	179	³	216	Ø
32		69	E	106	j	143	▨	180	´	217	Ù
33	!	70	F	107	k	144	▨	181	µ	218	Ú
34	"	71	G	108	l	145	‘	182	¶	219	Û
35	#	72	H	109	m	146	’	183	·	220	Ü
36	$	73	I	110	n	147	▨	184	¸	221	Ý

▨ Nonsupported Characters

222	Þ	228	ä	234	ê	240	ð	246	ö	252	ü
223	ß	229	å	235	ë	241	ñ	247	÷	253	ý
224	à	230	æ	236	ì	242	ò	248	ø	254	þ
225	á	231	ç	237	í	243	ó	249	ù	255	ÿ
226	â	232	è	238	î	244	ô	250	ú		
227	ã	233	é	239	ï	245	õ	251	û		

▨ Nonsupported Characters

Appendix D - Data Types

IPBasic Data Types

String The data type used to hold character data (e.g., letters, digits and punctuation). Strings may be variable or fixed length, and are defined as such during declaration.

Internally, a string's storage requirements are the length of the string plus four bytes. The four bytes are used to store the string's length. They occupy the first four bytes of the string in memory (C programmers, note that this differs from the way in which strings are stored by C).

Strings may contain up to 65,000 characters. IPBasic string data is interpreted according to the ANSI character set (see *Appendix C - ANSI Characters*).

Integer A data type used to hold nonfractional numeric values (integers), ranging from -32,768 to +32,767. An Integer is stored as a 16-bit number, occupying 2 bytes of storage.

Long A data type used to hold large, nonfractional numeric values (integers), ranging from -2,147,483,648 to +2,147,483,647. A Long value is stored as a 32-bit signed number, occupying 4 bytes of storage.

Single A data type used to hold numeric values that include fractional values, ranging from -3.402823E+38 to -1.401298E-45 (for negative numbers) and +1.401298E-45 to +3.402823E+38 (for positive numbers). Single data types represent single-precision, floating-point values. A Single value is stored in three parts: the sign, the exponent and the mantissa. It requires 4 bytes of storage.

Float Identical to Single

Auto-Pro API Data Types

RECT The RECT user-defined type is used to hold two, x,y-coordinate pairs. This data type is usually used for variables that define a rectangular area within an image. It is defined in IPBasic, as follows:

```
Type RECT
    left As Long
    top As Long
    right As Long
    bottom As Long
End Type
```

POINTAPI The POINTAPI user-defined type is used to hold a pair of x,y coordinates. It is defined in IPBasic, as follows:

```
Type POINTAPI
   x As Long
   y As Long
End Type
```

IPDOCINFO The IPDOCINFO user-defined type is used to hold image information obtained by the IpDocGet function. It is defined in IPBasic, as follows:

```
Type IPDOCINFO
   Width As Integer
   Height As Integer
   Class As Integer
   Bpp As Integer
   Extent As RECT
End Type
```

IPDOCPOS The IPDOCPOS user-defined type is used to hold position information obtained by the IpDocGetPosition function. It is defined in IPBasic, as follows:

```
Type IPDOCPOS
      IsKnown As Integer
      Position As Single
End Type
```

C Data Type Equivalents

The *Auto-Pro Function Reference* describes its function parameters according to IPBasic data types. The table below describes their C equivalents.

IPBasic TYPE	**C TYPE**	**NOTES**
String	**LPSTR**	See **String** description, above, for comments about the way a string is internally represented by IPBasic.
Integer	**short**	In this manual, parameters that take a "pointer" to an **Integer** variable are also listed as type, **Integer**. You will need to refer to the parameter's description to determine whether the required C data type is **short** or **LPSHORT**.
Long	**long**	In this manual, parameters that take a "pointer" to a **Long** variable are also listed as type, **Long**. You will need to refer to the parameter's description to determine whether the required C data type is **long** or **LPLONG**.
Single	**float**	In this manual, parameters that take a "pointer" to a **Single** variable are also listed as type, **Single**. You will need to refer to the parameter's description to determine whether the required C data type is **float** or **LPFLOAT**.
POINTAPI	**LPPOINT**	See structure definition in ipc.h
RECT	**LPRECT**	See structure definition in ipc.h
IPDOCINFO	**LPDOCINFO**	See structure definition in ipc.h
IPDOCPOS	**LPDOCPOS**	See structure definition in ipc.h

Appendix E - Shortcut Key Assignments

The following table shows the names of the shortcut key combinations supported by *Auto-Pro*. Shortcut key names must be typed exactly as shown below; case is significant.

KEY	ALONE	+CTRL	+SHIFT	+CTRL+SHIFT
F1	▨	▨	▨	▨
F2	F2	<c>F2	<s>F2	<c><s>F2
F3	F3	<c>F3	<s>F3	<c><s>F3
F4	F4	<c>F4	<s>F4	<c><s>F4
F5	F5	<c>F5	<s>F5	<c><s>F5
F6	F6	<c>F6	<s>F6	<c><s>F6
F7	F7	<c>F7	<s>F7	<c><s>F7
F8	F8	<c>F8	<s>F8	<c><s>F8
F9	F9	<c>F9	<s>F9	<c><s>F9
F10	▨	▨	▨	▨
F11	F11	<c>F11	<s>F11	<c><s>F11
F12	F12	<c>F12	<s>F12	<c><s>F12
A	▨	<c>A	▨	<c><s>A
B	▨	<c>B	▨	<c><s>B
C	▨	<c>C	▨	<c><s>C
D	▨	<c>D	▨	<c><s>D
E	▨	<c>E	▨	<c><s>E
F	▨	<c>F	▨	<c><s>F
G	▨	<c>G	▨	<c><s>G
H	▨	<c>H	▨	<c><s>H
I	▨	<c>I	▨	<c><s>I

continued on next page

▨ Nonsupported key combinations

KEY	ALONE	+CTRL	+SHIFT	+CTRL+SHIFT
J	▨	<c>J	▨	<c><s>J
K	▨	<c>K	▨	<c><s>K
L	▨	<c>L	▨	<c><s>L
M	▨	<c>M	▨	<c><s>M
N	▨	<c>N	▨	<c><s>N
O	▨	<c>O	▨	<c><s>O
P	▨	<c>P	▨	<c><s>P
Q	▨	<c>Q	▨	<c><s>Q
R	▨	<c>R	▨	<c><s>R
S	▨	<c>S	▨	<c><s>S
T	▨	<c>T	▨	<c><s>T
U	▨	<c>U	▨	<c><s>U
V	▨	<c>V	▨	<c><s>V
W	▨	<c>W	▨	<c><s>W
X	▨	<c>X	▨	<c><s>X
Y	▨	<c>Y	▨	<c><s>Y
Z	▨	<c>Z	▨	<c><s>Z
0	▨	<c>0	▨	<c><s>0
1	▨	<c>1	▨	<c><s>1
2	▨	<c>2	▨	<c><s>2
3	▨	<c>3	▨	<c><s>3
4	▨	<c>4	▨	<c><s>4
5	▨	<c>5	▨	<c><s>5
6	▨	<c>6	▨	<c><s>6
7	▨	<c>7	▨	<c><s>7
8	▨	<c>8	▨	<c><s>8
9	▨	<c>9	▨	<c><s>9

▨ Nonsupported key combinations

Appendix F – Error Messages

Error Code	Error Message	Description
0	IPCERR_NONE	No error calling the function. A positive return value also indicates successful completion, and usually is returning a document ID or other "handle" to something the function created.
-1	IPCERR_APPINACTIVE	*Image-Pro* is not running. This is also a default return value that is used by older code, so it may just indicate that the function failed.
-2	IPCERR_NOTFOUND	Missing item, data structure, etc.
-3	IPCERR_DLLNOTFOUND	The function could not be executed because *Image-Pro* couldn't find DLL that implements the function. This might occur if a feature uses an Auto-Pro function that is supported by an optional plug-in (e.g. Scope-Pro).
-4	IPCERR_FUNCNOTFOUND	The function could not be executed because *Image-Pro* couldn't find the function in the DLL. This could be result of an installation error (a newer plug-in calling another plug-in that is older and not the expected version). This error code is also used sometimes to indicate that some crucial prerequisite for the function was not met, e.g. older functions that require the feature's dialog to be displayed before the Auto-Pro functions will work.
-5	IPCERR_INVCOMMAND	Not applicable to the current image/situation i.e. The requested function, command or attribute is not applicable to the current image/situation. This might be something like trying to do color channel operations on a grayscale image.

Error Code	Error Message	Description
-6	IPCERR_NODOC	For most functions, this return value indicates that the function requires an image but there is no active workspace (none are open).
-7	IPCERR_INVARG	Invalid command arguments. One of the parameters was out of range, or incorrect for the active image.
-8	IPCERR_MEMORY	Insufficient memory
-9	IPCERR_BUSY	*Image-Pro* is busy executing another function. This should not occur very often since when running a macro script, each Auto-Pro function is run to completion before the next line of the script is run.
-10	IPCERR_EMPTY	The requested information is not present. The type of object that the function works with is not present on the active image, e.g. cannot edit spatial calibration information because the image is not calibrated, or cannot return set information if the image is not part of a set.
-11	IPCERR_LIMIT	An argument was out of range, but the function may have been executed within the valid limits.
-12	IPCERR_CANCELLED	Operation cancelled by user.
-13	IPCERR_NOTASET	Not really an error, but the file cannot be opened as a set, and has been opended as a single image workspace.
-1000	IPCERR_FUNC	This error code may indicate an invalid command argument, or it may indicate that an optional component that supports the Auto-Pro function was not installed.

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