This quick reference guide contains both a functional and alphabetical listing of all IDL routines. The alphabetical listing contains all functions, procedures, statements, and objects, including the syntax of each. The following information is included in this guide:

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The following is a list of all routines included in IDL 5.4, categorized by functionality.

**3D Visualization**

**3D Transformations & Scene Setup**

- **CONVERT_COORD** - Transforms coordinates to and from the coordinate systems supported by IDL.
- **COORD2TO3** - Returns 3D data coordinates given normalized screen coordinates.
- **CREATE_VIEW** - Sets up 3D transformations.
- **CV_COORD** - Converts 2D and 3D coordinates between coordinate systems.
- **SCALE3** - Sets up axis ranges and viewing angles for 3D plots.
- **SCALE3D** - Scales 3D unit cube into the viewing area.
- **SET_SHADING** - Sets the light source shading parameters.
- **SURFR** - Sets up 3D transformations by duplicating rotation, translation, and scaling of SURFACE.
- **T3D** - Performs various 3D transformations.
- **VERT_T3D** - Transforms a 3D array by a 4x4 transformation matrix.
- **VOXEL_PROJ** - Generates volume visualizations using voxel technique.

**Polygonal Mesh Routines**

- **COMPUTE_MESH_NORMALS** - Computes normal vectors for a set of polygons described by the input array.
- **MESH_CLIP** - Clips a polygonal mesh to an arbitrary plane in space and returns a polygonal mesh of the remaining portion.
- **MESH_DECIMATE** - Reduces the density of geometry while preserving as much of the original data as possible.
- **MESH_ISSOLID** - Computes various mesh properties and enables IDL to determine if a mesh encloses space (is a solid).
- **MESH_MERGE** - Merges two polygonal meshes.
- **MESH_NUMTRIANGLES** - Computes the number of triangles in a polygonal mesh.
- **MESH_OBJ** - Generates a polygon mesh for various simple objects.
- **MESH_SMOOTH** - Performs spatial smoothing on a polygon mesh.
- **MESH_SURFACEAREA** - Computes various mesh properties to determine the mesh surface area, including integration of other properties interpolated on the surface of the mesh.
- **MESH_VALIDATE** - Checks for NaN values in vertices, removes unused vertices, and combines close vertices.
- **MESH_VOLUME** - Computes the volume that the mesh encloses.
- **POLYSHADE** - Creates a shaded surface representation from a set of polygons.

**Surfaces and Contours**

- **CONTOUR** - Draws a contour plot.
- **IMAGE_CONT** - Overlays an image with a contour plot.
- **MIN_CURVE_SURF** - Interpolates points with a minimum curvature surface or a thin-plate-spline surface. Useful with CONTOUR.
- **POLAR_CONTOUR** - Draws a contour plot from data in polar coordinates.
- **SHADE_SURF** - Creates a shaded-surface representation of gridded data.
- **SHADE_SURF_IRR** - Creates a shaded-surface representation of an irregularly gridded dataset.
- **SHOW3** - Displays array as image, surface plot, and contour plot simultaneously.
- **SURFACE** - Plots an array as a wireframe mesh surface.
- **XSURFACE** - Provides GUI to SURFACE and SHADE_SURF.

**Tetrahedral Mesh Routines**

- **TETRA_CLIP** - Clips a tetrahedral mesh to an arbitrary plane in space and returns a tetrahedral mesh of the remaining portion.
- **TETRA_SURFACE** - Extracts a polygonal mesh as the exterior surface of a tetrahedral mesh.
- **TETRA_VOLUME** - Computes properties of tetrahedral mesh array.

**Vector Field Visualization**

- **FLOW3** - Draws lines representing a 3D flow/velocity field.
- **INTERPOL** - Performs linear interpolation on vectors.
- **PARTICLE_TRACE** - Traces the path of a massless particle through a vector field.
- **STREAMLINE** - Generates the visualization graphics from a path.
- **VECTOR_FIELD** - Places colored, oriented vectors of specified length at each vertex in an input vertex array.
- **VEL** - Draws a velocity (flow) field with streamlines.
- **VELOVECT** - Draws a 2D velocity field plot.

**Volume Visualization**

- **EXTRACT_SLICE** - Returns 2D planar slice extracted from volume.
- **IDLgrVolume** - Represents a mapping from a 3D array of data to a 3D array of voxel colors, which, when drawn, are projected to two dimensions.
- **ISOSURFACE** - Returns topologically consistent triangles by using oriented tetrahedral decomposition.
- **PROJECT_VOL** - Returns a translucent rendering of a volume projected onto a plane.
- **RECON3** - Reconstructs a 3D representation of an object from 2D images.
SEARCH3D - Finds “objects” or regions of similar data values within a volume.

SHADE_VOLUME - Contours a volume to create a list of vertices and polygons that can be displayed using POLYSHADE.

SLICER3 - Interactive volume visualization tool.

VOXEL_PROJ - Generates volume visualizations using voxel technique.

XOBJVIEW - Displays object viewer widget.

XVOLUME - Utility for viewing and interactively manipulating volumes and isosurfaces.

Animation

CW_ANIMATE - Creates a compound widget for animation.

CW_ANIMATE_GETP - Gets pixmap window IDs used by CW_ANIMATE.

CW_ANIMATE_LOAD - Loads images into CW_ANIMATE.

CW_ANIMATE_RUN - Displays images loaded into CW_ANIMATE.

FLICK - Causes the display to flicker between two images.

MPEG_CLOSE - Closes an MPEG sequence.

MPEG_OPEN - Opens an MPEG sequence.

MPEG_PUT - Inserts an image array into an MPEG sequence.

MPEG_SAVE - Saves an MPEG sequence to a file.

XINTERANIMATE - Displays animated sequence of images.

Array Creation

BINDGEN - Returns byte array with each element set to its subscript.

BYTARR - Creates a byte vector or array.

CINDGEN - Returns a complex array with each element set to its subscript.

COMPLEXARR - Creates a complex, single-precision, floating-point vector or array.

DBLARR - Creates a double-precision array.

DCINDGEN - Returns a double-precision, complex array with each element set to its subscript.

DCOMPLEXARR - Creates a complex, double-precision vector or array.

DINDGEN - Returns a double-precision array with each element set to its subscript.

FINDGEN - Returns a floating-point array with each element set to its subscript.

FLTARR - Returns a single-precision, floating-point vector or array.

INDGEN - Return an integer array with each element set to its subscript.

INTARR - Creates an integer vector or array.

L64INDGEN - Returns a 64-bit integer array with each element set to its subscript.

LINDGEN - Returns a longword integer array with each element set to its subscript.

LON64ARR - Returns a 64-bit integer vector or array.

LONARR - Returns a longword integer vector or array.

MAKE_ARRAY - Returns an array of the specified type, dimensions, and initialization.

OBJJARR - Creates an array of object references.

PTRARR - Creates an array of pointers.

REPLICATE - Creates an array of given dimensions, filled with specified value.

SINDGEN - Returns a string array with each element set to its subscript.

STRARR - Returns string array containing zero-length strings.

TIMEGEN - Returns an array of double-precision floating-point values that represent times in Julian dates.

UINTARR - Returns unsigned integer array with each element set to its subscript.

ULINDGEN - Returns an unsigned longword array with each element set to its subscript.

UL64INDGEN - Returns an unsigned 64-bit integer vector or array.

ULON64ARR - Returns an unsigned 64-bit integer vector or array.

Array Manipulation

ARRAY_EQUAL - Provides fast test for data equality in cases where the positions of the differing data elements is not required.

BLAS_AXPY - Updates existing array by adding a multiple of another array.

INVERT - Computes the inverse of a square array.

MAX - Returns the value of the largest element of Array.

MEDIAN - Returns the median value of Array or applies a median filter.

MIN - Returns the value of the smallest element of an array.

REFORM - Changes array dimensions without changing the total number of elements.

REPLICATE_INPLACE - Updates an array by replacing all or selected parts of it with a specified value.

REVERSE - Reverses the order of one dimension of an array.

ROT - Rotates an image by any amount.

ROTATE - Rotates/transposes an array in multiples of 90 degrees.

SHIFT - Shifts elements of vectors or arrays by a specified number of elements.

SIZE - Returns array size and type information.

SORT - Returns indices of an array sorted in ascending order.

TOTAL - Sums of the elements of an array.

TRANSPOSE - Transposes an array.

UNIQ - Returns subscripts of the unique elements in an array.

WHERE - Returns subscripts of nonzero array elements.

XVAREDIT - Provides widget-based editor for IDL variables.
Color Table Manipulation

COLOR_CONVERT - Converts color triples to and from RGB, HLS, and HSV.
COLOR_QUAN - Converts true-color (24-bit) image to pseudo-color (8-bit) image.
COLORMAP_APPLICABLE - Determines whether the current visual class supports the use of a colormap.
CT_LUMINANCE - Calculates the luminance of colors.
CW_PALETTE_EDITOR - Creates compound widget to display and edit color palettes.
CW_PALETTE_EDITOR_GET - Gets CW_PALETTE_EDITOR properties.
CW_PALETTE_EDITOR_SET - Sets CW_PALETTE_EDITOR properties.
GAMMA_CT - Applies gamma correction to a color table.
H_EQ_CT - Histogram-equalizes the color tables for an image or a region of the display.
H_EQ_INT - Interactively histogram-equalizes the color tables of an image or a region of the display.
HLS - Creates color table in Hue, Lightness, Saturation color system.
HSV - Creates color table based on Hue and Saturation Value color system.
LJLCCT - Loads standard color tables for LJ-250/252 printer.
LOADCT - Loads one of the predefined IDL color tables.
MODIFYCT - Saves modified color tables in the IDL color table file.
MULTI - Replicates current color table to enhance contrast.
PSEUDO - Creates pseudo-color table based on Lightness, Hue, and Brightness system.
REDUCE_COLORS - Reduces the number of colors used in an image by eliminating unused pixel values.
STRETCH - Stretches color table for contrast enhancement.
TEK_COLOR - Loads color table based on Tektronix printer.
TVLCT - Loads display color tables.
XLOADCT - Provides GUI to interactively select and load color tables.
XPalette - Displays widget used to create and modify color tables.

Debugging

.CONTINUE - Continues execution of a stopped program.
.SKIP - Skips over the next n statements and then single steps.
.STEP - Executes one or n statements from the current position.
.STEPOVER - Executes a single statement if the statement doesn’t call a routine.
.TRACE - Similar to .CONTINUE, but displays each line of code before execution.
BREAKPOINT - Sets and clears breakpoints for debugging.
STOP - Stops the execution of a running program or batch file.

Dialog Routines

DIALOG_MESSAGE - Creates modal message dialog.
DIALOG_PICKFILE - Creates native file-selection dialog.
DIALOG_PRINTERSETUP - Opens native dialog used to set properties for a printer.
DIALOG_PRINTJOB - Opens native dialog used to set parameters for a print job.
DIALOG_READ_IMAGE - Presents GUI for reading image files.
DIALOG_WRITE_IMAGE - Presents GUI for writing image files.

Direct Graphics, General

ANNOTATE - Starts IDL widget used to interactively annotate images and plots with text and drawings.
ARROW - Draws line with an arrow head.
BOX_CURSOR - Emulates operation of a variable-sized box cursor.
CONVERT_COORD - Transforms coordinates to and from the coordinate systems supported by IDL.
CURSOR - Reads position of the interactive graphics cursor.
CVTTOBM - Creates a bitmap byte array for a button label.
DEVICE - Sets to plot in device coordinates.
EMPTY - Empties the graphics output buffer.
ERASE - Erases the screen of the current graphics device, or starts a new page if the device is a printer.
FORMAT_AXIS_VALUES - Formats numbers as strings for use as axis values.
PLOTS - Plots vectors and points.
POLYFILL - Fills the interior of a polygon.
PROFILE - Extracts a profile from an image.
PROFILES - Interactively examines image profiles.
SET_PLOT - Sets the output device used by the IDL direct graphics procedures.
THREED - Plots a 2D array as a pseudo 3D plot.
TV - Displays an image.
TVCRS - Manipulates the image display cursor.
TVSCL - Scales and displays an image.

Date and Time

BIN_DATE - Converts ASCII date/time string to binary string.
CALDAT - Converts Julian date to month, day, year.
CALENDAR - Displays a calendar for a given month or year.
JULDAY - Returns Julian Day Number for given month, day, and year.
SYSTIME - Returns the current time as either a date/time string, as the number of seconds elapsed since 1 January 1970, or as a Julian date/time value.
TIMEGEN - Returns an array of double-precision floating-point values that represent date/times in terms of Julian values.
Functional Listing

**Functional Listing**

**IDL HandiGuide**

**XYOUTS** - Draws text on currently-selected graphics device.

**ZOOM** - Zooms portions of the display.

**ZOOM_24** - Zooms portions of true-color (24-bit) display.

**Error Handling**

**CATCH** - Intercepts and processes error messages, and continues program execution.

**MESSAGE** - Issues error and informational messages.

**ON_ERROR** - Designates the error recovery method.

**ON_IOERROR** - Declares I/O error exception handler.

**STRMESSAGE** - Returns the text of a given error number.

**Executive Commands**

**.COMPILE** - Compiles programs without running.

**.CONTINUE** - Continues execution of a stopped program.

**.EDIT** - Opens files in editor windows of the IDLDE (Windows and Motif only).

**.FULL_RESET_SESSION** - Does everything .RESET_SESSION does, plus additional reset tasks such as unloading sharable libraries.

**.GO** - Executes previously-compiled main program.

**.OUT** - Continues execution until the current routine returns.

**.RESET_SESSION** - Resets much of the state of an IDL session without requiring the user to exit and restart the IDL session.

**.RETURN** - Continues execution until RETURN statement.

**.RNEW** - Erases main program variables and then does .RUN.

**.RUN** - Compiles and executes IDL commands from files or keyboard.

**.SKIP** - Skips over the next $n$ statements and then single steps.

**.STEP** - Executes one or $n$ statements from the current position.

**.STEPOVER** - Executes a single statement if the statement doesn’t call a routine.

**.TRACE** - Similar to .CONTINUE, but displays each line of code before execution.

**External Linking**

**CALL_EXTERNAL** - Calls a function in an external sharable object and returns a scalar value.

**DLM_LOAD** - Explicitly causes a DLM to be loaded.

**LINKIMAGE** - Merges routines written in other languages with IDL at run-time.

**MAKE_DLL** - Compiles and links sharable libraries (DLLs) for Unix, VMS, and Windows.

**Font Manipulation**

**EFONT** - Interactive vector font editor and display tool.

**PS_SHOW_FONTS** - Displays all the PostScript fonts that IDL knows about.

**PSAFM** - Converts Adobe Font Metrics file to IDL format.

**SHOWFONT** - Displays a TrueType or vector font

**XFONT** - Creates modal widget to select and view an X Windows font.

**Help Routines**

**?** - Invokes the IDL Online Help facility when entered at the IDL command line.

**DOC_LIBRARY** - Extracts documentation headers from IDL programs.

**HELP** - Provides information about the current IDL session.

**MEMORY** - Returns information about dynamic memory currently in use by the IDL session.

**MK_HTML_HELP** - Converts text documentation headers to HTML files.

**ONLINE_HELP** - Invokes hypertext help viewer from programs.

**STRUCT_HIDE** - Prevents the IDL HELP procedure from displaying information about structures or objects.

**Image Processing**

**Contrast Enhancement and Filtering**

**ADAPT_HIST_EQUAL** - Performs adaptive histogram equalization

**BYTSCL** - Scales all values of an array into range of bytes.

**CONVOL** - Convolves two vectors or arrays.

**DIGITAL_FILTER** - Calculates coefficients of a non-recursive, digital filter.

**FFT** - Returns the Fast Fourier Transform of an array.

**HILBERT** - Constructs a Hilbert transform.

**HIST_EQUAL** - Histogram-equalizes an image.

**LEEFILTER** - Performs the Lee filter algorithm on an image array.

**MEDIAN** - Returns the median value of Array or applies a median filter.

**ROBERTS** - Returns an approximation of Roberts edge enhancement.

**SMOOTH** - Smooths with a boxcar average.

**SOBEL** - Returns an approximation of Sobel edge enhancement.

**See Also** - Wavelet Toolkit

**Feature Extraction/Image Segmentation**

**CONTOUR** - Draws a contour plot.

**DEFROI** - Defines an irregular region of interest of an image.

**HISTOGRAM** - Computes the density function of an array.

**HOUGH** - Returns the Hough transform of a two-dimensional image.

**IMAGE_STATISTICS** - Computes sample statistics for a given array of values.
**ISOCONTOUR** - Interprets the contouring algorithm found in the IDLgrContour object.

**ISOSURFACE** - Returns topologically consistent triangles by using oriented tetrahedral decomposition.

**LABEL_REGION** - Labels regions (blobs) of a bi-level image.

**MAX** - Returns the value of the largest element of Array.

**MEDIAN** - Returns the median value of Array or applies a median filter.

**MIN** - Returns the value of the smallest element of Array.

**PROFILES** - Interactively examines image profiles.

**RADON** - Returns the Radon transform of a two-dimensional image.

**SEARCH2D** - Finds “objects” or regions of similar data within a 2D array.

**THIN** - Returns the “skeleton” of a bi-level image.

**UNIQ** - Returns subscripts of the unique elements in an array.

**WATERSHED** - Applies the morphological watershed operator to a grayscale image.

**WHERE** - Returns subscripts of nonzero array elements.

### Image Display

**DISSOLVE** - Provides a digital “dissolve” effect for images.

**LIVE_IMAGE** - Displays visualizations using a GUI.

**RDPIX** - Interactively displays image pixel values.

**SLIDE_IMAGE** - Creates a scrolling graphics window for examining large images.

**TV** - Displays an image.

**TVCRS** - Manipulates the image display cursor.

**TVSCL** - Loads display color tables.

**XOBJVIEW** - Displays object viewer widget.

**ZOOM** - Zooms portions of the display.

**ZOOM_24** - Zooms portions of true-color (24-bit) display.

### Image Geometry Transformations

**CONGRID** - Resamples an image to any dimensions.

**EXPAND** - Shrinks/expands image using bilinear interpolation.

**EXTRAC** - Returns sub-matrix of input array. Array operators (e.g., *, and :) should usually be used instead.

**INTERPOLATE** - Returns an array of interpolates.

**INVERT** - Computes the inverse of a square array.

**POLY_2D** - Performs polynomial warping of images.

**POLYWARP** - Performs polynomial spatial warping.

**REBIN** - Resizes a vector or array by integer multiples.

**REFORM** - Changes array dimensions without changing the total number of elements.

**REVERSE** - Reverses the order of one dimension of an array.

**ROT** - Rotates an image by any amount.

**ROTATE** - Rotates/transposes an array in multiples of 90 degrees.

### Morphological Image Operators

**DILATE** - Implements morphologic dilation operator on binary and grayscale images.

**ERODE** - Implements the erosion operator on binary and grayscale images and vectors.

**LABEL_REGION** - Labels regions (blobs) of a bi-level image.

**MORPH_CLOSE** - Applies closing operator to binary or grayscale image.

**MORPH_DISTANCE** - Estimates N-dimensional distance maps, which contain for each foreground pixel the distance to the nearest background pixel, using a given norm.

**MORPH_GRADIENT** - Applies the morphological gradient operator to a grayscale image.

**MORPH_HITORMISS** - Applies the hit-or-miss operator to a binary image.

**MORPH_OPEN** - Applies the opening operator to a binary or grayscale image.

**MORPH_THIN** - Performs a thinning operation on binary images.

**MORPH_TOPHAT** - Applies top-hat operator to a grayscale image.

**WATERSHED** - Applies the morphological watershed operator to a grayscale image.

### Regions of Interest

**CW_DEFROI** - Creates compound widget used to define region of interest.

**DEFCROI** - Defines an irregular region of interest of an image.

**DRAW_ROI** - Draws region or group of regions to current Direct Graphics device.

**IDLanROI** - Represents a region of interest.

**IDLanROIGroup** - Analytical representation of a group of regions of interest.

**IDLgrROI** - Object graphics representation of a region of interest.

**IDLgrROIGroup** - Object Graphics representation of a group of regions of interest.

**LABEL_REGION** - Labels regions (blobs) of a bi-level image.

### Input/Output

**ASCII_TEMPLATE** - Presents a GUI that generates a template defining an ASCII file format.

**ASSOC** - Associates an array structure with a file.

**BINARY_TEMPLATE** - Presents a GUI for interactively generating a template structure for use with READ_BINARY.

**CDF Routines** - Common Data Format routines.

**CLOSE** - Closes the specified files.

**DIALOG_READ_IMAGE** - Presents GUI for reading image files.

**DIALOG_WRITE_IMAGE** - Presents GUI for writing image files.
EOF • Tests the specified file for the end-of-file condition.

EOS Routines • HDF-EOS (Hierarchical Data Format-Earth Observing System) routines.

FILEPATH • Returns full path to a file in the IDL distribution.

FINDFILE • Finds all files matching given file specification.

FLUSH • Flushes file unit buffers.

FREE_LUN • Frees previously-reserved file units.

FSTAT • Returns information about a specified file unit.

GET_KBRD • Gets one input IDL character.

GET_LUN • Reserves a logical unit number (file unit).

HDF Routines • Hierarchical Data Format routines.

HDF_BROWSER • Opens GUI to view contents of HDF, HDF-EOS, or NetCDF file.

HDF_READ • Extracts HDF, HDF-EOS, and NetCDF data and metadata into an output structure.

IDLffDICOM • Contains the data for one or more images embedded in a DICOM part 10 file.

IDLffDXF • Object that contains geometry, connectivity, and attributes for graphics primitives.

IDLffShape • Contains geometry, connectivity and attributes for graphics primitives accessed from ESRI Shapefiles.

IOCTL • Performs special functions on UNIX files.

MPEG_CLOSE • Closes an MPEG sequence.

MPEG_OPEN • Opens an MPEG sequence.

MPEG_PUT • Inserts an image array into an MPEG sequence.

MPEG_SAVE • Saves an MPEG sequence to a file.

NCDF Routines • Network Common Data Format routines.

OPEN • Opens files for reading, updating, or writing.

POINT_LUN • Sets or gets current position of the file pointer.

PRINT/PRINTF • Writes formatted output to screen or file.

READ/READF • Reads formatted input from keyboard or file.

READ_ASCII • Reads data from an ASCII file.

READ_BINARY • Reads the contents of a binary file using a passed template or basic command line keywords.

READ_BMP • Reads Microsoft Windows bitmap file (.BMP).

READ_DICOM • Reads a visualization.

READ_IMAGE • Reads X11 bitmap file.

READ_JPEG • Reads JPEG file.

READ_NRIF • Writes NCAR Raster Interchange Format rasterfile.

READ_PICT • Writes Macintosh PICT (version 2) bitmap file.

READ_PNG • Reads Portable Network Graphics (PNG) file.

READ_PPM • Writes PPM (true-color) or PGM (gray scale) file.

READ_SRF • Writes Sun Raster File (SRF).

READ_SYLK • Writes SYLK (Symbolic Link) spreadsheet file.

READ_TIFF • Writes TIFF file with 1 to 3 channels.

READ_WAV • Reads Wavefront Advanced Visualizer file.

READ_X11_BITMAP • Reads an X11 bitmap file.

READ_XWD • Reads X Windows Dump file.

READS • Reads formatted input from a string variable.

REDAU • Reads unformatted binary data from a file.

REWIND (VMS only) • Rewinds tape on designated IDL tape unit.

SKIPF • Skips records or files on the designated magnetic tape unit.

SOCKET • Opens a client-side TCP/IP Internet socket as an IDL file unit.

TAPRD • Reads the next record on a tape.

TAPWRT • Writes data to a tape.

TVRD • Reads an image from a window into a variable.

WEOF • Writes an end-of-file mark on the designated tape unit.

WRITE_BMP • Writes Microsoft Windows Version 3 device independent bitmap file (.BMP).

WRITE_IMAGE • Writes an image and its color table vectors, if any, to a file of a specified type.

WRITE_JPEG • Writes JPEG file.

WRITE_NRIF • Writes NCAR Raster Interchange Format rasterfile.

WRITE_PICT • Writes Macintosh PICT (version 2) bitmap file.

WRITE_PNG • Writes Portable Network Graphics (PNG) file.

WRITE_PPM • Writes PPM (true-color) or PGM (gray scale) file.

WRITE_SRF • Writes Sun Raster File (SRF).

WRITE_SYLK • Writes SYLK (Symbolic Link) spreadsheet file.

WRITE_TIFF • Writes TIFF file with 1 to 3 channels.

WRITE_WAV • Writes the audio stream to the named .WAV file.

WRITE_WAVE • Writes Wavefront Advanced Visualizer (.WAV) file.

WRITEEU • Writes unformatted binary data to a file.

VAX_FLOAT • Determines the default value for the VAX_FLOAT keyword to the OPEN procedures, or if an open file unit has the VAX_FLOAT attribute set.

Language Catalogs

IDLffLanguageCat • Provides an interface to IDL language catalog files.

LOCAL_GET • Returns the current locale of the operating platform.

MSG_CAT_CLOSE • Closes a catalog file from the stored cache.

MSG_CAT_COMPILE • Creates an IDL language catalog file.

MSG_CAT_OPEN • Returns a catalog object for the given parameters if found.

Live Routines

LIVE_CONTOUR • Displays contour plots using a GUI.

LIVE_CONTROL • Sets the properties of a visualization in a LIVE tool from the IDL command line.

LIVE_DESTROY • Destroys a window visualization or an element in a visualization.

LIVE_EXPORT • Exports visualization or window to a file.
**LIVE_IMAGE** - Displays visualizations using a GUI.

**LIVE_INFO** - Gets the properties of a LIVE tool.

**LIVE_LINE** - Provides an interface for line annotation.

**LIVE_LOAD** - Loads into memory the complete set of routines necessary to run all LIVE tools.

**LIVE_OPLOT** - Inserts data into pre-existing plots.

**LIVE_PLOT** - Displays a plot using a GUI.

**LIVE_PRINT** - Prints a given window to the printer.

**LIVE_RECT** - Provides an interface for insertion of rectangles.

**LIVE_STYLE** - Controls style settings for a LIVE tool.

**LIVE_SURFACE** - Displays a surface using a GUI.

**LIVE_TEXT** - Provides an interface for text annotation.

### Mapping

**LL_ARC_DISTANCE** - Returns the longitude and latitude of a point given arc distance and azimuth.

**MAP_2POINTS** - Returns distance, azimuth, and path relating to the great circle or rhumb line connecting two points on a sphere.

**MAP_CONTINENTS** - Draws continental boundaries, filled continents, political boundaries, coastlines, and/or rivers, over an existing map projection established by MAP_SET.

**MAP_GRID** - Draws parallels and meridians over a map projection.

**MAP_IMAGE** - Returns an image warped to fit the current map projection. (Use when map data is larger than the display).

**MAP_PATCH** - Returns an image warped to fit the current map projection. (Use when map data is smaller than the display).

**MAP_PROJ_INFO** - Returns information about current map and/or the available projections.

**MAP_SET** - Establishes map projection type and limits.

### Mathematics

#### Complex Numbers

**COMPLEX** - Converts argument to complex type.

**CONJ** - Returns the complex conjugate of X.

**DCOMPLEX** - Converts argument to double-precision complex type.

**IMAGINARY** - Returns the imaginary part of a complex value.

### Correlation Analysis

**A_CORRELATE** - Computes autocorrelation.

**C_CORRELATE** - Computes cross correlation.

**CORRELATE** - Computes the linear Pearson correlation.

**M_CORRELATE** - Computes multiple correlation coefficient.

**P_CORRELATE** - Computes partial correlation coefficient.

**R_CORRELATE** - Computes rank correlation.

### Curve and Surface Fitting

**COMFIT** - Fits paired data using one of six common filtering functions.

**CRVLENGTH** - Computes the length of a curve.

**CURVEFIT** - Fits multivariate data with a user-supplied function.

**GAUSS2DFIT** - Fits a 2D elliptical Gaussian equation to rectilinearly gridded data.

**GAUSSFIT** - Fits the sum of a Gaussian and a quadratic.

**GRID_TPS** - Uses thin plate splines to interpolate a set of values over a regular 2D grid, from irregularly sampled data values.

**KRG2D** - Interpolates set of points using kriging.

**LADFIT** - Fits paired data using least absolute deviation method.

**LINFIT** - Fits by minimizing the Chi-square error statistic.

**LMFIT** - Does a non-linear least squares fit.

**MIN_CURVE_SURF** - Interpolates points with a minimum curvature surface or a thin-plate-spline surface. Useful with CONTOUR.

**POLY_FIT** - Performs a least-square polynomial fit.

**REGRESS** - Computes fit using multiple linear regression.

**SFIT** - Performs polynomial fit to a surface.

**SVDFIT** - Multivariate least squares fit using SVD method.

**TRIGRID** - Interpolates irregularly-gridded data to a regular grid from a triangulation.

### Differentiation and Integration

**CRVLENGTH** - Computes the length of a curve.

**DERIV** - Performs differentiation using 3-point Langrangian interpolation.

**DERIVSIG** - Computes standard deviation of derivative found by DERIV.

**INT_2D** - Computes the double integral of a bivariate function.

**INT_3D** - Computes the triple integral of a trivariate function.

**INT_TABULATED** - Integrates a tabulated set of data.

**LSODE** - Advances a solution to a system of ordinary differential equations one time-step H.

**QROMB** - Evaluates integral over a closed interval.

**QROMO** - Evaluates integral over an open interval.

**QSIMP** - Evaluates integral using Simpson’s rule.

**RK4** - Solves differential equations using fourth-order Runge-Kutta method.

### Eigenvalues and Eigenvectors

**EIGENQL** - Computes eigenvalues and eigenvectors of a real, symmetric array.

**EIGENVEC** - Computes eigenvectors of a real, non-symmetric array.

**ELMHES** - Reduces nonsymmetric array to upper Hessenberg form.

**HQR** - Returns all eigenvalues of an upper Hessenberg array.

**TRIQL** - Determines eigenvalues and eigenvectors of tridiagonal array.

**TRIRED** - Reduces a real, symmetric array to tridiagonal form.
Gridding and Interpolation

**BILINEAR** - Computes array using bilinear interpolation.
**GRID_TPS** - Uses thin plate splines to interpolate a set of values over a regular 2D grid, from irregularly sampled data values.
**GRID3** - Creates a regularly-gridded 3D dataset from a set of scattered 3D nodes.
**INTERPOL** - Performs linear interpolation on vectors.
**INTERPOLATE** - Returns an array of interpolates.
**KRIG2D** - Interpolates set of points using kriging.
**MIN_CURVE_SURF** - Interpolates points with a minimum curvature surface or a thin-plate-spline surface. Useful with CONTOUR.
**POLAR_SURFACE** - Interpolates a surface from polar coordinates to rectangular coordinates.
**SPH_SCAT** - Performs spherical gridding.
**SPL_INIT** - Establishes the type of interpolating spline.
**SPL_INTERP** - Performs cubic spline interpolation (Numerical Recipies).
**SPLINE** - Performs cubic spline interpolation.
**SPLINE_P** - Performs parametric cubic spline interpolation.
**TRI_SURF** - Interpolates gridded set of points with a smooth quintic surface.
**TRIANGULATE** - Constructs Delaunay triangulation of a planar set of points.
**TRIGRID** - Interpolates irregularly-gridded data to a regular grid from a triangulation.
**VALUE_LOCATE** - Finds the intervals within a given monotonic vector that brackets a given set of one or more search values.

Mathematical Error Assessment

**CHECK_MATH** - Returns and clears accumulated math error status.
**FINITE** - Returns True if its argument is finite.
**MACHAR** - Determines and returns machine-specific parameters affecting floating-point arithmetic.

Miscellaneous Math Routines

**ABS** - Returns the absolute value of X.
**CEIL** - Returns the closest integer greater than or equal to X.
**CIR_3PNT** - Returns radius and center of circle, given 3 points.
**COMPLEXROUND** - Rounds a complex array.
**DIST** - Creates array with each element proportional to its frequency.
**EXP** - Returns the natural exponential function of given expression.
**FLOOR** - Returns closest integer less than or equal to argument.
**IMAGINARY** - Returns the imaginary part of a complex value.
**ISHFT** - Performs integer bit shift.
**LEEFILT** - Performs the Lee filter algorithm on an image array.
**MATRIX_MULTIPLY** - Calculates the IDL matrix-multiply operator (#) of two (possibly transposed) arrays.
**PNT_LINE** - Returns the perpendicular distance between a point and a line.
**POLY_AREA** - Returns the area of a polygon given the coordinates of its vertices.
**PRIMES** - Computes the first K prime numbers.
**ROUND** - Returns the integer closest to its argument.
**SPH_4PNT** - Returns center and radius of a sphere given 4 points.
**SQRT** - Returns the square root of X.
**TOTAL** - Sums of the elements of an array.
**VOIGT** - Calculates intensity of atomic absorption line (Voigt) profile.
Multivariate Analysis

CLUST_WTS - Computes cluster weights of array for cluster analysis.
CLUSTER - Performs cluster analysis.
CTI_TEST - Performs chi-square goodness-of-fit test.
KW_TEST - Performs Kruskal-Wallis H-test.
M_CORRELATE - Computes multiple correlation coefficient.
P_CORRELATE - Computes partial correlation coefficient.
PCOMP - Computes principal components/derived variables.
STANDARDIZE - Computes standardized variables.

Nonlinear Equations

BROYDEN - Solves nonlinear equations using Broyden’s method.
FX_ROOT - Computes real and complex roots of a univariate nonlinear function using an optimal Müller’s method.
FZ_ROOTS - Finds the roots of a complex polynomial using Laguerre’s method.
NEWTON - Solves nonlinear equations using Newton’s method.

Optimization

AMOEBA - Minimizes a function using downhill simplex method.
CONSTRAINED_MIN - Minimizes a function using Generalized Reduced Gradient Method.
DFPMIN - Minimizes a function using Davidson-Fletcher-Powell method.
POWELL - Minimizes a function using the Powell method.

Probability

BINOMIAL - Computes binomial distribution function.
CHISQR_CVF - Computes cutoff value in a Chi-square distribution.
CHISQR_PDF - Computes Chi-square distribution function.
F_CVF - Computes the cutoff value in an F distribution.
F_PDF - Computes the F distribution function.
GAUSS_CVF - Computes cutoff value in Gaussian distribution.
GAUSS_PDF - Computes Gaussian distribution function.
GAUSSINT - Returns integral of Gaussian probability function.
T_CVF - Computes the cutoff value in a Student’s t distribution.
T_PDF - Computes Student’s t distribution.

Sparse Arrays

FULSTR - Restores a sparse matrix to full storage mode.
LINBCG - Solves a set of sparse linear equations using the iterative biconjugate gradient method.
READ_SPR - Reads a row-indexed sparse matrix from a file.
SPRSAB - Performs matrix multiplication on sparse matrices.
SPRSAX - Multiplies sparse matrix by a vector.
SPRSIN - Converts matrix to row-index sparse matrix.
SPRSTP - Constructs the transpose of a sparse matrix.
WRITE_SPR - Writes row-indexed sparse array structure to a file.

Special Math Functions

BESELI - Returns the I Bessel function of order N for X.
BESELJ - Returns the J Bessel function of order N for X.
BESELK - Returns the K Bessel function of order N for X.
BESELY - Returns the Y Bessel function of order N for X.
BETA - Returns the value of the beta function.
ERRORF - Returns the value of an error function.
EXPINT - Returns the value of the exponential integral.
GAMMA - Returns the gamma function of X.
IBETA - Computes the incomplete beta function.
IGAMMA - Computes the incomplete gamma function.
LAGUERRE - Returns value of the associated Laguerre polynomial.
LEGENDRE - Returns value of the associated Legendre polynomial.
LNGAMMA - Returns logarithm of the gamma function of X.
POLY - Evaluates polynomial function of a variable.
SPHER_HARM - Returns value of the spherical harmonic function.

Statistical Fitting

COMFIT - Fits paired data using one of six common filtering functions.
CURVEFIT - Fits multivariate data with a user-supplied function.
FUNCT - Evaluates the sum of a Gaussian and a 2nd-order polynomial and optionally returns the value of its partial derivatives.
LADFIT - Fits paired data using least absolute deviation method.
LINFIT - Fits by minimizing the Chi-square error statistic.
REGRESS - Multiple linear regression.
SVDFIT - Multivariate least squares fit using SVD method.

Statistical Tools

FACTORIAL - Computes the factorial N!.
HIST_2D - Returns histogram of two variables.
HISTOGRAM - Computes the density function of an array.
KURTOSIS - Computes statistical kurtosis of n-element vector.
MAX - Returns the value of the largest element of an array.
MEAN - Computes the mean of a numeric vector.
MEANABSDEV - Computes the mean absolute deviation of a vector.
MEDIAN - Returns the median value of Array or applies a median filter.
MIN - Returns the value of the smallest element of an array.
MOMENT - Computes mean, variance, skewness, and kurtosis.
RANDOM - Returns normally-distributed pseudo-random numbers.
RANDOMU - Returns uniformly-distributed pseudo-random numbers.
RANKS - Computes magnitude-based ranks.
SKEWNESS - Computes statistical skewness of an n-element vector.
SORT - Returns the indices of an array sorted in ascending order.
STDDEV - Computes the standard deviation of an n-element vector.
TOTAL - Sums of the elements of an array.
VARIANCE - Computes the statistical variance of an n-element vector.
**Time-Series Analysis**

- **A_CORRELATE** - Computes autocorrelation.
- **C_CORRELATE** - Computes cross correlation.
- **SMOOTH** - Smooths with a boxcar average.
- **TS_COEF** - Computes the coefficients for autoregressive time-series.
- **TS_DIFF** - Computes the forward differences of a time-series.
- **TS_SMOOTH** - Computes moving averages of a time-series.

**Transcendental Functions**

- **ACOS** - Returns the arc-cosine of \( X \).
- **ALOG** - Returns the natural logarithm of \( X \).
- **ALOG10** - Returns the logarithm to the base 10 of \( X \).
- **ASIN** - Returns the arc-sine of \( X \).
- **ATAN** - Returns the arc-tangent of \( X \).
- **COS** - Returns the cosine of \( X \).
- **COSH** - Returns the hyperbolic cosine of \( X \).
- **EXP** - Returns the natural exponential function of a given expression.
- **SIN** - Returns the trigonometric sine of \( X \).
- **SINH** - Returns the hyperbolic sine of \( X \).
- **TAN** - Returns the tangent of \( X \).
- **TANH** - Returns the hyperbolic tangent of \( X \).

**Transforms**

- **BLK_CON** - Convolves input signal with impulse-response sequence.
- **CHEBYSHEV** - Returns the forward or reverse Chebyshev polynomial expansion.
- **CONVOL** - Convolves two vectors or arrays.
- **FFT** - Returns the Fast Fourier Transform of an array.
- **HILBERT** - Constructs a Hilbert transform.
- **HOUGH** - Returns the Hough transform of a two-dimensional image.
- **RADON** - Returns the Radon transform of a two-dimensional image.
- **WTN** - Returns wavelet transform of the input array.

**Performance Testing**

- **TIME_TEST2** - Performs speed benchmarks for IDL.
- **PROFILER** - Accesses the IDL Code Profiler used to analyze performance of applications.

**Plotting**

- **AXIS** - Draws an axis of the specified type and scale.
- **BAR_PLOT** - Creates a bar graph.
- **ERRPLOT** - Plots error bars over a previously drawn plot.
- **OPLLOT** - Plots vector data over a previously-drawn plot.
- **OPLLOTERR** - Draws error bars over a previously drawn plot.
- **PLOT** - Plots vector arguments as X versus Y graphs.
- **PLOT_3DBOX** - Plots function of two variables inside 3D box.
- **PLOT_FIELD** - Plots a 2D field using arrows.
- **PLOTERR** - Plots individual data points with error bars.
- **PLOTS** - Plots vectors and points.
- **POLYFILL** - Fills the interior of a polygon.

**Operating System Access**

- **CALL_EXTERNAL** - Calls a function in an external sharable object and returns a scalar value.
- **CD** - Sets and/or changes the current working directory.
- **DELETE_SYMBOL (VMS Only)** - Deletes a DCL interpreter symbol for the current process.
- **DELLOG (VMS Only)** - Deletes a VMS logical name.
- **DO_APPLE_SCRIPT** - Compiles, executes AppleScript code.
- **FILE_CHMOD** - Changes file access permissions.
- **FILE_DELETE** - Deletes files and empty directories.
- **FILE_EXPAND_PATH** - Fully qualifies file and directory paths.
- **FILE_MKDIR** - Creates directories.
- **FILE_TEST** - Tests a file or directory for existence and other specific attributes.
- **FILE_WHICH** - Searches for a specified file in a directory search path.
- **GET_DRIVE_LIST (Windows/Mac only)** - Returns string array of the names of valid drives/volumes for the file system.
- **GET_SCREEN_SIZE** - Returns dimensions of the screen.
- **GET_SYMBOL (VMS Only)** - Returns value of a VMS DCL interpreter symbol.
- **GETENV** - Returns the value of an environment variable.
- **GETLOG** - Returns the value of an environment variable.
- **SET_SYMBOL (VMS Only)** - Defines a VMS DCL interpreter symbol.
- **SETENV (UNIX/Windows Only)** - Adds or changes an environment variable.
- **GETLOG** - Defines a VMS logical name.
- **SETUP_KEYS** - Sets function keys for UNIX versions of IDL.
- **SPAWN** - Spawns child process for access to operating system.
- **TRNLOG (VMS Only)** - Searches the VMS logical name tables for a specified logical name.
POLYFILLV - Returns subscripts of pixels inside a polygon.
PROFILE - Extracts a profile from an image.
PROFILES - Interactively examines image profiles.
THREED - Plots a 2D array as a pseudo 3D plot.
TRIANGULATE - Constructs Delaunay triangulation of a planar set of points.
TRIGRID - Interpolates irregularly-gridded data to a regular grid from a triangulation.
USERSYM - Defines a new plotting symbol.
VEL - Draws a velocity (flow) field with streamlines.
VELOTECT - Draws a 2D velocity field plot.
WF_DRAW - Draws weather fronts with smoothing.
XPLT3D - Utility for creating and interactively manipulating 3D plots.
XYOUTS - Draws text on currently-selected graphics device.

Programming and IDL Control

ARG_PRESENT - Returns TRUE if the value of the specified variable can be passed back to the caller.
BREAKPOINT - Sets and clears breakpoints for debugging.
BYTEORDER - Converts between host and network byte ordering.
CALL_FUNCTION - Calls an IDL function.
CALL_METHOD - Calls an IDL object method.
CALL_PROCEDURE - Calls an IDL procedure.
CATCH - Declares and clears exception handlers.
CREATE_STRUCT - Creates and concatenates structures.
DEFINE_KEY - Programs keyboard function keys.
DEFSYSV - Creates a new system variable.
EXECUTE - Compiles, executes IDL statements contained in a string.
EXIT - Quits IDL and exits back to the operating system.
EXPAND_PATH - Expands path-definition string into full path name for use with the !PATH system variable.
HEAP_GC - Performs “garbage collection” on heap variables.
KEYWORD_SET - Returns True if given expression is defined and nonzero or an array.
LMGR - Determines the type of license used by the current IDL session.
MESSAGE - Issues error and informational messages.
N_ELEMENTS - Returns the number of elements contained in an expression or variable.
N_PARAMS - Returns the number of non-keyword parameters used in calling an IDL procedure or function.
N_TAGS - Returns the number of tags in a structure.
OBJ_CLASS - Determines the class name of an object.
OBJ_DESTROY - Destroys an object reference.
OBJ_ISA - Determines inheritance relationship of an object.
OBJ_NEW - Creates an object reference.
OBJ_VALID - Verifies validity of object references.
ON_ERROR - Designates the error recovery method.
ON_IOERROR - Declares I/O error exception handler.
PTR_FREE - Destroys a pointer.
PTR_NEW - Creates a pointer.
PTR_VALID - Verifies the validity of pointers.
PTRARR - Creates an array of pointers.
RECALL_COMMANDS - Returns entries in IDL’s command recall buffer.
RESOLVE_ALL - Compiles any uncompiled routines.
RESOLVE_ROUTINE - Compiles a routine.
RETAILL - Returns control to the main program level.
RETURN - Returns control to the next-higher program level.
ROUTINE_INFO - Provides information about compiled procedures and functions.
SETUP_KEYS - Sets function keys for UNIX versions of IDL.
STOP - Stops the execution of a running program or batch file.
STRMESSAGE - Returns the text of a given error number.
STRUCT_ASSIGN - Uses “Relaxed Structure Assignment” to copy structures.
STRUCT_HIDE - Prevents the IDL HELP procedure from displaying information about structures or objects.
SWAP_ENDIAN - Reverses the byte ordering of scalars, arrays or structures.
TAG_NAMES - Returns the names of tags in a structure.
TEMPORARY - Returns a temporary copy of a variable, and sets the original variable to “undefined”.
WAIT - Suspends execution of an IDL program for a specified period.

Query Routines

QUERY_BMP - Obtains information about a BMP image file.
QUERY_DICOM - Tests file for compatibility with READ_DICOM.
QUERY_IMAGE - Determines if a file is recognized as an image file.
QUERY_JPEG - Obtains information about a JPEG image file.
QUERY_PICT - Obtains information about a PICT image file.
QUERY_PNG - Obtains information about a PNG image file.
QUERY_PPM - Obtains information about a PPM image file.
QUERY_SRF - Obtains information about an SRF image file.
QUERY_TIFF - Obtains information about a TIFF image file.
QUERY_WAV - Checks that the file is actually a .WAV file and that the READ_WAV function can read the data in the file.

Signal Processing

A_CORRELATE - Computes autocorrelation.
BLK_CON - Convolves input signal with impulse-response sequence.
C_CORRELATE - Computes cross correlation.
CONVOL - Convolves two vectors or arrays.
CORRELATE - Computes the linear Pearson correlation.
DIGITAL_FILTER - Calculates coefficients of a non-recursive, digital filter.

FFT - Returns the Fast Fourier Transform of an array.

HANNING - Creates Hanning and Hamming windows.

HILBERT - Constructs a Hilbert transform.

INTERPOL - Performs linear interpolation on vectors.

LEEFILT - Performs the Lee filter algorithm on an image array.

M_CORRELATE - Computes multiple correlation coefficient.

MEDIAN - Returns median value of an array or applies a median filter.

P_CORRELATE - Computes partial correlation coefficient.

R_CORRELATE - Computes rank correlation.

SAVGOL - Returns coefficients of Savitzky-Golay smoothing filter.

SMOOTH - Smooths with a boxcar average.

TS_COEF - Computes the coefficients for autoregressive time-series.

TS_DIFF - Computes the forward differences of a time-series.

TS_FCAST - Computes future or past values of stationary time-series.

TS_SMOOTH - Computes moving averages of a time-series.

WTN - Returns wavelet transform of the input array.

See Also - Wavelet Toolkit

Saving/Restoring a Session

JOURNAL - Logs IDL commands to a file.IDL.

RESTORE - Restores IDL variables and routines in an IDL SAVE file.

SAVE - Saves variables, system variables, and IDL routines in a file for later use.

String Processing

STRCMP - Compares two strings.

STRCOMPRESS - Removes whitespace from a string.

STREGEX - Performs regular expression matching.

STRJOIN - Collapses a string scalar or array into merged strings.

STRLEN - Returns the length of a string.

STRLOWCASE - Converts a string to lower case.

STRMATCH - Compares search string against input string expression.

STRMID - Extracts a substring from a string.

STRPOS - Finds first occurrence of a substring within a string.

STRPUT - Inserts the contents of one string into another.

STRSPLIT - Splits its input string argument into separate substrings, according to the specified pattern.

STRTRIM - Removes leading and/or trailing blanks from string.

STRUPCASE - Converts a string to upper case.

Structures

REPLICATE - Creates an array of given dimensions, filled with specified value.

STRUCT_ASSIGN - Uses “Relaxed Structure Assignment” to copy structures.

STRUCT_HIDE - Prevents the IDL HELP procedure from displaying information about structures or objects.

Type Conversion

BYTE - Converts argument to byte type.

COMPLEX - Converts argument to complex type.

DCOMPLEX - Converts argument to double-precision complex type.

DOUBLE - Converts argument to double-precision type.

FIX - Converts argument to integer type, or type specified by TYPE keyword.

FLOAT - Converts argument to single-precision floating-point.

LONG - Converts argument to longword integer type.

LONG64 - Converts argument to 64-bit integer type.

STRING - Converts arguments to string type.

UINT - Converts argument to unsigned integer type.

ULONG - Converts argument to unsigned longword integer type.

ULONG64 - Converts argument to unsigned 64-bit integer type.

Utilities

EFONT - Interactive vector font editor and display tool.

SLIDE_IMAGE - Creates a scrolling graphics window for examining large images.

XBM_EDIT - Creates, edits bitmap icons for IDL widget button labels.

XDISPLAYFILE - Displays ASCII text file in scrolling text widget.

XDXF - Utility for displaying and interactively manipulating DXF objects.

XFONT - Creates modal widget to select and view an X Windows font.

XINTERANIMATE - Displays animated sequence of images.

XMTOOL - Displays tool for viewing XMANAGER widgets.

XOBJVIEW - Displays object viewer widget.

XPCOLOR - Adjusts the value of the current foreground plotting color. !P.COLOR.

XPLT3D - Utility for creating and interactively manipulating 3D plots.

XROI - Utility for interactively defining and obtaining information about regions of interest.

XVOLUME - Utility for viewing and interactively manipulating volumes and isosurfaces.
Wavelet Toolkit (optional)

**WV_APPLET** - Runs the IDL Wavelet Toolkit GUI.

**WV_CW_WAVELET** - Compound widget used to select and display wavelet functions.

**WV_DWT** - Returns the multi-dimensional discrete wavelet transform of the input array.

**WV_FN_COIFLET** - Constructs wavelet coefficients for the coiflet wavelet function.

**WV_FN_DAUDBECHIES** - Constructs wavelet coefficients for the Daubechies wavelet function.

**WV_FN_HAAR** - Constructs wavelet coefficients for the Haar wavelet function.

**WV_FN_SYML** - Constructs wavelet coefficients for the symlet wavelet function.

**WV_IMPORT_DATA** - Allows user to add a variable to the currently active WV_APPLET widget from the IDL> command prompt.

**WV_IMPORT_WAVELET** - Allows user to add wavelet functions to the IDL Wavelet Toolkit.

**WV_PLOT3D_WPS** - Runs the GUI for 3D visualization of the wavelet power spectrum.

**WV_PLOT_MULTIRES** - Runs GUI for multiresolution analysis.

**WV_PWT** - Returns the partial wavelet transform of the input vector.

**WV_TOOL_DENOISE** - Runs the GUI for wavelet filtering and denoising.

Widget Routines

**WIDGET_BASE** - Creates base widget (containers for other widgets).

**WIDGET_BUTTON** - Creates button widgets.

**WIDGET_CONTROL** - Realizes, manages, and destroys widgets.

**WIDGET_DRAW** - Creates drawable widgets.

**WIDGET_DROPLIST** - Creates droplist widgets.

**WIDGET_EVENT** - Returns events for the widget hierarchy.

**WIDGET_INFO** - Obtains information about widgets.

**WIDGET_LABEL** - Creates label widgets.

**WIDGET_LIST** - Creates list widgets.

**WIDGET_SLIDER** - Creates slider widgets.

**WIDGET_TABLE** - Creates table widgets.

**WIDGET_TEXT** - Creates text widgets.

**XMANAGER** - Provides event loop manager for IDL widgets.

**XMNG_TMPL** - Template for creating widgets.

**XMTOTOOL** - Displays tool for viewing XMANAGER widgets.

**XREGISTERED** - Returns registration status of a given widget.

Widget Routines, Compound

**CW_ANIMATE** - Creates a compound widget for animation.

**CW_ANIMATE_GET** - Gets pixmap window IDs used by CW_ANIMATE.

**CW_ANIMATE_LOAD** - Loads images into CW_ANIMATE.

**CW_ANIMATE_RUN** - Displays images loaded into CW_ANIMATE.

**CW_ARCBALL** - Creates compound widget for intuitively specifying 3D orientations.

**CW_BGROUP** - Creates button group for use as a menu.

**CW_CLR_INDEX** - Creates compound widget for the selection of a color index.

**CW_COLORSEL** - Creates compound widget that displays all colors in current colormap.

**CW_DEFROI** - Creates compound widget used to define region of interest.

**CW_FIELD** - Creates a widget data entry field.

**CW_FILESEL** - Creates compound widget for file selection.

**CW_FORM** - Creates compound widget for creating forms.

**CW_FSLIDER** - Creates slider that selects floating-point values.

**CW_LIGHT_EDITOR** - Creates compound widget to edit properties of existing IDLgrLight objects in a view.

**CW_LIGHT_EDITOR_GET** - Gets the CW_LIGHT_EDITOR properties.

**CW_LIGHT_EDITOR_SET** - Sets the CW_LIGHT_EDITOR properties.

**CW_PDMENU** - Creates widget pulldown menus.

**CW_RGBSLIDER** - Creates compound widget with sliders for adjusting RGB color values.

**CW_TMPL** - Template for compound widgets that use XMANAGER.

**CW_ZOOM** - Creates widget for displaying zoomed images.

Window Routines

**WINDOW** - Creates window for the display of graphics or text.

**WDELETE** - Deletes IDL graphics windows.

**WSET** - Selects the current window.

**WSHOW** - Exposes or hides the designated window.
IDL Syntax Conventions

Function: \[ \text{Result} = \text{FUNCTION}( \text{Argument1} [, \text{Argument2}] [, \text{KEYWORD1} = \text{value}] [, /\text{KEYWORD2}] ) \]

Procedure: \[ \text{PROCEDURE}, \text{Argument1} [, \text{Argument2}] [, \text{KEYWORD1} = \{ \text{value1} | \text{value2} \}] [, /\text{KEYWORD2}] \]

Statement: \[ \text{IF} \text{expression} \text{THEN} \text{statement} [ \text{ELSE} \text{statement} ] \]

Elements of Syntax

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] (Square brackets)</td>
<td>Indicates that the contents are optional.</td>
</tr>
<tr>
<td>/ / (Italicized square brackets)</td>
<td>Indicates that the square brackets are part of the statement (used to define an array).</td>
</tr>
<tr>
<td>Argument</td>
<td>Arguments are shown in italics, and must be specified in the order listed.</td>
</tr>
<tr>
<td>KEYWORD</td>
<td>Keywords are all caps, and can be specified in any order. For functions, all arguments and keywords must be contained within parentheses.</td>
</tr>
<tr>
<td>/KEYWORD</td>
<td>Indicates a boolean keyword.</td>
</tr>
<tr>
<td>Italic</td>
<td>Indicates arguments, expressions, or statements for which you must provide values.</td>
</tr>
</tbody>
</table>
| { } (Braces)  | • Indicates that you must choose one of the values they contain  
|              | • Encloses a list of possible values, separated by vertical lines ( | )  
|              | • Encloses useful information about a keyword  
|              | • Defines an IDL structure (this is the only case in which the braces are included in the statement). |
| | (Vertical lines) | Separates multiple values or keywords.                                      |
| [, Value\_1, ... , Value\_n] | Indicates that any number of values can be specified.                       |
| [, Value\_1, ... , Value\_8] | Indicates the maximum number of values that can be specified.               |

Square Brackets ([ ])

- Content between square brackets is optional. Pay close attention to the grouping of square brackets. Consider the following examples:

ROUTINE\_NAME, Value\_1 [, Value\_2] [, Value\_3] : You must include Value\_1. You do not have to include Value\_2 or Value\_3. Value\_2 and Value\_3 can be specified independently.

ROUTINE\_NAME, Value\_1 [, Value\_2, Value\_3] : You must include Value\_1. You do not have to include Value\_2 or Value\_3, but you must include both Value\_2 and Value\_3, or neither.

ROUTINE\_NAME [, Value\_1 [, Value\_2]] : You can specify Value\_1 without specifying Value\_2, but if you specify Value\_2, you must also specify Value\_1.
• Do not include square brackets in your statement unless the brackets are italicized. Consider the following syntax:

\[ Result = \text{KRI}G2\text{D}( Z [, X, Y [, \text{BOUNDS}=[x_{\text{min}}, y_{\text{min}}, x_{\text{max}}, y_{\text{max}}]]) \]

An example of a valid statement is:

\[ R = \text{KRI}G2\text{D}( Z, X, Y, \text{BOUNDS}=[0,0,1,1]) \]

• Note that when \([, \text{Value}_1, \ldots, \text{Value}_n] \) is listed, you can specify any number of arguments. When an explicit number is listed, as in \([, \text{Value}_1, \ldots, \text{Value}_8] \), you can specify only as many arguments as are listed.

**Braces ( { } )**

• For certain keywords, a list of the possible values is provided. This list is enclosed in braces, and the choices are separated by a vertical line ( | ). Do not include the braces in your statement. For example, consider the following syntax:

\[ \text{LIVE\_EXPORT} [, \text{QUALITY}={0 | 1 | 2}] \]

In this example, you must choose either 0, 1, or 2. An example of a valid statement is:

\[ \text{LIVE\_EXPORT}, \text{QUALITY}=1 \]

• Braces are used to enclose the allowable range for a keyword value. Unless otherwise noted, ranges provided are inclusive. Consider the following syntax:

\[ Result = \text{CVTTOBM}( \text{Array} [, \text{THRESHOLD}=\text{value} \{0 \text{ to } 255\}] ) \]

An example of a valid statement is:

\[ Result = \text{CVTTOBM}( A, \text{THRESHOLD}=150 ) \]

• Braces are also used to provide useful information about a keyword. For example:

\[ [, \text{LABEL}=n\{\text{label every } n^\text{th} \text{ gridline}\}] \]

Do not include the braces or their content in your statement.

• Certain keywords are prefaced by X, Y, or Z. Braces are used for these keywords to indicate that you must choose one of the values it contains. For example, \([X | Y] \text{RANGE}=\text{array} \] indicates that you can specify either \( \text{XRANGE} = \text{array} \) or \( \text{YRANGE} = \text{array} \).

• Note that in IDL, braces are used to define structures. When defining a structure, you do want to include the braces in your statement.

**Italics**

• Italicized words are arguments, expressions, or statements for which you must provide values. The value you provide can be a numerical value, such as 10, an expression, such as \( \text{DIST}(100) \), or a named variable. For keywords that expect a string value, the syntax is listed as \( \text{KEYWORD} = \text{string} \). The value you provide can be a string, such as 'Hello' (enclosed in single quotation marks), or a variable that holds a string value.

• The italicized values that must be provided for keywords are listed in the most helpful terms possible. For example, \([, \text{XSIZE} = \text{pixels}] \) indicates that the XSIZE keyword expects a value in pixels, while \([, \text{ORIENTATION} = \text{ccw\_degrees\_from\_horiz}] \) indicates that you must provide a value in degrees, measured counter-clockwise from horizontal.
Specifying Keywords

- Certain keywords are boolean, meaning they can be set to either 0 or 1. These keywords are switches used to turn an option on and off. Usually, setting such keywords equal to 1 causes the option to be turned on. Explicitly setting the keyword to 0 (or not including the keyword) turns the option off. All keywords in this reference that are preceded by a slash can be set by prefacing them by the slash. For example, SURFACE, DIST(10), /SKIRT is a shortcut for SURFACE, DIST(10), SKIRT=1. To turn the option back off, you must set the keyword equal to 0, as in SURFACE, DIST(10), SKIRT=0.

In rare cases, a keyword’s default value is 1. In these cases, the syntax is listed as KEYWORD=0, as in SLIDE_IMAGE [. Image] [. CONGRID=0]. In this example, CONGRID is set to 1 by default. If you specify CONGRID=0, you can turn it back on by specifying either /CONGRID or CONGRID=1.

- Some keywords are used to obtain values that can be used upon return from the function or procedure. These keywords are listed as KEYWORD=variable. Any valid variable name can be used for these keywords, and the variable does not need to be defined first. Note, however that when a keyword calls for a named variable, only a named variable can be used—sending an expression causes an error.

For example, the WIDGET_CONTROL procedure can return the user values of widgets in a named variable using the GET_UVALUE keyword. To return the user value for a widget ID (contained in the variable mywidget) in the variable userval, you would use the command:

WIDGET_CONTROL, mywidget, GET_UVALUE = userval

Upon return from the procedure, userval contains the user value. Note that userval did not have to be defined before the call to WIDGET_CONTROL.

- Some routines have keywords that are mutually exclusive, meaning only one of the keywords can be present in a given statement. These keywords are grouped together, and separated by a vertical line. For example, consider the following syntax:

PLOT, [X.] Y [, /DATA | /DEVICE | /NORMAL]

In this example, you can choose either DATA, DEVICE, or NORMAL, but not more than one. An example of a valid statement is:

PLOT, SIN(A), /DEVICE

- Keywords can be abbreviated to their shortest unique length. For example, the XSTYLE keyword can be abbreviated to XST because there are no other keywords in IDL that begin with XST. You cannot shorten XSTYLE to XS, however, because there are other keywords that begin with XS, such as XSIZE.
Alphabetical Listing

The following alphabetical listing contains all IDL functions, procedures, and statements included in IDL version 5.4.

A

A_CORRELATE - Computes autocorrelation.
   \[ Result = A_{\text{CORRELATE}}(X, \text{Lag} [, /\text{COVARIANCE}] [, /\text{DOUBLE}] ) \]

ABS - Returns the absolute value of \( X \).
   \[ Result = \text{ABS}(X) \]

ACOS - Returns the arc-cosine of \( X \).
   \[ Result = \text{ACOS}(X) \]

ADAPT_HIST_EQUAL - Performs adaptive histogram equalization.
   \[ Result = \text{ADAPT}_{\text{HIST}}_{\text{EQUAL}}(\text{Image} [, \text{CLIP}=\text{value}] [, \text{NREGIONS}=\text{nregions}] [, \text{TOP}=\text{value}] ) \]

ALOG - Returns the natural logarithm of \( X \).
   \[ Result = \text{ALOG}(X) \]

ALOG10 - Returns the logarithm to the base 10 of \( X \).
   \[ Result = \text{ALOG10}(X) \]

AMOEBA - Minimizes a function using downhill simplex method.
   \[ Result = \text{AMOEBA}(\text{Ftol} [, \text{FUNCTION}_{\text{NAME}}=\text{string}] [, \text{FUNCTION}_{\text{VALUE}}=\text{variable}] [, \text{NCALLS}=\text{value}] [, \text{NMAX}=\text{value}] [, \text{P0}=\text{vector}] [, \text{SCALE}=\text{vector}] [, \text{SIMPLEX}=\text{array}] ) \]

ANNOTATE - Starts IDL widget used to interactively annotate images and plots with text and drawings.
   \[ \text{ANNOTATE} [, \text{COLOR}_{\text{INDICES}}=\text{array}] [, \text{DRAWABLE}=\text{widget}_{\text{id}}] [, \text{WINDOW}=\text{index}] [, \text{LOAD}_{\text{FILE}}=\text{filename}] /\text{TEK}_{\text{COLORS}} \]

ARG_PRESENT - Returns TRUE if the value of the specified variable can be passed back to the caller.
   \[ Result = \text{ARG}_{\text{PRESENT}}(\text{Variable}) \]

ARRAYEQUAL - Provides a fast way to compare data for equality in situations where the index of the elements that differ are not of interest.
   \[ Result = \text{ARRAY}_{\text{EQUAL}}(\text{Op1} , \text{Op2} [, , /\text{NO}_{\text{TYPE}_{\text{CONV}}}] ) \]

ARROW - Draws line with an arrow head.
   \[ \text{ARROW}, \text{X0}, \text{Y0}, \text{X1}, \text{Y1} [, , /\text{DATA}] [, , /\text{NORMALIZED}] [, \text{HSIZE}=\text{length}] [, \text{COLOR}=\text{index}] [, \text{HTHICK}=\text{value}] [, \text{SOLID}] [, \text{THICK}=\text{value}] \]

ASCII TEMPLATE - Presents a GUI that generates a template defining an ASCII file format.
   \[ Result = \text{ASCII}_{\text{TEMPLATE}}([\text{File}_{\text{name}}] [, \text{BROWSE}]=\text{lines} [, \text{CANCEL}=\text{variable}] [, \text{GROUP}=\text{widget}_{\text{id}}] ) \]

ASIN - Returns the arc-sine of \( X \).
   \[ Result = \text{ASIN}(X) \]

ASSOC - Associates an array structure with a file.
   \[ Result = \text{ASSOC}([\text{Unit}] , \text{Array}_{\text{Structure}} [, \text{Offset}] [, , /\text{PACKED}] ) \]

ATAN - Returns the arc-tangent of \( X \).
   \[ Result = \text{ATAN}(X) \]

AXIS - Draws an axis of the specified type and scale.
   \[ \text{AXIS} [, X [, Y [, Z]]] [, , /\text{SAVE}] [, XAXIS=\{0 \mid 1\}] [, YAXIS=\{0 \mid 1 \mid 2 \mid 3\}] [, , /\text{XLOG}] [, , /\text{YNOZERO}] [, , /\text{YLOG}] [, , /\text{ZLOG}] \]

Graphics Keywords: \[ /\text{CHARSIZE}=\text{value} \]
\[ /\text{CHARTHICK}=\text{integer} \]
\[ /\text{COLOR}=\text{value} \]
\[ /\text{DATA} \]
\[ /\text{DEVICE} \]
\[ /\text{NORMAL} \]
\[ /\text{FONT}=\text{integer} \]
\[ /\text{NODATA} \]
\[ /\text{NOERASE} \]
\[ /\text{SUBTITLE}=\text{string} \]
\[ /\text{T3D} \]
\[ /\text{TICKLEN}=\text{value} \]
\[ /\text{X} \]
\[ /\text{Y} \]
\[ /\text{Z} \]
\[ /\text{CHARSIZE}=\text{value} \]
\[ /\text{GRIDSTYLE}=\text{integer} \]
\[ /\text{STYLE}=\text{integer} \]
\[ /\text{MARGIN}=\{\text{left} \mid \text{right}\} \]
\[ /\text{MINOR}=\text{integer} \]
\[ /\text{RANGE}=\{\text{min} \mid \text{max}\} \]
\[ /\text{STYLE}=\text{value} \]
\[ /\text{THICK}=\text{value} \]
\[ /\text{ TickFORMAT} = \text{string or a vector of strings} \]
\[ /\text{TI CKINTERVALUE}=\text{value} \]
\[ /\text{TICKLAYOUT}=\text{scalar} \]
\[ /\text{TI CKLEN}=\text{value} \]
\[ /\text{TI CKNAME}=\text{string} \]
\[ /\text{TI CKS}=\text{integer} \]
\[ /\text{TI CKUNITS}=\text{string or a vector of strings} \]
\[ /\text{TI CKV}=\text{array} \]
\[ /\text{TI CK_CONTINUE}=\text{variable} \]
\[ /\text{TITLE}=\text{string} \]
\[ /\text{ZVALUE}=\{0 \mid 1\} \]

B

BAR PLOT - Creates a bar graph.
   \[ \text{BAR}_{\text{PLOT}}(\text{Values} [, , /\text{BACKGROUND}=\text{color}_{\text{index}}] [, , /\text{BAR}_{\text{NAME}}=\text{string} \text{array}] [, , /\text{BAROFFSET}=\text{scalar}] [, , /\text{BARSPACE}=\text{scalar}] [, , /\text{BASELINE}=\text{scalar} \text{array}] [, , /\text{BASELINE} \text{vector}] [, , /\text{BAR}_{\text{LENGTH}}=\text{scalar} \text{array}] [, , /\text{BAR}_{\text{SPACE}}=\text{scalar}] [, , /\text{BAR}_{\text{WIDTH}}=\text{scalar}] [, , /\text{BAR}_{\text{SOLID}}=\text{integer}] [, , /\text{BAR}_{\text{SOLID}}=\text{array}] [, , /\text{BAR}_{\text{SOLID}}=\text{vector}] \]

ASCII TEMPLATE

ASCII TEMPLATE - Presents a GUI that generates a template defining an ASCII file format.
   \[ Result = \text{ASCII}_{\text{TEMPLATE}}([\text{Filename}] [, \text{BROWSE}]=\text{lines} [, \text{CANCEL}=\text{variable}] [, \text{GROUP}=\text{widget}_{\text{id}}] ) \]

ASIN - Returns the arc-sine of \( X \).
   \[ Result = \text{ASIN}(X) \]

ASSOC - Associates an array structure with a file.
   \[ Result = \text{ASSOC}([\text{Unit}] , \text{Array}_{\text{Structure}} [, \text{Offset}] [, , /\text{PACKED}] ) \]

ATAN - Returns the arc-tangent of \( X \).
   \[ Result = \text{ATAN}(X) \]

AXIS - Draws an axis of the specified type and scale.
   \[ \text{AXIS} [, X [, Y [, Z]]] [, , /\text{SAVE}] [, XAXIS=\{0 \mid 1\}] [, YAXIS=\{0 \mid 1 \mid 2 \mid 3\}] [, , /\text{XLOG}] [, , /\text{YNOZERO}] [, , /\text{YLOG}] [, , /\text{ZLOG}] \]

Graphics Keywords: \[ /\text{CHARSIZE}=\text{value} \]
\[ /\text{CHARTHICK}=\text{integer} \]
\[ /\text{COLOR}=\text{value} \]
\[ /\text{DATA} \]
\[ /\text{DEVICE} \]
\[ /\text{NORMAL} \]
\[ /\text{FONT}=\text{integer} \]
\[ /\text{NODATA} \]
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\[ /\text{TICKLEN}=\text{value} \]
\[ /\text{X} \]
\[ /\text{Y} \]
\[ /\text{Z} \]
\[ /\text{CHARSIZE}=\text{value} \]
\[ /\text{GRIDSTYLE}=\text{integer} \]
\[ /\text{STYLE}=\text{integer} \]
\[ /\text{MARGIN}=\{\text{left} \mid \text{right}\} \]
\[ /\text{MINOR}=\text{integer} \]
\[ /\text{RANGE}=\{\text{min} \mid \text{max}\} \]
\[ /\text{STYLE}=\text{value} \]
\[ /\text{THICK}=\text{value} \]
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\[ /\text{TICKLAYOUT}=\text{scalar} \]
\[ /\text{TI CKLEN}=\text{value} \]
\[ /\text{TI CKNAME}=\text{string} \]
\[ /\text{TI CKS}=\text{integer} \]
\[ /\text{TI CKUNITS}=\text{string or a vector of strings} \]
\[ /\text{TI CKV}=\text{array} \]
\[ /\text{TI CK_CONTINUE}=\text{variable} \]
\[ /\text{TITLE}=\text{string} \]
\[ /\text{ZVALUE}=\{0 \mid 1\} \]
BEGIN...END - Defines a block of statements.

BREAK - Immediately exits from a loop (FOR, WHILE, REPEAT).

BREAKPOINT - Sets and clears breakpoints for debugging.

CALL_FUNCTION - Calls an IDL function.

CALL_EXTERNAL - Calls a function in an external sharable object and returns a scalar value.

CASE, or SWITCH statement.

BETA - Returns the value of the beta function.

RESULTS = BETA( X, Y )

BYTSL - Scales all values of an array into range of bytes.

RESULTS = BYTSL( Array, Max, Min )

BYTEDATE - Converts ASCII date/time string to binary string.

RESULT = BYTEDATE( Ascii_Time )

BYTEDATE - Converts ASCII date/time string to binary string.

RESULT = BYTEDATE( Ascii_Time )

CALL_FUNCTION - Calls an IDL function.

RESULT = CALL_FUNCTION( Name )

CASE, or SWITCH statement.

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CASE, or SWI...
CALL_METHOD - Calls an IDL object method.
   CALL_METHOD, Name, ObjRef, [ , P_1, ..., P_n] or
   Result = CALL_METHOD(Name, ObjRef, [ , P_1, ..., P_n])

CALL_PROCEDURE - Calls an IDL procedure.
   CALL_PROCEDURE, Name [, P_1, ..., P_n]

CASE - Selects one statement for execution, depending on the value of an expression.
   CASE expression OF
     expression: statement
     ...
   expression: statement
   [ ELSE: statement ]
   ENDCASE

CATCH - Declares and clears exception handlers.
   CATCH, Variable [, /CANCEL]

CD - Sets and/or changes the current working directory.
   CD [, Directory] [, CURRENT=variable]

CDF_* Routines - See “CDF Routines” on page 53.

CEIL - Returns the closest integer greater than or equal to X.
   Result = CEIL( X [, /L64] )

CHEBYSHEV - Returns the forward or reverse Chebyshev polynomial expansion.
   Result = CHEBYSHEV(D, N)

CHECK_MATH - Returns and clears accumulated math error status.
   Result = CHECK_MATH( [ , MASK=bitmap] [, /NOCLEAR] [, /PRINT] )

CHISQR_CVF - Computes cutoff value in a Chi-square distribution.
   Result = CHISQR_CVF(P, Df)

CHISQR_PDF - Computes Chi-square distribution function.
   Result = CHISQR_PDF(V, Df)

CHOLDC - Constructs Cholesky decomposition of a matrix.
   CHOLDC, A, P [, /DOUBLE]

CHOLSOL - Solves set of linear equations (use with CHOLDC).
   Result = CHOLSOL( A, P, B [, /DOUBLE] )

CINDGEN - Returns a complex array with each element set to its subscript.
   Result = CINDGEN(D_1, ..., D_8)

CIR_3PNT - Returns radius and center of circle, given 3 points.
   CIR_3PNT, X, Y, R, X0, Y0

CLOSE - Closes the specified files.
   CLOSE, [ Unit_1, ..., Unit_n ] [, /ALL]
   [ , EXIT STATUS=variable ] [, /FILE] [, /FORCE]

CLUST_WTS - Computes the cluster weights of an array for cluster analysis.
   Result = CLUST_WTS( Array [, /DOUBLE]
   [ , N_CLUSTERS=value ] [ , N_ITERATIONS=integer]
   [ , VARIABLE_WTS=vector] )

CLUSTER - Performs cluster analysis.
   Result = CLUSTER( Array, Weights [, /DOUBLE]
   [ , N_CLUSTERS=value ] )

COLOR_CONVERT - Converts color triples to and from RGB, HLS, and HSV.
   COLOR_CONVERT, I0, I1, I2, O0, O1, O2 [, /HLS_RGB | /HSV_RGB | /RGB_HLS | /RGB_HSV]

COLOR_QUAN - Converts true-color (24-bit) image to pseudo-color (8-bit) image.
   or
   Result = COLOR_QUAN( Image_R, Dim, R, G, B )

   Keywords: [, COLORS=integer[2 to 256]] [, CUBE={2 | 3 | 4 | 5 | 6} | GET_TRANSLATION=variable]
   [, /MAP_ALL] [, /DITHER] [, ERROR=variable]
   [, TRANSLATION=vector]

COLOMAP_APPLICABLE - Determines whether the current visual class supports the use of a colormap.
   Result = COLOMAP_APPLICABLE( redrawRequired )

COMFIT - Fits paired data using one of six common filtering functions.
   Result = COMFIT( X, Y, A [, /EXPONENTIAL | /GEOMETRIC | /GOMPertz | /HYPERBOLIC | /LOGISTIC | /LOGSQUARE]
   [, SIGMA=variable] [, WEIGHTS=vector] [, YFIT=variable] )

COMMON - Creates a common block.
   COMMON Block_Name, Variable_1, ..., Variable_n

COMPILE_OPT - Gives IDL compiler information that changes the default rules for compiling functions or procedures.
   COMPILE_OPT opt_1 [ , opt_2, ..., opt_n]

   Note: opt_n can be IDL2, DEFINT32, HIDDEN, OBSOLETE, or STRICTARR

COMPLEX - Converts argument to complex type.
   Result = COMPLEX( Real [, Imaginary] )
   or
   Result = COMPLEX( Expression, Offset, Dim_1 [ , ..., Dim_m] )

COMPLEXARR - Creates a complex, single-precision, floating-point vector or array.
   Result = COMPLEXARR( D_1, ..., D_8 [, /NOZERO] )

COMPLEXROUND - Rounds a complex array.
   Result = COMPLEXROUND(Input)

COMPUTE_MESH_NORMALS - Computes normal vectors for a set of polygons.
   Result = COMPUTE_MESH_NORMALS( fVerts, iConn )

COND - Computes the condition number of a square matrix.
   Result = COND( A [, /DOUBLE] )

CONGRID - Resamples an image to any dimensions.
   Result = CONGRID( Array, X, Y, Z [, CUBIC=value{-1 to 0}] [, /INTERP] [, /MINUS_ONE] )
CONVOL - Convolves two vectors or arrays.

COS - Returns the cosine of X.

COSH - Returns the hyperbolic cosine of X.

CRAMER - Solves system of linear equations using Cramer’s rule.

CRANE - Solves system of linear equations using Cramer’s rule.

CONVOL - Convolves two vectors or arrays.

CRANE - Solves system of linear equations using Cramer’s rule.

COORD2TO3 - Returns 3D data coordinates given normalized screen coordinates.

CROSSP - Computes vector cross product.

CWTTOBM - Creates a bitmap byte array for a button label.

CREATE_STRUCT - Creates and concatenates structures.

CREATE_VIEW - Sets up 3D transformations.

CURVEFIT - Fits multivariate data with a user-supplied function.

CURVD - Creates and concatenates structures.

CV_COORD - Converts 2D and 3D coordinates between coordinate systems.

CTI_TEST - Performs chi-square goodness-of-fit test.

CURSOR - Returns position of the interactive graphics cursor.

CREATE_STRUCT - Creates and concatenates structures.

CROSSP - Computes vector cross product.

CREATE_VIEW - Sets up 3D transformations.

CURVEFIT - Fits multivariate data with a user-supplied function.

CURVD - Creates and concatenates structures.

CV_COORD - Converts 2D and 3D coordinates between coordinate systems.

CTI_TEST - Performs chi-square goodness-of-fit test.

CURSOR - Returns position of the interactive graphics cursor.

CREATE_STRUCT - Creates and concatenates structures.

CV_COORD - Converts 2D and 3D coordinates between coordinate systems.

CONJ - Returns the complex conjugate of X.

CONVOL - Convolves two vectors or arrays.

CONSTRANMIN - Minimizes a function using Generalized Reduced Gradient Method.

CONTURE - Draws a contour plot.

CONTINUE - Immediately starts the next iteration of the enclosing FOR, WHILE, or REPEAT loop.

CONVERT_COORD - Transforms coordinates to and from the coordinate systems supported by IDL.

CV_COORD - Converts 2D and 3D coordinates between coordinate systems.

CREATE_STRUCT - Creates and concatenates structures.

CREATE_VIEW - Sets up 3D transformations.

CURVEFIT - Fits multivariate data with a user-supplied function.

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CONTURE - Draws a contour plot.

CONTINUE - Immediately starts the next iteration of the enclosing FOR, WHILE, or REPEAT loop.

CONVERT_COORD - Transforms coordinates to and from the coordinate systems supported by IDL.

CV_COORD - Converts 2D and 3D coordinates between coordinate systems.
**CW_ANIMATE_GETP** - Gets pixmap window IDs used by CW_ANIMATE.

```idl```
Result = CW_ANIMATE_GETP, Widget, Pixmaps
[ , /KILL_ALL_ANYWAY]
```idl```

**CW_ANIMATE_LOAD** - Loads images into CW_ANIMATE.

```idl```
Result = CW_ANIMATE_LOAD, Widget [ , /CYCLE]
[ , FRAME=value{0 to NFRAMES} [ , IMAGE=value]
[ , /ORDER] [ , WINDOW=[window_num [ , X0, Y0, Sx, Sy]] [ , XOFFSET=pixels] [ , YOFFSET=pixels]
```idl```

**CW_ANIMATE_RUN** - Displays images loaded into CW_ANIMATE.

```idl```
Result = CW_ANIMATE_RUN, Widget [ , Rate={0 to 100}]
[ , NFRAMES=value] [ , /STOP]
```idl```

**CW_ARCBALL** - Creates compound widget for intuitively specifying 3D orientations.

```idl```
Result = CW_ARCBALL( Parent [, COLORS=array]
[ , /FRAME] [ , LABEL=string] [ , RETAIN={0 | 1 | 2}]
[ , SIZE=pixels] [ , UPDATE] [ , UNAME=string]
[ , UVALUE=value] [ , VALUE=array]
```idl```

**CW_BGROUP** - Creates button group for use as a menu.

```idl```
Result = CW_BGROUP( Parent, Names
[ , BUTTON=UVALUE=array] [ , COLUMN=value]
[ , EVENT_FUNC=string] [ , /EXCLUSIVE]
[ , /NONEXCLUSIVE] [ , /SPACE=pixels] [ , XPAD=pixels]
[ , YPAD=pixels] [ , FONT=font] [ , FRAME=width]
[ , IDS=variable] [ , /FRAME_LEFT] [ , /LABEL_TOP]
[ , /MAP] [ , /NO_RELEASE] [ , /RETURN_ID]
[ , /RETURN_INDEX] [ , /RETURN_NAME] [ , ROW=value]
[ , /SCROLL] [ , X_SCROLL_SIZE=width]
[ , Y_SCROLL_SIZE=height] [ , SET_VALUE=value]
[ , UNAME=string] [ , UVALUE=value]
[ , XOFFSET=value] [ , XSIZE=width]
[ , YOFFSET=value] [ , YSIZE=value]
```idl```

**CW_CLR_INDEX** - Creates compound widget for the selection of a color index.

```idl```
Result = CW_CLR_INDEX( Parent
[ , COLOR_VALUES=vector] [ , NCOLORS=value]
[ , START_COLOR=value]
[ , EVENT_FUNC=\’function_name\’] [ , /FRAME]
[ , LABEL=string] [ , UNAME=string] [ , UVALUE=value]
[ , VALUE=value] [ , XSIZE=pixels] [ , YSIZE=pixels]
```idl```

**CW_COLORSEL** - Creates compound widget that displays all colors in current colormap.

```idl```
Result = CW_COLORSEL( Parent [ , /FRAME]
[ , UNAME=string] [ , UVALUE=value]
[ , XOFFSET=value] [ , YOFFSET=value]
```idl```

**CW_DEFROI** - Creates compound widget used to define region of interest.

```idl```
Result = CW_DEFROI( Draw [ , IMAGE_SIZE=vector]
[ , OFFSET=vector] [ , /ORDER] [ , /RESTORE]
[ , ZOOM=vector]
```idl```

**CW_FIELD** - Creates a widget data entry field.

```idl```
Result = CW_FIELD( Parent [ , /ALL_EVENTS]
[ , /COLUMN] [ , FIELD_FONT=font] [ , /FLOATING]
[ , /INTEGER] [ , /LONG] [ , /STRING] [ , FONT=font]
[ , FRAME=pixels] [ , /NOEDIT] [ , /RETURN_EVENTS]
[ , /ROW] [ , /TEXT_FRAME] [ , TITLE=string]
[ , UNAME=string] [ , UVALUE=value] [ , VALUE=value]
[ , XSIZE=characters] [ , YSIZE=lines]
```idl```

**CW_FILESEL** - Creates compound widget for file selection.

```idl```
Result = CW_FILESEL ( Parent [, /FILENAME]
[ , FILTER=string array] [ , /FIX_FILTER] [ , /FRAME]
[ , /IMAGE_FILTER] [ , /MULTIPLE] [ , /SAVE]
[ , PATH=string] [ , UNAME=string] [ , UVALUE=value]
[ , /WARN_EXIST]
```idl```

**CW_FORM** - Creates compound widget for creating forms.

```idl```
Result = CW_FORM( Parent, Desc [: , /COLUMN]
[ , IDS=variable] [ , TITLE=string] [ , UNAME=string]
[ , UVALUE=value] )

**Note:** Desc is a string array. Each element of string array contains 2 or more comma-delimited fields. Each string has the following format: \’[Depth, Item, Initial_Value, Keywords]\’

**CW_FSLIDER** - Creates slider that selects floating-point values.

```idl```
Result = CW_FSLIDER( Parent [, /DRAG] [, /EDIT]
[ , FORMAT=string] [ , /FRAME] [ , MAXIMUM=value]
[ , MINIMUM=value] [ , SCROLL=units]
[ , /SUPRESS_VALUE] [ , TITLE=string]
[ , UNAME=string] [ , UVALUE=value]
[ , VALUE=initial_value] [ , XSIZE=units] [ , /
[ , /VERTICAL] [ , YSIZE=height]]
```idl```

**CW_LIGHT_EDITOR** - Creates compound widget to edit properties of existing IDLgrLight objects in a view.

```idl```
Result = CW_LIGHT_EDITOR( Parent
[ , /DIRECTION_DISABLED] [ , /DRAG_EVENTS]
[ , /FRAME=width] [ , /HIDE_DISABLED]
[ , LIGHT=objcRef(s)] [ , /LOCATION_DISABLED]
[ , /TYPE_DISABLED] [ , UVALUE=value]
[ , XSIZE=pixels] [ , YSIZE=pixels] [ , XRANGE=vector]
[ , YRANGE=vector] [ , ZRANGE=vector]
```idl```

**CW_LIGHT_EDITOR_GET** - Gets the CW_LIGHT_EDITOR properties.

```idl```
Result = CW_LIGHT_EDITOR_GET, WidgetID
[ , DIRECTION_DISABLED=value]
[ , DRAG_EVENTS=value]
[ , HIDE_DISABLED=value] [ , LIGHT=value]
[ , LOCATION_DISABLED=value]
[ , TYPE_DISABLED=value] [ , XSIZE=value]
[ , YSIZE=value] [ , XRANGE=value]
[ , YRANGE=value] [ , ZRANGE=value]
CW_LIGHT_EDITOR_SET *- Sets the CW_LIGHT_EDITOR_SET properties.

**CW_LIGHT_EDITOR_SET**, WidgetID
[. /DIRECTION_DISABLED] [. /DRAG_EVENTS]
[. /HIDE_DISABLED] [. LIGHT=objRef(s)]
[. /LOCATION_DISABLED] [. /TYPE_DISABLED]
[. XSIZE=px] [. YSIZE=px] [. XRANGE=vector]
[. YRANGE=vector] [. ZRANGE=vector]

CW_ORIENTATION *- Creates compound widget used to interactively adjust the 3D drawing transformation.

Result = CW_ORIENTATION( Parent [. AX=degrees]
[. AZ=degrees] [. FRAME=width]
[. HISTOGRAM=vector] [. HORIZONTAL]
[. ORIENTATION=start, end] [. UNAME=string]
[. UVALUE=value] [. XSIZE=width]
[. YSIZE=height] )

CW_PALETTE_EDITOR *- Creates compound widget to display and edit color palettes.

Result = CW_PALETTE_EDITOR( Parent
[. ARRAY=variable] [. HISTOGRAM=variable]

CW_PALETTE_EDITOR_SET *- Sets the CW_PALETTE_EDITOR properties.

Result = CW_PALETTE_EDITOR_SET, WidgetID
[. ALPHA=byte_vector] [. HISTOGRAM=byte_vector]

CW_PDMENU *- Creates widget pulldown menus.

Result = CW_PDMENU( Parent, Desc [. /COLUMN]
[. DELIMITER=string] [. Font=value] [. MBAR
[. /HELP]] [. ID=variable] [. /RETURN_ID],
/RETURN_INDEX [. /RETURN_NAME],
/RETURN_FULL_NAME [. UNAME=string]
[. UVALUE=value] [. OFFSET=variable]
[. YOFFSET=variable] )

CW_RGBSLIDER *- Creates compound widget with sliders for adjusting RGB color values.

Result = CW_RGBSLIDER( Parent
[. COLOR_INDEX], [GRAPHICS_LEVEL={1 | 2}]
[. DRAG [. FRAME], [LENGTH=value]
[. UNAME=string] [. UVALUE=value]
[. VALUE=[n g b]] [. VERTICAL])

CW_TMPL *- Template for compound widgets that use XMANAGER.

Result = CW_TMPL( Parent [. UNAME=string]
[. UVALUE=variable] )

CW_ZOOM *- Creates widget for displaying zoomed images.

Result = CW_ZOOM( Parent [. FRAME], [MAX=value]
[. MIN=value] [. RETAIN={0 | 1 | 2}]
[. SAMPLE=value]
[. SCALE=value] [. TRACK] [. UNAME=string]
[. UVALUE=value] [. XSIZE=width]
[. X_SCROLL_SIZE=width] [. X_ZSIZE=zoom_width]
[. YSIZE=height] [. Y_SCROLL_SIZE=height]
[. Y_ZSIZE=zoom_height] )

D

DBLARR *- Creates a double-precision array.

Result = DBLARR( D1, ..., D8 [. /NOZERO] )

DCINDGEN *- Returns a double-precision, complex array with each element set to its subscript.

Result = DCINDGEN( D1, ..., D8 )

DCOMPLEX *- Converts argument to double-precision complex type.

Result = DCOMPLEX( Real [. Imaginary] )
or
Result = DCOMPLEX( Expression, Offset,
Dim1 [. ..., Dim8] )

DCOMPLEXARR *- Creates a complex, double-precision vector or array.

Result = DCOMPLEXARR( D1, ..., D8 [. /NOZERO] )

DEFINE_KEY *- Programs keyboard function keys.

DEFINE_KEY, Key [. Value] [. MATCH_PREVIOUS]
[. NOECHO] [. TERMINATE]

UNIX Keywords: [. BACK_CHARACTER]
[. BACK_WORD] [. CONTROL] [. ESCAPE]
[. DELETE_CHARACTER] [. DELETE_CURRENT]
[. DELETE_EOL] [. DELETE_LINE]
[. DELETE_WORD] [. END_OF_LINE]
[. END_OF_FILE] [. ENTER_LINE]
[. FORWARD_CHARACTER] [. FORWARD_WORD]
[. INSERT_OVERRIDE_TOGGLE] [. NEXT_LINE]
[. PREVIOUS_LINE] [. RECALL] [. REDRAW]
[. START_OF_LINE]

DEFROI *- Defines an irregular region of interest of an image.

Result = DEFROI( Xs, Sy [. Xverts, Yverts] [. NOREGION]
[. NOFILL] [. NOVIEW] [. RESTORE] [. X0=device_coord,
Y0=device_coord] [. ZOOM=factor] )

DEFSYSV *- Creates a new system variable.

DEFSYSV, Name, Value [. READ_ONLY]
[. EXISTS=variable]

DELETE_SYMBOL (VMS Only) *- Deletes a DCL interpreter symboll for the current process.

DELETE_SYMBOL, Name [. TYPE={1 | 2}]

DELLOG (VMS Only) *- Deletes a VMS logical name.

DELLOG, Lognam [. TABLE=string]

DELVAR *- Deletes variables from the main IDL program level.

DELVAR, V1, ..., Vn
**DERIV** - Performs differentiation using 3-point, Lagrangian interpolation and returns the derivative.  
\[ \text{Result} = \text{DERIV}(X, Y) \]

**DERIVSIG** - Computes standard deviation of derivative found by DERIV.  
\[ \text{Result} = \text{DERIVSIG}(X, Y) \]

**DETERM** - Computes the determinant of a square matrix.  
\[ \text{Result} = \text{DETERM}(A) \]

**DEVICE** - Sets to plot in device coordinates.  
Note: Each keyword to DEVICE is followed by the device(s) to which it applies.  
\[ \text{DEVICE} \{, \text{/AVANTGARDE} | , \text{/BKMAN} | , \text{/COU RIER} | , \text{/HEL VETICA} | , \text{/ISOLATIN1} | , \text{/PALATINO} | , \text{/SCHOOLBOOK} | , \text{/SYMBOL} | , \text{TIMES} | , \text{ZAPF CHANCERY} | , \text{ZAPF DINGBATS}(PS) \} \]

\[ , \{\text{/AVANTGARDE}(REGIS) \} | , \{\text{/BINARY} | , \{\text{/NCAR} | , \{\text{/TEXT}\{CGM\} | , \{\text{BITS_PER_PIXEL}\{1 | 2 | 4 | 8\}(PS) \} | , \{\text{/BOLD}\{PS\} \} | , \{\text{/BOLD}(PS) \} \}

\[ , \{\text{/BYPASS_TRANSLATION}(MAC, WIN, X) \} \]

\[ , \{\text{/CLOSE}(Z) \} | , \{\text{/CLOSE_DOCUMENT}(PRINTER) \}

\[ , \{\text{/CLOSE_FILE}(CGM, HP, LJ, METAFILE, PCL, PS, REGIS, TEK) \} \]

\[ , \{\text{/COLOR}\{PCL, PS\} \} \]

\[ , \{\text{/COLOR}(PCL, PS) \} \]

\[ , \{\text{/COPY}\{Xsource, Ysource, cols, rows, Xdest, Ydest \}

\[ \{\text{Window_index}\}{MAC, WIN, X} \]

\[ , \{\text{/CURSOR_CROSSHAIR}(WIN, X) \}

\[ , \{\text{/CURSOR_IMAGE}\{value\{16-element short int vector\}{MAC, WIN, X} \}

\[ , \{\text{/CURSOR_MASK}\{MAC, WIN, X} \}

\[ , \{\text{/CURSOR_ORIGINAL}\{MAC, WIN, X} \}

\[ , \{\text{/CURSOR_STANDARD}\{MAC, WIN, X} \}

\[ , \{\text{/CURSOR_XY}\{x, y\}{MAC, WIN, X} \]

\[ , \{\text{/DECOMPOSED}\{MAC, WIN, X} \]

\[ , \{\text{/DEPTH}\{value\{significant bits per pixel\}{LJ} \}

\[ , \{\text{/DIRECT_COLOR}\{X\} \} | , \{\text{/EJECT}\{0 | 1 | 2\}(HP) \}

\[ , \{\text{ENCAPSULATED}\{0 | 1\}(PS) \} | , \{\text{ENCODING}\{1 \}

\[ \{(\text{binary} \cdot 2)^{\text{text}} \cdot 3 \} \{\text{NCA R binary}\} \{\text{CGM} \}

\[ , \{\text{FILENAME}\{filename\}{CGM, HP, LJ, METAFILE, PCL, PS, REGIS, TEK} \] | , \{\text{/FLOYD}\{LJ, MAC, PCL, X} \]

\[ , \{\text{/FONT_INDEX}\{integer\}(PS) \]

\[ , \{\text{/FONT_SIZE}\{points\}(PS) \]

\[ , \{\text{/GET_CURRENT_FONT}\{variable\}{MAC, METAFILE, PRINTER, WIN, X} \]

\[ , \{\text{/GET_DECOMPOSED}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{/GET_FONTINDEX}\{variable\}{MAC, METAFILE, PRINTER, WIN, X} \]

\[ , \{\text{/GET_FONTNAME}\{variable\}{MAC, METAFILE, PRINTER, WIN, X} \]

\[ , \{\text{/GET_FONTNUM}\{variable\}{MAC, METAFILE, PRINTER, WIN, X} \]

\[ , \{\text{/GET_GRAPHICS_FUNCTION}\{variable\}{MAC, WIN, X, Z} \}

\[ , \{\text{/GET_PAGESIZE}\{variable\}{PRINT ER} \]

\[ , \{\text{/GET_SCREEN_SIZE}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{/GET_VISUAL_DEPTH}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{/GET_VISUAL_NAME}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{/GET_WINDOWREGION}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{/GET_WRITE_MASK}\{variable\}{X, Z} \]

\[ , \{\text{GIN_CHARS}\{number_of_characters\}(TEK) \]

\[ , \{\text{GLYPH_CACHE}\{number_of_glyphs\}{MAC, METAFILE, PRINTER, PS, WIN, Z} \]

\[ , \{\text{/INCHES}\{HP, LJ, METAFILE, PCL, PRINTER, PS} \]

\[ , \{\text{/INDEX_COLOR}\{METAFILE, PRINTER\} \]

\[ , \{\text{/ITALIC}\{PS\} \} | , \{\text{/LANDSCAPE} \} | , \{\text{/PORTRAIT}(HP, LJ, PCL, PRINTER, PS) \] | , \{\text{/DEMI} | , \{\text{/LIGHT} | , \{\text{/MEDIUM} | , \{\text{/NARROW} \} | , \{\text{/OBLIQUE}(PS) \]

\[ , \{\text{OPTIMIZE}\{0 | 1 | 2\}(PCL) \] | , \{\text{/ORDERED}\{LJ, MAC, PCL, X} \]

\[ , \{\text{OUTPUT}\{scalar string\}(HP, PS) \]

\[ , \{\text{/PIXELS}\{LJ, PCL\} \] | , \{\text{PLOT_TO}\{logical unit number\}(REGIS, TEK) \]

\[ , \{\text{/POLYFILL}(HP) \] | , \{\text{PRE_DEPTH}\{value\}(PS) \]

\[ , \{\text{PRE_XSIZE}\{width\}(PS) \] | , \{\text{PRE_YSIZE}\{height\}(PS) \]

\[ , \{\text{/PREVIEW}(PS) \] | , \{\text{PRINT_FILE}\{filename\}(WIN) \]

\[ , \{\text{RESET_STRING}\{string\}(TEK) \]

\[ , \{\text{RESOLUTION}\{value\}(LJ, PCL) \] | , \{\text{RETAIN}\{0 | 1 | 2\}(MAC, WIN, X) \]

\[ , \{\text{SCALE_FACTOR}\{value\}(PRINTER, PS) \]

\[ , \{\text{SET_CHARACTER_SIZE}\{font size, line spacing\}(CGM, HP, LJ, MAC, METAFILE, PCL, PS, REGIS, TEK, WIN, X, Z) \]

\[ , \{\text{SET_COLORMAP}\{value\}(14739-element byte vector\)(PCL) \] | , \{\text{SET_COLORS}\{2 to 256\}(Z) \]

\[ , \{\text{SET_FONT}\{scalar string\}{MAC, METAFILE, PRINTER, PS, WIN, Z} \]

\[ , \{\text{SET_GRAPHICS_FUNCTION}\{code\}{0 to 15\}(MAC, WIN, X, Z) \] | , \{\text{SET_RESOLUTION}\{width, height\}(Z) \]

\[ , \{\text{SET_STRING}\{string\}(TEK) \]

\[ , \{\text{SET_TRANSLATION}\{variable\}(X) \]

\[ , \{\text{SET_WRITE.Mask}\{value\}{0 to 2^n-1\} for n-bit system\}{X, Z} \]

\[ , \{\text{STATIC_COLOR}\{value\}{bits per pixel\}(X) \] | , \{\text{STATIC_GRAY}\{value\}{bits per pixel\}(X) \]

\[ , \{\text{/TEK4014}(TEK) \] | , \{\text{TEK4100}(TEK) \]

\[ , \{\text{THRESHOLD}\{value\}(LJ, MAC, PCL, X) \]

\[ , \{\text{TRANSLATION}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{TRUE_COLOR}\{value\}{bits per pixel\}{MAC, METAFILE, PRINTER, X} \]

\[ , \{\text{/TT_FONT}\{variable\}{MAC, METAFILE, PRINTER, WIN, X, Z} \]

\[ , \{\text{/TTY}\{REGIS, TEK\} \] | , \{\text{/VT240} \] | , \{\text{/VT241} \] | , \{\text{/VT340} \]

\[ , \{\text{/VT341}(REGIS) \] | , \{\text{WINDOW_STATE}\{variable\}{MAC, WIN, X} \]

\[ , \{\text{XOFFSET}\{value\}(HP, LJ, PCL, PRINTER, PS) \]

\[ , \{\text{XON_XOFF}\{0 | 1\}(default)\{HP} \]

\[ , \{\text{XSIZE}\{width\}(HP, LJ, PCL, METAFILE, PRINTER, PS) \]

\[ , \{\text{YOFFSET}\{value\}(HP, LJ, PCL, METAFILE, PRINTER, PS) \]

\[ , \{\text{ZBUFFERING}\{0 | 1\}(default)\{Z} \]
DFPMIN - Minimizes a function using Davidon-Fletcher-Powell method.

\[
\text{DFPMIN} \sim X, \text{Gtol}, \text{Fmin}, \text{Func}, \text{Dfunc} \sim \text{[DOUBLE]}
\]
\[
\sim \text{EPS=value} \sim \] \sim \text{ITER=variable} \sim \text{ITMAX=value} \sim \text{STEPMAX=value} \sim \text{STEPMAX=value} \sim \text{TOLX=value}
\]

DIALOG_MESSAGE - Creates modal message dialog.

\[
\text{Result} = \text{DIALOG_MESSAGE} (\text{Message Text} \sim \text{[CANCEL]} \sim \text{[DEFAULT_CANCEL]} \sim \text{[DEFAULT_NO]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[ERROR]} \sim \text{[INFORMATION]} \sim \text{[QUESTION]} \sim \text{[RESOURCE_NAME=string]} \sim \text{[TITLE=string]} \sim )
\]

DIALOG_PICKFILE - Creates native file-selection dialog.

\[
\text{Result} = \text{DIALOG_PICKFILE} (\sim \text{[DIRECTORY]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[FILE=string]} \sim \text{[FILTER=string/string array]} \sim \text{[FIX_FILTER]} \sim \text{[GET_PATH=variable]} \sim \text{[GROUP=widget_id]} \sim \text{[MULTIPLE_FILES]} \sim \text{[MUST_EXIST]} \sim \text{[PATH=string]} \sim \text{[READ]} \sim \text{[WRITE]} \sim \text{[RESOURCE_NAME=string]} \sim \text{[TITLE=string]} \sim )
\]

DIALOG_PRINTERSETUP - Opens native dialog used to set properties for a printer.

\[
\text{Result} = \text{DIALOG_PRINTERSETUP} (\sim \text{[PrintDestination]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[RESOURCE_NAME=string]} \sim \text{[TITLE=string]} \sim )
\]

DIALOG_PRINTJOB - Opens native dialog used to set parameters for a print job.

\[
\text{Result} = \text{DIALOG_PRINTJOB} (\sim \text{[PrintDestination]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[RESOURCE_NAME=string]} \sim \text{[TITLE=string]} \sim )
\]

DIALOG_READ_IMAGE - Presents GUI for reading image files.

\[
\text{Result} = \text{DIALOG_READ_IMAGE} (\sim \text{[Filename]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[FILTER_TYPE=string]} \sim \text{[GET_PATH=variable]} \sim \text{[IMAGE=variable]} \sim \text{[PATH=string]} \sim \text{[QUERY=variable]} \sim \text{[RED=variable]} \sim \text{[GREEN=variable]} \sim \text{[BLUE=variable]} \sim \text{[TITLE=string]} \sim )
\]

DIALOG_WRITE_IMAGE - Presents GUI for writing image files.

\[
\text{Result} = \text{DIALOG_WRITE_IMAGE} (\sim \text{[Image]} \sim \text{[R, G, B]} \sim \text{[DISPLAY_NAME=string]} \sim \text{[FILTER_TYPE=string]} \sim \text{[NOWRITE]} \sim \text{[OPTIONS=variable]} \sim \text{[PATH=string]} \sim \text{[TITLE=string]} \sim \text{[TYPE=variable]} \sim \text{[WARN_EXIST]} \sim )
\]

DIGITAL_FILTER - Calculates coefficients of a non-recursive, digital filter.

\[
\text{Result} = \text{DIGITAL_FILTER} (\sim \text{[Flow, Fhigh, A, Nterms]} \sim )
\]

DILATE - Implements morphologic dilation operator on binary and grayscale images.

\[
\text{Result} = \text{DILATE} (\text{Image}, \text{Structure} \sim \text{[X0 \sim [Y0 \sim [Z0]]]} \sim \text{[ABSOLUTE]} \sim \text{[ASCENDING]} \sim \text{[DOUBLE]} \sim \text{[EIGENVECTORS=variable]} \sim \text{[OVERWRITE]} \sim \text{[RESIDUAL=variable]} \sim )
\]

DINDGEN - Returns a double-precision array with each element set to its subscript.

\[
\text{Result} = \text{DINDGEN} (D_1, ..., D_8)
\]

DISSOLVE - Provides a digital “dissolve” effect for images.

\[
\text{DISSOLVE} (\text{Image} \sim \text{[WAIT=seconds]} \sim \text{[ORDER]} \sim \text{[SIZ=pixels]} \sim \text{[X0=pixels, Y0=pixels]}
\]

DIST - Creates array with each element proportional to its frequency.

\[
\text{Result} = \text{DIST} (N \sim [M])
\]

DLM_LOAD - Explicitly causes a DLM to be loaded.

\[
\text{DLM_LOAD} (\sim \text{DLM_{NameStr}_1} \sim \text{DLM_{NameStr}_2, ..., DLM_{NameStr}_n})
\]

DO_APPLE_SCRIPT - Compiles, executes AppleScript code.

\[
\text{DO_APPLE_SCRIPT} (\sim \text{Script} \sim \text{[AG_STRING]} \sim \text{RESULT=variable})
\]

DOC_LIBRARY - Extracts documentation headers from IDL programs.

\[
\text{DOC_LIBRARY} (\text{[Name]} \sim \text{[PRINT]} \sim \text{UNIX keywords: [DIRECTORY=string]} \sim \text{[MULTI]} \sim \text{VMS keywords: [FILE=string]} \sim \text{[PATH=string]} \sim \text{[OUTPUTS]}
\]

DOUBLE - Converts argument to double-precision type.

\[
\text{Result} = \text{DOUBLE} (\text{Expression} \sim \text{[Dim1, ..., Dim_n]})
\]

DRAW_ROI - Draws region or group of regions to current Direct Graphics device.

\[
\text{DRAW_ROI} (\sim oROI \sim \text{[LINE_FILL]} \sim \text{[SPACING=value]} \sim \text{Graphics Keywords: [CLIP=[X_0, Y_0, X_1, Y_1]]} \sim \text{[COLOR=value]} \sim \text{[DATA]} \sim \text{[DEVICE]} \sim \text{[NORMAL]} \sim \text{[LINESTYLE={0 | 1 | 2 | 3 | 4 | 5}]} \sim \text{[NOCLIP]} \sim \text{[ORIENTATION=ccw_degrees_from_horiz]} \sim \text{[PSYM=integer(0 to 10)]} \sim \text{[SYMSIZE=value]} \sim \text{[T3D]} \sim \text{[THICK=value]}
\]

E

EFONT - Interactive vector font editor and display tool.

\[
\text{EFONT, Init_Font} \sim \text{[BLOCK]} \sim \text{[GROUP=widget_id]}
\]

EIGENQL - Computes eigenvalues and eigenvectors of a real symmetric array.

\[
\text{Result} = \text{EIGENQL} (\sim A \sim \text{[ABSOLUTE]} \sim \text{[ASCENDING]} \sim \text{[DOUBLE]} \sim \text{[EIGENVECTORS=variable]} \sim \text{[OVERWRITE] \sim \text{[RESIDUAL=variable]}})
\]
Alphabetical Listing

**EIGENVEC** - Computes eigenvectors of a real, non-symmetric array.

```
Result = EIGENVEC( A, Eval [, /DOUBLE]
[, ITMAX=value] [, RESIDUAL=variable] )
```

**ELMHES** - Compiles and executes IDL statements contained in an EXECUTE block.

```
Result = ELMHES( A [, /COLUMN] [, /DOUBLE]
[, /NO_BALANCE] )
```

**EMPTY** - Empties the graphics output buffer.

```
EMPTY
```

**ENABLE_SYSRTN** - Enables/disables IDL system routines.

```
ENABLE_SYSRTN [, Routines ] [, /DISABLE]
[, /EXCLUSIVE ] [, /FUNCTIONS]
```

**EOF** - Tests the specified file for the end-of-file condition.

```
Result = EOF(Unit)
```

**ERASE** - Erases the screen of the current graphics device, or starts a new page if the device is a printer.

```
ERASE [, Background_Color] [, CHANNEL=value]
[, COLOR=value]
```

**ERODE** - Implements the erosion operator on binary and grayscale images and vectors.

```
Result = ERODE( Image, Structure [, X_0 [, Y_0 [, Z_0]]]
[, /GRAY [, /PREERVE_TYPE ] [, /UINT ] [, /ULONG]]
[, VALUES=array] )
```

**ERRORF** - Returns the value of an error function.

```
Result = ERRORF(X)
```

**EXP** - Returns the natural exponential function of Expression.

```
Result = EXP(Expression)
```

**EXPAND** - Shrinks/expands image using bilinear interpolation.

```
EXPAND, A, Nx, Ny, Result [, FILLVAL=value]
[, MAXVAL=value]
```

**EXPAND_PATH** - Expands path-definition string into full path name for use with the !PATH system variable.

```
Result = EXPAND_PATH( String [, /ALL_DIRS]
```

**EXPINT** - Returns the value of the exponential integral.

```
Result = EXPINT( X, Ycenter[, /DOUBLE]
[, EPS=value] [, ITMAX=value] )
```

**EXTRACT_SLICE** - Returns 2D planar slice extracted from volume.

```
Result = EXTRACT_SLICE( Vol, Xsize, Ysize, Xcenter,
Ycenter, Zcenter, Xrot, Yrot, Zrot
[, ANISOTROPY=[xspacing, yspacing, zspacing]]
[, /CUBIC] [, OUT_VAL=value] [, /RADIANS]
[, /SAMPLE] [, VERATES=variable] )
```

**EXIT** - Quits IDL and exits back to the operating system.

```
Result = EXIT( )
```

**FILE_TEST** - Returns sub-matrix of input array. Array operators (e.g., *, and :) should usually be used instead.

```
Result = EXTRACTC( Array , C_1, C_2, ..., C_n , S_1, S_2, ..., S_n )
```

**FILE_CHMOD** - Changes the current access permissions (or modes) associated with a file or directory.

```
FILE_CHMOD, File [, Mode]
[, /A_EXECUTE | /A_READ | , /A_WRITE ]
[, /G_EXECUTE | /G_READ | , /G_WRITE ]
[, /O_EXECUTE | /O_READ | , /O_WRITE ]
[, /U_EXECUTE | /U_READ | , /U_WRITE ]

UNIX-Only Keywords: [, /SETGID] [, /SETUID]
[, /STICKY_BIT]
```

**FILE_DELETE** - Deletes a file or empty directory, if the process has the necessary permissions to remove the file as defined by the current operating system.

```
FILE_DELETE, File [, ... FileN ] [, /QUIET ]
```

**FILE_EXPAND_PATH** - Expands a given file or partial directory name to its fully qualified name regardless of the current working directory.

```
Result = FILE_EXPAND_PATH( Path )
```

**FILE_MKDIR** - Creates a new directory, or directories, with default access permissions for the current process.

```
FILE_MKDIR, File [, ... FileN ]
```

**FILE_TEST** - Checks files for existence and other file attributes without first having to open the file.

```
Result = FILE_TEST( File [, /DIRECTORY ] ,
/EXECUTABLE | /READ | , /REGULAR | , /WRITE |
, [ZERO_LENGTH] [, /GET_MODE=variable ] ]

UNIX-Only Keywords: [, /BLOCK_SPECIAL ]
[, /CHARACTER_SPECIAL ] [, /DANGLING_SYMLINK ]
[, /DIRECTORY | ...
```
UNIX and VMS-Only Keywords: [/GROUP] [/USER]

**FILE WHICH** - Separates a specified file path into its component directories, and searches each directory in turn for a specific file.

**FILEPATH** - Returns full path to a file in the IDL distribution.

**FINDFILE** - Finds all files matching FileSpecification.

**FINDGEN** - Returns a floating-point array with each element set to its closest integer less than or equal to argument.

**FLOOR** - Returns the largest integer less than or equal to argument.

**FLOOFS** - Converts argument to single-precision floating-point.

**FOR** - Executes statements repeatedly, incrementing or decrementing a variable with each repetition, until a condition is met.

**FORMAT_AXIS_VALUES** - Formats numbers as strings for use as axis values.

**FRAOF** - Converts argument to integer type, or type specified by TYPE keyword.

**FZ_ROOTS** - Finds the roots of a complex polynomial using Laguerre’s method.

**FREE_LUN** - Frees previously-reserved file units.

**FSTAT** - Returns information about a specified file unit.

**FUNCTION** - Defines a function.

**FV_TEST** - Performs the F-variance test.

**FX_ROOT** - Computes real and complex roots of a univariate nonlinear function using an optimal Müller’s method.

**FZ_ROOTS** - Finds the roots of a complex polynomial using Laguerre’s method.

**GAUSSFIT** - Fits the sum of a Gaussian and a quadratic.

**GAUSS2DFIT** - Fits a 2D elliptical Gaussian equation to rectilinearly gridded data.

**GAUSSPDF** - Fits the sum of a Gaussian and a quadratic.

**GAUSSINT** - Returns integral of Gaussian probability function.

**GAMMA** - Returns the gamma function of X.

**GAMMA_CT** - Applies gamma correction to a color table.

**GAUSS_CVF** - Computes the sum of a Gaussian and a quadratic.

**GAUSSFIT** - Fits a 2D elliptical Gaussian equation to rectilinearly gridded data.

**GAUSSINT** - Returns integral of Gaussian probability function.
GRID3 - Creates a regularly-gridded 3D dataset from a set of scattered

GRID_TPS - Uses thin plate splines to interpolate a set of values over a regular 2D grid, from irregularly sampled data values.

GRID3 - Creates a regularly-gridded 3D dataset from a set of scattered 3D nodes.

H -

HistoGRAM - Computes the density function of an array.

HIST_EQUAL - Histogram-equalizes an image.

HIST_EQUAL - Histogram-equalizes an image.

HIST_2D - Returns histogram of two variables.

HISTOGRAM - Computes the density function of an array.

HLS - Creates color table in Hue, Lightness, Saturation color system.

HOUGH - Returns the Hough transform of a two-dimensional image.


HDF_READ - Extracts HDF, HDF-EOS, and NetCDF data and metadata into an output structure.

HILBERT - Constructs a Hilbert transform.

HLS - Creates color table in Hue, Lightness, Saturation color system.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HDF_* Routines - See “HDF Routines” on page 59.

HDF_BROWSER - Opens GUI to view contents of HDF, HDF-EOS, or NetCDF file.

HELP - Provides information about the current IDL session.

HELP, Expression1, ... , Expressionn [ /ALL_KEYS] [ /BREAKPOINTS] [ /BRIEF] [ /CALLS=variable] [ /DEVICE] [ /DLM] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HILBERT - Constructs a Hilbert transform.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HIST_2D - Returns histogram of two variables.

HIST_EQUAL - Histogram-equalizes an image.

HISTOGRAM - Computes the density function of an array.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HLS - Creates color table in Hue, Lightness, Saturation color system.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HILBERT - Constructs a Hilbert transform.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]

HLS - Creates color table in Hue, Lightness, Saturation color system.

HISTORY Keywords: [ /DEVICE] [ /FILES] [ /FULL] [ /FUNCTIONS] [ /HEAP_VARIABLES] [ /KEYS] [ /LAST_MESSAGE] [ /MEMORY] [ /MESSAGES] [ /NAMES=string_of_variable_names] [ /OBJECTS] [ /OUTPUT=variable] [ /PROCEDURES] [ /RECALL_COMMANDS] [ /Routines] [ /SOURCE_FILES] [ /STYLES] [ /SYSTEM_VARIABLES] [ /TRACEBACK]
**Hough Backprojection**: \( Result = \text{HOUGH}(\text{Array}, \ /\text{BACKPROJECT}, \ \text{RHO}=\text{variable}, \ \text{THETA}=\text{variable} \ [, /\text{DOUBLE}] \ [, \ \text{DX}=\text{scalar} \ [, \ \text{DY}=\text{scalar} \ [, \ \text{NX}=\text{scalar} \ [, \ \text{NY}=\text{scalar} \ [, \ \text{XMIN}=\text{scalar} \ [, \ \text{YMIN}=\text{scalar} \ )} \ ) \ )

**HQR** - Returns all eigenvalues of an upper Hessenberg array.
\( Result = \text{HQR}(A [, /\text{COLUMN}] [, /\text{DOUBLE}]) \)

**HSV** - Creates color table based on Hue/Saturation/Value color system.
HSV, Vlo, Vhi, Satlo, Sathi, Hue, Loops [, Colr]

**IBETA** - Computes the incomplete beta function.
\( Result = \text{IBETA}(A, B, X [, /\text{DOUBLE}] [, \ \text{EPS}=\text{value}] \ [, \ \text{ITER}=\text{variable}] \ [, \ \text{ITMAX}=\text{value}] \ ) \)

**IDENTITY** - Returns an identity array.
\( Result = \text{IDENTITY}(N [, /\text{DOUBLE}]) \)

**IDL_Container Object** - See “IDL_Container” on page 65.

**IDLanROI Object** - See “IDLanROI” on page 65.

**IDLanROIGroup Object** - See “IDLanROIGroup” on page 66.

**IDLffDICOM Object** - See “IDLffDICOM” on page 66.

**IDLffDXF Object** - See “IDLffDXF” on page 66.

**IDLffLanguageCat Object** - See “IDLffLanguageCat” on page 67.

**IDLffShape Object** - See “IDLffShape” on page 67.

**IDLgr* Objects** - IDLgr* objects and their methods are described starting with “IDLgrAxis” on page 68.

**IF...THEN...ELSE** - Conditionally executes a statement or block of statements.

- IF expression THEN statement [ ELSE statement ]
- or
- IF expression THEN BEGIN statements ENDIF [ ELSE BEGIN statements ENDELSE ]

**IGAMMA** - Computes the incomplete gamma function.
\( Result = \text{IGAMMA}(A, X [, /\text{DOUBLE}] [, \ \text{EPS}=\text{value}] \ [, \ \text{ITER}=\text{variable}] \ [, \ \text{ITMAX}=\text{value}] \ [, \ \text{METHOD}=\text{variable}] \ ) \)

**IMAGE_CONT** - Overlays an image with a contour plot.
IMAGE_CONT, A [, /ASPECT] [, /INTERP] [, /WINDOW_SCALE]

**IMAGE_STATISTICS** - Computes sample statistics for a given array of values.

- **IMAGE_STATISTICS, Data [, /LABLED]**
- **[, /WEIGHTED]**
- **[, WEIGHT_SUM=variable]**
- **[, /VECTOR]**
- **[, LUT=array]**
- **[, MASK=array]**
- **[, COUNT=variable]**
- **[, MEAN=variable]**
- **[, STDDEV=variable]**
- **[, DATA_SUM=variable]**
- **[, SUM_OF_SQUARES=variable]**

**IMAGINARY** - Returns the imaginary part of a complex value.
\( Result = \text{IMAGINARY}([/\text{Complex}]) \)

**INDGEN** - Returns an integer array with each element set to its subscript.
\( Result = \text{INDGEN}(D_1, ..., D_k [, /\text{BYTE}] [, /\text{COMPLEX}] [, /\text{DWORD}] [, /\text{FLOAT}] [, /\text{LONG}] [, /\text{STRING}] [, /\text{UINT}] [, /\text{UL64}] [, /\text{ULONG}] [, /\text{TYPE}=\text{value}] \)

**INT_2D** - Computes the double integral of a bivariate function.
\( Result = \text{INT_2D}(F, AB_Limits, PQ_Limits, Pts [, /\text{DOUBLE}] [, /\text{ORDER}]) \)

**INT_3D** - Computes the triple integral of a trivariate function.
\( Result = \text{INT_3D}(Fxyz, AB_Limits, PQ_Limits, UV_Limits, Pts [, /\text{DOUBLE}]) \)

**INT_TABULATED** - Integrates a tabulated set of data.
\( Result = \text{INT_TABULATED}(X, F [, /\text{DOUBLE}] [, /\text{SORT})] \)

**INTARR** - Creates an integer vector or array.
\( Result = \text{INTARR}(D_1, ..., D_k [, /\text{NOZERO}]) \)

**INTERPOL** - Performs linear interpolation on vectors.
For regular grids: \( Result = \text{INTERPOL}(V, N [, /\text{LSQUARE}] [, /\text{INDEX}] [, /\text{SPLINE}] \)
For irregular grids: \( Result = \text{INTERPOL}(V, X, U [, /\text{LSQUARE}] [, /\text{INDEX}] [, /\text{SPLINE}] \)

**INTERPOLATE** - Returns an array of interpolates.
\( Result = \text{INTERPOLATE}(P, X, Y [, /Z] [, /<KeyValuePair=\{-1 to 0\}] [, /GRID] [, /MISSING=value]) \)

**INVERT** - Computes the inverse of a square array.
\( Result = \text{INVERT}(Array [, Status] [, /\text{DOUBLE}]) \)

**IOCTL** - Performs special functions on UNIX files.
\( Result = \text{IOCTL}(\text{File_Unit}, \ \text{Request}, \ \text{Arg} [, /\text{FILE_VALUE}] [, /\text{MT_OFFLINE}] [, /\text{MT_REWIND}] [, /MT_SKIP_FILE=\{-\text{number_of_files}\}] [, /MT_SKIP_RECORD=\{-\text{number_of_records}\}] [, /MT_WEOF] [, /\text{SUPPRESS_ERROR}]) \)

**ISHFT** - Performs integer bit shift.
\( Result = \text{ISHFT}(P_1, P_2) \)

**ISOCONTOUR** - Interprets the contouring algorithm found in the IDLgrContour object.
ISOCONTOUR, Values, Outverts, Outconn
[, AUXDATA_IN=\{array\}, AUXDATA_OUT=\{variable\}]
[, C_VALUE=scalar or \{vector\} [, /DOUBLE]]
[, GEOMX=\{vector\}] [, GEOMY=\{vector\}]
[, GEOMZ=\{vector\} [, /\{FILL\}]]
[, LEVEL_VALUES=\{variable\} [, N_LEVELS=\{levels\}]
[, OUTCONN_INDICES=\{variable\} [, POLYGONS=\{array\} of polygon descriptions\}]

**HSV** - Creates color table based on Hue/Saturation/Value color system.
HSV, Vlo, Vhi, Satlo, Sathi, Hue, Loops [, Colr]
ISOSURFACE - Returns topologically consistent triangles by using oriented tetrahedral decomposition.

ISOSURFACE, Data, Value, Outverts, Outconn
[ , GEOM_XYZ=array, TETRAHEDRA=array]
[ , AUXDATA_IN=array, AUXDATA_OUT=variable]

KW_TEST - Performs Kruskal-Wallis H-test.

LADFIT - Fits paired data using least absolute deviation method.

Result = LADFIT( X, Y [, ABSDEV=variable] [, /DOUBLE] )

LAGUERRE - Returns value of the associated Laguerre polynomial.

Result = LAGUERRE( X, N [, K]
[ , COEFFICIENTS=variable] [, /DOUBLE] )

LEEFILT - Performs the Lee filter algorithm on an image array.

Result = LEEFILT( A [, N [, Sig]] [, /DOUBLE] [, /EXACT] )

LEGENDRE - Returns value of the associated Legendre polynomial.

Result = LEGENDRE( X, L [, M] [, /DOUBLE] )

LINBCG - Solves a set of sparse linear equations using the iterative biconjugate gradient method.


LINDGEN - Returns a 64-bit integer array with each element set to nonzero_value.

Result = LINDGEN(D_1, ..., D_8)

LINFIT - Fits by minimizing the Chi-square error statistic.

Result = LINFIT( X, Y [, CHISQ=variable]
[ , COVAR=variable] [, /DOUBLE]
[ , MEASURE_ERRORS=vector] [, PROB=variable]
[ , SIGMA=variable] [, YFIT=variable] )

LINKIMAGE - Merges routines written in other languages with IDL at run-time.

LINKIMAGE, Name, Image [, Type [, Entry]]
[ , /DEVICE] [, /FUNCTION] [, /KEYWORDS]
[ , MAX_ARGS=value] [, MIN_ARGS=value]

VMS Keywords: [ , DEFAULT=string]

LIVE_CONTOUR - Displays contour plots using a GUI.

LIVE_CONTOUR, Z_1, ..., Z_25 [ , /BUFFER]
[ , /DOUBLE] [, DIMENSIONS=[width, height][normal units]]
[ , DRAW_DIMENSIONS=[width, height][device units]]
[ , ERROR=variable] [, /INDEXED_COLOR]
[ , INSTANCING=[-1 0 1]]
[ , LOCATION=[x, y][normal units]]
[ , /MANAGE_STYLE] [, NAME=structure]
[ , /NO_DRAW] [, /NO_SELECTION] [, /NO_STATUS]
[ , /NO_TOOLBAR] [, PARENT_BASE=widget_id]
[ , TLB_LOCATION=[Xoffset, Yoffset][device units]]
[ , PREFERENCE_FILE=filename[full path]]
[ , REFERENCE_FILE=filename]
[ , REFERENCE_OUT=variable] [, RENDERER={0 | 1}]
[ , REPLACE={structure | 0 | 1 | 2 | 3 | 4}]
[ , STYLE=Name_or_reference]
[ , TEMPLATE_FILE=filename] [, TITLE=string]
[ , WINDOW_IN=string]
[ , X | Y]INDEPENDENT=value] [, (X | Y)LOG]
[ , X | Y]RANGE=[min, max][data units]]
[ , X | Y]_TICKNAME=variable]
LIVE_CONTROL - Sets the properties of a visualization in a LIVE tool from the IDL command line.
LIVE_CONTROL, [Name] [, /DIALOG]
[, ERROR=variable] [, /NO_DRAW]
[, PROPERTIES=structure] [, /SELECT]
[, /UPDATE_DATA] [, WINDOW_IN=string]

LIVE_DESTROY - Destroys a window visualization or an element in a visualization.
LIVE_DESTROY, [Name1,..., Name25]
[, /ENVIRONMENT] [, ERROR=variable]
[, /NO_DRAW] [, /PURGE] [, WINDOW_IN=string]

LIVE_EXPORT - Exports visualization or window to a file.
LIVE_EXPORT [, /APPEND]
[, COMPRESSION={0 | 1 | 2} (TIFF only)] [, /DIALOG]
[, DIMENSIONS={width, height} [, ERROR=variable]
[, FILENAME=string] [, ERROR=variable]
[, /PROGRESSIVE (JPEG only)]
[, QUALITY={0 | 1 | 2} (for VRML) | {0 to 100} (for JPEG)]
[, RESOLUTION=value] [, STYLE=string]
[, VISUALIZATION_IN=string]
[, WINDOW_IN=string]

LIVE_IMAGE - Displays visualizations using a GUI.
LIVE_IMAGE, Image [, RED=byte_vector] [, BLUE=byte_vector]
[, /BUFFER] [, DIMENSIONS={width, height} (normal units)]
[, DRAW_DIMENSIONS={width, height} (devide units)]
[, ERROR=variable] [, /INDEXED_COLOR]
[, INSTANCING={-1 | 0 | 1}]
[, LOCATION={x, y} (normal units)]
[, /MANAGE_STYLE] [, NAME=structure]
[, /NO_DRAW] [, /NO_SELECTION] [, /NO_STATUS]
[, /NO_TOOLBAR] [, PARENT_BASE=widget_id] ,
[, TLB_LOCATION={Xoffset, Yoffset} (device units)]
[, /INTERACTIVE] [, /NEW_AXES] [, /NO_DRAW]
[, /NO_SELECTION] [, /NO_STATUS]
[, REFERENCE_FILE=filename] [, WINDOW_IN=string]

LIVE_INFO - Gets the properties of a LIVE tool.
LIVE_INFO, [Name] [, ERROR=variable]
[, PROPERTIES=variable] [, WINDOW_IN=string]

LIVE_LINE - Provides an interface for line annotation.
LIVE_LINE, [ARROW_ANGLE=value={1.0 to 179.0}] [, /ARROW_END] [, ARROW_SIZE=value={0.0 to 0.3}]
[, ARROW_START] [, COLOR='color_name']
[, /DIALOG] [, DIMENSIONS={width, height}]
[, ERROR=variable] [, /HIDE] [, LINEDIST={0 | 1 | 2 | 3 | 4 | 5}]
[, LOCATION={x, y}] [, NAME=string]
[, /NO_DRAW] [, /NO_SELECTION]
[, REFERENCE_OUT=variable]

LIVE_LOAD - Loads into memory the complete set of routines necessary to run all LIVE tools.
LIVE_LOAD

LIVE_OPLOT - Inserts data into pre-existing plots.
LIVE_OPLOT, Yvector1,..., Yvector25
[, ERROR=variable] [, INDEPENDENT=vector]
[, NAME=structure] [, /NEW_AXES] [, /NO_DRAW]
[, /NO_SELECTION] [, REFERENCE_OUT=variable]
[, REPLACE=structure] [, WINDOW_IN=string]
[, X | Y]_TICKNAME=variable
[, X | Y]_AXIS_IN=string

LIVE_PLOT - Displays a plot using a GUI.
LIVE_PLOT, Yvector1,..., Yvector25
[, /BUFFER] [, DIMENSIONS={width, height} (normal units)]
[, /DOUBLE]
[, DRAW_DIMENSIONS={width, height} (devide units)]
[, ERROR=variable] [, /HISTOGRAM] [, /LINE]
[, /POLAR] [, /SCATTER] [, /INDEXED_COLOR]
[, INSTANCING={-1 | 0 | 1}]
[, LOCATION={x, y} (normal units)]
[, INDEPENDENT=vector]
[, /MANAGE_STYLE] [, NAME=structure]
[, /NO_DRAW] [, /NO_SELECTION] [, /NO_STATUS]
[, /NO_TOOLBAR] [, PARENT_BASE=widget_id] ,
[, TLB_LOCATION={Xoffset, Yoffset} (device units)]
[, /INTERACTIVE] [, /NEW_AXES] [, /NO_DRAW]
[, /NO_SELECTION] [, /NO_STATUS]
[, REFERENCE_FILE=filename] [, WINDOW_IN=string]
[, X | Y]_AXIS_IN=string

LIVE_PRINT - Prints a given window to the printer.
LIVE_PRINT [, /DIALOG] [, ERROR=variable]
[, WINDOW_IN=string]

Macintosh Keywords: [, /SETUP]

LIVE_RECT - Provides an interface for insertion of rectangles.
LIVE_RECT [, COLOR='color_name'] [, /DIALOG]
[, DIMENSIONS={width, height}] [, ERROR=variable]
[, /HIDE] [, LINEDIST={0 | 1 | 2 | 3 | 4 | 5}]
[, LOCATION={x, y}] [, NAME=string]
[, /NO_DRAW] [, /NO_SELECTION]
[, REFERENCE_OUT=variable]

LIVE_STYLE - Controls style settings for a LIVE tool.
Style = LIVE_STYLE ('contour' | 'image' | 'plot' | 'surface') [, BASESTYLE=style_name]
[, COLORBAR_PROPERTIES=structure]
LIVE_SURFACE - Displays a surface using a GUI.

LIVE_TEXT - Provides an interface for text annotation.

LJLCT - IDs HandiGuide

LUSOL - Returns the longitude and latitude of a point

LL_ARC_DISTANCE - Does a non-linear least squares fit.

LMFIT - Determines the type of license used by the current IDL session.

LMGR - Computes the Lomb Normalized Periodogram.

LNP_TEST - Loads one of the predefined IDL color tables.

LOADCT - Returns logarithm of the gamma function of X.

LOCATE_GET - Returns a longword integer vector or array.

LONG64 - Returns a 64-bit integer vector or array.

LONG - Converts argument to 64-bit integer type.

LONG64 - Converts argument to 64-bit integer type.

LSODE - Advances a solution to a system of ordinary differential equations one time-step H.

LU_COMPLEX - Solves complex linear system using LU decomposition.

LU_COMPLEX - Solves complex linear system using LU decomposition.

LUSOL - Solves a set of linear equations. Use with LUDC.

Result = LUSOL(A, Index, B [, /COLUMN] [, /DOUBLE])
M_CORRELATE - Computes multiple correlation coefficient.
Result = M_CORRELATE(X, Y [, /DOUBLE])

MACHAR - Determines and returns machine-specific parameters affecting floating-point arithmetic.
Result = MACHAR( [, /DOUBLE] )

MAKE_ARRAY - Returns an array of the specified type, dimensions, and initialization.

MAKE_DLL - Builds a shareable library suitable for use with IDL’s dynamic linking.

MAP_2POINTS - Returns distance, azimuth, and path relating to the great circle or rhumb line connecting two points on a sphere.
Result = MAP_2POINTS( lat0, lon0, lat1, lon1 [, /INT] [, LIMIT=vector] [, MLINESTYLE={0 | 1 | 2 | 3 | 4 | 5}] [, MLINETHICK=value] [, /HORIZON] [, INCREMENT=value] [, LABEL=n{label_every_nth_gridline}] [, LATDEL=degrees] [, LATNAMES=array, LATS=vector] [, LONDEL=degrees] [, LONNAMES=array, LONS=vector] [, /NO_GRID] Graphics Keywords: [, /T3D] [, ZVALUE=value(0 to 1)]

MAP_IMAGE - Returns an image warped to fit the current map projection. (Use when map data is larger than the display).
Result = MAP_IMAGE( Image [, Startx, Starty [, Xsize, Ysize]] [, LATMIN=degrees{-90 to 90}] [, LATMAX=degrees{-90 to 90}] [, LONMIN=degrees{-180 to 180}] [, LONMAX=degrees{-180 to 180}] [, /BILINEAR] [, COMPRESS=value] [, SCALE=value] [, MAX_VALUE=value] [, MIN_VALUE=value] [, MISSING=value] )

MAP_PATCH - Returns an image warped to fit the current map projection. (Use when map data is smaller than the display).

MAP_PROJ_INFO - Returns information about current map and/or the available projections.

MAP_SET - Establishes map projection type and limits.

MESH_ISSOLID - Computes the mean of a numeric vector.
Result = MESH_ISSOLID (Conn)

MEMORY - Clips a polygonal mesh to an arbitrary plane in space
Result = MESH_CLIP (Plane, Vertsin, Connin, Vertsout, Connout [, AUXDATA_IN=variable, AUXDATA_OUT=variable] [, CUT_VERTS=variable ])

MEAN - Computes the mean of a numeric vector.
Result = MEAN (X [, /DOUBLE] [, /NAN] )

MEANABSDEV - Computes the mean absolute deviation of a vector.
Result = MEANABSDEV( X [, /DOUBLE] [, /MEDIAN] [, /NAN] )

MEDIAN - Returns the median value of Array or applies a median filter.
Result = MEDIAN( Array [, Width] [, /EVEN] )

MEMORY - Returns a vector containing information on the amount of dynamic memory currently in use by the IDL session.
Result = MEMORY( [ , /CURRENT] [ , /HIGHWATER] [ , /NUM_ALLOC] [ , /NUM_FREE] [ , /STRUCTURE] [ , /L64] )

MESH_CLIP - Clips a polygonal mesh to an arbitrary plane in space and returns a polygonal mesh of the remaining portion.
Result = MESH_CLIP( Plane, Vertsin, Connin, Vertsout, Connout [, AUXDATA_IN=variable, AUXDATA_OUT=variable] [, CUT_VERTS=variable ])

MESH_DECIMATE - Reduces the density of geometry while preserving as much of the original data as possible.
Result = MESH_DECIMATE (Vertsin, Connin [, VERTICES=variable] [, PERCENT_VERTICES=percent] [, PERCENT_POLYGONS=percent] )

MESH_ISSOLID - Computes various mesh properties and enables IDL to determine if a mesh encloses space (is a solid).
Result = MESH_ISSOLID (Conn)

MESH_NUMTRIANGLES - Computes the number of triangles in a polygonal mesh.
Result = MESH_NUMTRIANGLES (Conn)

MESH_OBJ - Generates a polygon mesh for various simple objects.
MESH_OBJ. Type, Vertex_List, Polygon_List, Array1, Array2 [, /DEGREES] [ , P1=value] [ , P2=value] [ , P3=value] [ , P4=value] [ , P5=value]

MESH_SMOOTH - Performs spatial smoothing on a polygon mesh.
Result = MESH_SMOOTH (Verts, Conn [, ITERATIONS=value] [ , FIXED_VERTICES=variable] [ , /FIXED_EDGE_VERTICES] [ , LAMBDA=value] )

MESH_VOLUME - Computes the volume that the mesh encloses.
Result = MESH_VOLUME (Verts, Conn [, /SIGNED] )

MESSAGE - Issues error and informational messages.

MIN - Returns the value of the smallest element of an array.
Result = MIN( Array [, Min_Subscript] [, MAX=value] [, /NAN] )

MIN_CURVE_SURF - Interpolates over either a plane or a sphere with a minimum curvature surface or a thin-plate-spline surface.

MK_HTML_HELP - Converts text documentation headers to HTML files.
MK_HTML_HELP, Sources, Filename [, /STRICT] [, TITLE=string] [, /VERBOSE]

MODIFYCT - Saves modified color tables in the IDL color table file.
MODIFYCT, Itab, Name, R, G, B [, FILE=filename]
MOMENT - Computes mean, variance, skewness, and kurtosis.

\[
\text{Result} = \text{MOMENT}( X, [], \text{DOUBLE}[, \text{MDEV}=\text{variable}] [, \text{NAN}=\text{variable}] [, \text{SDEV}=\text{variable}])
\]

MORPH_CLOSE - Applies closing operator to binary or grayscale image.

\[
\text{Result} = \text{MORPH_CLOSE}(\text{Image}, \text{Structure}, [], \text{GRAY}[, \text{PRESCRIBE\_TYPE}=\text{bytearray} \text{or} \text{UINT} \text{or} \text{ULONG}][, \text{VALUES}=\text{array}])
\]

MORPH_DISTANCE - Estimates N-dimensional distance maps, which contain for each foreground pixel the distance to the nearest background pixel, using a given norm.

\[
\text{Result} = \text{MORPH\_DISTANCE}(\text{Data}, [], \text{GRAY}[, \text{BACKGROUND}] [, \text{NEIGHBOR\_SAMPLING}=\{1 \text{ or } 3\}, \text{NO\_COPY}])
\]

MORPH_GRADIENT - Applies the morphological gradient operator to a grayscale image.

\[
\text{Result} = \text{MORPH\_GRADIENT}(\text{Image}, \text{Structure}, [], \text{GRAY}[, \text{PRESCRIBE\_TYPE}=\text{bytearray} \text{or} \text{UINT} \text{or} \text{ULONG}][, \text{VALUES}=\text{array}])
\]

MORPH_HITORMISS - Applies the hit-or-miss operator to a binary image.

\[
\text{Result} = \text{MORPH\_HITORMISS}(\text{Image}, \text{HitStructure}, \text{MissStructure})
\]

MORPH_OPEN - Applies the opening operator to a binary or grayscale image.

\[
\text{Result} = \text{MORPH\_OPEN}(\text{Image}, \text{Structure}, [], \text{GRAY}[, \text{PRESCRIBE\_TYPE}=\text{bytearray} \text{or} \text{UINT} \text{or} \text{ULONG}][, \text{VALUES}=\text{array}])
\]

MORPH_THIN - Performs a thinning operation on binary images.

\[
\text{Result} = \text{MORPH\_THIN}(\text{Image}, \text{HitStructure}, \text{MissStructure})
\]

MORPH_TOPHAT - Applies top-hat operator to a grayscale image.

\[
\text{Result} = \text{MORPH\_TOPHAT}(\text{Image}, \text{Structure}, [], \text{GRAY}[, \text{PRESCRIBE\_TYPE}=\text{bytearray} \text{or} \text{UINT} \text{or} \text{ULONG}][, \text{VALUES}=\text{array}])
\]

MPEG_CLOSE - Closes an MPEG sequence.

\[
\text{MPEG\_CLOSE, mpegID}
\]

MPEG_OPEN - Opens an MPEG sequence.

\[
\text{mpegID} = \text{MPEG\_OPEN}(\text{Dimensions}, [], \text{FILENAME}=\text{string}[, \text{BITRATE}=\text{value}] [, \text{FRAME\_GAP}=\text{integer} \text{value}] [, \text{MOTION\_VEC\_LENGTH}=\{1 \text{ or } 3\}] [, \text{QUALITY}=\text{value}(0 \text{ to } 100)])
\]

N_ELEMENTS - Returns the number of elements contained in an expression or variable.

\[
\text{Result} = \text{N\_ELEMENTS}(\text{Expression})
\]

N_PARAMS - Returns the number of non-keyword parameters used in calling an IDL procedure or function.

\[
\text{Result} = \text{N\_PARAMS}()
\]

N_TAGS - Returns the number of tags in a structure.

\[
\text{Result} = \text{N\_TAGS}(\text{Expression}, [], \text{LENGTH})
\]

NEWTON - Solves nonlinear equations using Newton’s method.

\[
\text{Result} = \text{NEWTON}(\text{X}, \text{Vecfunc}, [], \text{CHECK}=\text{variable}[, \text{DOUBLE}][, \text{ITMAX}=\text{value}[, \text{STEPMAX}=\text{value}][, \text{TOLF}=\text{value}][, \text{TOLMIN}=\text{value}][, \text{TOLX}=\text{value}])
\]

NORM - Computes Euclidean norm of vector or Infinity norm of array.

\[
\text{Result} = \text{NORM}([\text{A}], [], \text{DOUBLE})
\]

OBJ_CLASS - Determines the class name of an object.

\[
\text{Result} = \text{OBJ\_CLASS}([\text{Arg}], [], \text{COUNT}=\text{variable}[, \text{SUPERCLASS}=\text{must specify Arg}])
\]

OBJ_DESTROY - Destroys an object reference.

\[
\text{OBJ\_DESTROY, ObjRef}, [\text{Arg}1, ..., \text{Arg}_n]
\]

OBJ_ISA - Determines inheritance relationship of an object.

\[
\text{Result} = \text{OBJ\_ISA}([\text{ObjectInstance}, \text{Name}][])
\]

OBJ_NEW - Creates an object reference.

\[
\text{Result} = \text{OBJ\_NEW}([\text{Name}], [\text{Arg}_1, ..., \text{Arg}_{n}])
\]

OBJ_VALIDATE - Verifies validity of object references.

\[
\text{Result} = \text{OBJ\_VALID}([\text{Arg}][, \text{CAST}=\text{integer}][, \text{COUNT}=\text{variable}])
\]

OBJARR - Creates an array of object references.

\[
\text{Result} = \text{OBJARR}([D_1, ..., D_g], [], \text{NO\_ZERO})
\]
ON_ERROR - Designates the error recovery method.
ON_ERROR, N

ON_IOERROR - Declares I/O error exception handler.
ON_IOERROR, Label

Label: Statement to perform upon I/O error

ONLINE_HELP - Invokes hypertext help viewer from programs.
ONLINE_HELP [, Value [, BOOK='filename']]
[, /CONTEXT] [, /FULL_PATH] [, /HTML_HELP]
[, /QUIT] [, /TOPICS]

OPEN - Opens files for reading, updating, or writing.
OPENR, Unit, File [, Record_Length]
OPENW, Unit, File [, Record_Length]
OPENU, Unit, File [, Record_Length]

Keywords (all platforms): [, APPEND [, COMPRESS]]
[, BUFSIZE={0 | 1 | value>512}] [, /DELETE]
[, ERROR=value] [, /77_UNFORMATTED]
[, GET_LUN] [, MORE] [, /STDIO]
[, SWAP_ENDIAN] [, SWAP_IF_BIG_ENDIAN]
[, SWAP_IF_LITTLE_ENDIAN] [, /VAX_FLOAT]
[, WIDTH=value] [, /XDR]

Macintosh-Only Keywords: [, MACCREATOR=string]
[, MACTYPE= string]

UNIX-Only Keywords: [, RAWIO]

VMS-Only Keywords: [, _BLOCK [, /SHARED] [, _UDF_BLOCK] DEFAULT='extension']
[, _EXTENDSIZE [, _FIXED] [, _FORTRAN]
[, _INITIALSIZE=blocks] [, _KEYED] [, _LIST] [, _NONE]
[, _PRINT] [, _SEGMENTED] [, _STREAM] [, _SUBMIT]
[, _SUPERSEDE] [, _TRUNCATE_ON_CLOSE]
[, /VARIABLE]

OPLOT - Plots vector data over a previously-drawn plot.
OPLOT, [X, Y] [, MAX_VALUE=value]
[, MIN_VALUE=value] [, NSUM=value] [, /POLAR]
[, THICK=value]

Graphics Keywords: [, CLIP=[X0, Y0, X1, Y1]]
[, COLOR=value] [, LINESTYLE={0 | 1 | 2 | 3 | 4 | 5}]
[, NOCLIP] [, PSYM=integer(0 to 10)]
[, SYMSIZE=value] [, /T3D] [, ZVALUE=value(0 to 1)]

OPLOTERR - Draws error bars over a previously drawn plot.
OPLOTERR, [X, Y, Err] [, Psym]

P

P_CORRELATE - Computes partial correlation coefficient.
Result = P_CORRELATE(X, Y, C [, /DOUBLE])

PARTICLE_TRACE - Traces the path of a massless particle through
a vector field.
PARTICLE_TRACE, Data, Seeds, Verts, Conn
[, Normals] [, MAX_ITERATIONS=value]

[, ANISOTROPY=array] [, INTEGRATION={0 | 1}]
[, SEED_NORMAL=vector] [, TOLERANCE=value]
[, MAX_STEPSIZE=value] [, /UNIFORM]

PCOMP - Computes principal components/derived variables.
Result = PCOMP( A [, COEFFICIENTS=variable]
[, /COVARIANCE] [, /DOUBLE]
[, EIGENVALUES=variable] [, N=variable]
[, /STANDARDIZE] [, DIMENSIONS=variable] )

PLOT - Plots vector arguments as X versus Y graphs.
PLOT, [X, Y] [, MAX_VALUE=value]
[, MIN_VALUE=value] [, NSUM=value] [, /POLAR]
[, THICK=value] [, /XLOG] [, /YLOG] [, /YNOZERO]

Graphics Keywords: [, BACKGROUND=string]
[, CHARSTYLE=value] [, CHARTICK=integer]
[, CLIP=[X0, Y0, X1, Y1]] [, COLOR=value] [, /DATA]
[, /DEVICE] [, /NORMAL] [, FONT=integer]
[, LINESTYLE={0 | 1 | 2 | 3 | 4 | 5}] [, NOCLIP]
[, NODETAIL] [, NOERASE] [, POSITION=[X0, Y0, X1, Y1]]
[, PSYM=integer(0 to 10)] [, SUBTITLE=string]
[, SYMSIZE=value] [, /T3D] [, THICK=value]
[, TICKLEN=value] [, TITLE=string]
[, X | Y | Z] CHARSIZE=value
[, X | Y | Z] GRIDSTYLE=integer(0 to 5)]
[, X | Y | Z] MARGIN={left, right}
[, X | Y | Z] MINOR=integer
[, X | Y | Z] RANGE=[min, max]
[, X | Y | Z] STYLE=integer
[, X | Y | Z] THICK=value
[, X | Y | Z] TICK_GET=integer
[, X | Y | Z] TICKFORMAT=string
[, X | Y | Z] TICKINTERVAL=variable
[, X | Y | Z] TICKLAYOUT=scalar
[, X | Y | Z] TICKLEN=variable
[, X | Y | Z] TICKNAME=string_array
[, X | Y | Z] TICKS=integer
[, X | Y | Z] TICKUNITS=string
[, X | Y | Z] Ticks=variable
[, X | Y | Z] TITLE=string
[, ZVALUE=value(0 to 1)]

PLOT_3DBOX - Plots function of two variables inside 3D box.
PLOT_3DBOX, X, Y, Z [, GRIDSTYLE={0 | 1 | 2 | 3 | 4 | 5}]
[, PSYM=integer(1 to 10)] [, /SOLID_WALLS]
[, /XY_PLANE] [, XYSTYLE={0 | 1 | 2 | 3 | 4 | 5}]
[, /XZ_PLANE] [, XZSTYLE={0 | 1 | 2 | 3 | 4 | 5}]
[, /YZ_PLANE] [, YZSTYLE={0 | 1 | 2 | 3 | 4 | 5}]
[, AX=degrees] [, AZ=degrees] [, ZAXIS=[1 | 2 | 3 | 4 | 5]]

Graphics Keywords: Accepts all graphics keywords
accepted by PLOT except for: FONT, PSYM, SYMSIZE,
(XYZ)TICK_GET, and ZVALUE.

PLOT_FIELD - Plots a 2D field using arrows.
PLOT_FIELD, U, V [, ASPECT=variable]
[, LENGTH=value] [, NUM=variable] [, TITLE=string]
POLYERR - Plots individual data points with error bars.

POLYERR, [X, Y, Err [, TYPE=[1 | 2 | 3 | 4]]
[, PSYM=integer [1 to 10]]

POLY - Plots vectors and points.

POLY, [X, Y [, Z] [, /CONTINUE]]

Graphics Keywords: [ , CLIP=[X0, Y0, X1, Y1]]
[, COLOR=value] [, /DATA] [, /DEVICE] [, /NORMAL]
[, LINESTYLE=[0 | 1 | 2 | 3 | 4 | 5]] [, /NOCLIP]
[, PSYM=integer [0 to 10]] [, SYMSIZE=value] [, /T3D]
[, THICK=value] [, Z=value]

PNAVLINE - Returns the perpendicular distance between a point and a line.
Result = PNAVLINE( P0, L0, LI [, PI] [, /INTERVAL ] )

POINT_LUN - Sets or gets current position of the file pointer.

POINT_LUN, Unit, Position

POLAR_CONTOUR - Draws a contour plot from data in polar coordinates.

POLAR_CONTOUR, Z, Theta, R
[ , C.Annotation=vector_of_strings]
[ , C.CHARSIZE=value] [, C.CHARTHICK=integer]
[ , C.COLORS=vector] [, C.LINESTYLE=vector]
[ , /CLOSED] [, /IRREGULAR] [, LEVELS=vector]
[NLEVELS=integer [1 to 29]] [, MAX_VALUE=value]
[, MIN_VALUE=value] [, /OVERPLOT]
[ , /PATH_DATACOORDS |)
[ , TRIANGULATION=variable] [, /XLOG] [, /YLOG]
[ , /ZAXIS] [, SHOW_TRIANGULATION=color_index]

POLAR_SURFACE - Interpolates a surface from polar coordinates to rectangular coordinates.

Result = POLAR_SURFACE( Z, R, Theta [, /GRID]
[ , SPACING=[xspacing, yspacing]]
[ , BOUNDS=[X0, Y0, X1, Y1]] [, /QUINTIC]
[, MISSING=value ]

POLY - Evaluates polynomial function of a variable.

Result = POLY( X, C)

POLY 2D - Performs polynomial warping of images.

Result = POLY 2D( Array, P, Q [, Interp [, Dimx, Dimy]]
[ , CUBIC=[-1 to 0]] [, MISSING=value ]

POLY_AREA - Returns the area of a polygon given the coordinates of its vertices.

Result = POLY_AREA( X, Y [, /SIGNED ] )

POLY_FIT - Performs a least-squares polynomial fit.

Result = POLY_FIT( X, Y, Degree [, CHISQ=variable]
[ , COVAR=variable] [, /DOUBLE]
[ , MEASURE_ERRORS=vector] [, SIGMA=variable]
[, STATUS=variable] [, YBAND=variable]
[, YERROR=variable] [, YFIT=variable ]

POLYFILL - Fills the interior of a polygon.

POLYFILL, X [, Y [, Z] [, IMAGE_COORD=array]
[, /IMAGE_INTERP] [, /LINE_FILL]
[, PATTERN=vector] [, SPACING=centimeters]
[, TRANSAPARENT=value]

Graphics Keywords: [ , CLIP=[X0, Y0, X1, Y1]]
[, COLOR=value] [, /DATA] [, /DEVICE] [, /NORMAL]
[, LINESTYLE=[0 | 1 | 2 | 3 | 4 | 5]] [, /NOCLIP]
[, ORIENTATION=ccw_degrees_from_horiz] [, /T3D]
[, THICK=value] [, Z=value]

POLYFILLV - Returns subscripts of pixels inside a polygon.

Result = POLYFILLV( X, Y, Sx, Sy [, Run_Length] )

POLYSHADE - Creates a shaded surface representation from a set of polygons.

Result = POLYSHADE( Vertices, Polygons)

or
Result = POLYSHADE( X, Y, Z, Polygons)

Keywords: [, /DATA] [, /NORMAL]
[, POLY_SHADES=vector] [, SHADES=vector] [, /T3D]
[, TOP=value] [, XSIZE=columns] [, YSIZE=rows]

POLYWARP - Performs polynomial spatial warping.

POLYWARP, Xi, Yi, Xo, Yo, Degree, Ks, Ky

POP - Removes the top directory on the working directory stack maintained by PUSHD/POPD.

POPD

POWELL - Minimizes a function using the Powell method.

POWELL, F, Xi, Tol, Fmin, Func [, /DOUBLE]
[, ITER=variable] [, ITMAX=value ]

PRIMES - Computes the first K prime numbers.

Result = PRIMES(K)

PRINT/PRINTF - Writes formatted output to screen or file.

PRINT [, Expr1, ..., Exprn]
PRINTF [, Unit, Expr1, ..., Exprn]

Keywords: [, AM_PM=[string, string]]
[, DAYS_OF_WEEK=string_array[7 names]]
[, FORMAT=vector] [, MONTHS=string_array[12 names]] [, /STDIO_NON_FINITE]

VMS Keywords: [, /REWRITE]

PRINTD - Prints contents of the directory stack maintained by PUSHD/POPD.

PRINTD

PRO - Defines a procedure.

PRO Procedure_Name, argument1, ..., argumentn

. . .

END

PROFILE - Extracts a profile from an image.

Result = PROFILE( Image [, XX, YY] [, /NOMARK]
[, XSTART=value] [, YSTART=value ]

POLYERR
Alphabetical Listing

PROFILER - Accesses the IDL Code Profiler used to analyze performance of applications.

PROFILE [Module] [ /CLEAR] [ DATA=variable] [ /LAST] [ /XML] [ /XML_VIEW]

PROFILES - Interactively examines image profiles.

PROFILES, Image [ /ORDER] [ SX=value] [ SY=value] [ SIZE=value] [ /WSIZE=value]

PROJECT_VOL - Returns a translucent rendering of a volume projected onto a plane.

RETURN = PROJECT_VOL( Vol, X_Sample, Y_Sample, Z_Sample [ , DEPTH_Q=value] [ , OPAQUE=3D_array] [ , TRANS=Array])

PS_SHOW_FONTS - Displays all the PostScript fonts that IDL knows about.

PS_SHOW_FONTS [ /NOLATIN]

PSAFM - Converts Adobe Font Metrics file to IDL format.

PSAFM, Input_Filename, Output_Filename

PSEUDO - Creates pseudo-color table based on Lightness, Hue, and Brightness system.

PSEUDO, Lerro, Light, Satlo, Sath, Hue, Loops [ , Colr]

PTR_FREE - Destroys a pointer.

PTR_FREE, P1, ... , Pn

PTR_NEW - Creates a pointer.

Result = PTR_NEW( [InitExpr] [ , /ALLOCATE_HEAP] [ , /NO_COPY] )

PTR_VALID - Verifies the validity of pointers.

Result = PTR_VALID( [Arg] [ , /CAST] [ , COUNT=variable] )

PTRARR - Creates an array of pointers.

Result = PTRARR( D1, ... , Dq [ , /ALLOCATE_HEAP] [ , /NOZERO] )

PUSHD - Pushes a directory to top of directory stack maintained by PUSHD/POPD.

PUSHD, Dir

Q

QROMB - Evaluates integral over a closed interval.

Result = QROMB( Func, A, B [ , /DOUBLE] [ , EPS=value] [ , JMAX=value] [ , K=value] )

QROMO - Evaluates integral over an open interval.

Result = QROMO(Func, A [ , B] [ , /DOUBLE] [ , EPS=value] [ , JMAX=value] [ , K=value] [ , MIDEXP] [ , MIDINF] [ , MIDPNT] [ , MIDSQL] [ , MIDSQUL] )

QSIMP - Evaluates integral using Simpson’s rule.

Result = QSIMP( Func, A, B [ , /DOUBLE] [ , EPS=value] [ , JMAX=value] )

QUERY_BMP - Obtains information about a BMP image file.

Result = QUERY_BMP( Filename[ , Info] )

QUERY_DIGICOM - Tests file for compatibility with READ_DIGICOM.

Result = QUERY_DIGICOM( Filename[, Info] [ , IMAGE_INDEX=index] )

QUERY_IMAGE - Determines if a file is recognized as an image file.

Result = QUERY_IMAGE( Filename[, Info] [ , CHANNELS=variable] [ , DIMENSIONS=variable] [ , HAS_PALETTE=variable] [ , IMAGE_INDEX=index] [ , NUM_IMAGES=variable] [ , PIXEL_TYPE=variable] [ , SUPPORTED_READ=variable] [ , SUPPORTED_WRITE=variable] [ , TYPE=variable] )

QUERY_JPEG - Obtains information about a JPEG image file.

Result = QUERY_JPEG( Filename[, Info] )

QUERY_PICT - Obtains information about a PICT image file.

Result = QUERY_PICT( Filename, Info)

QUERY_PNG - Obtains information about a PNG image file.

Result = QUERY_PNG( Filename[, Info] )

QUERY_PPM - Obtains information about a PPM image file.

Result = QUERY_PPM( Filename[, Info] [ , MAXVAL=variable] )

QUERY_SRF - Obtains information about an SRF image file.

Result = QUERY_SRF( Filename[, Info] )

QUERY_TIFF - Obtains information about a TIFF image file.

Result = QUERY_TIFF( Filename[, Info] [ , IMAGE_INDEX=index] )

QUERY_WAV - Checks that the file is actually a .WAV file and that the READ_WAV function can read the data in the file.

Result = QUERY_WAV( Filename[, Info] )

R

R_CORRELATE - Computes rank correlation.

Result = R_CORRELATE( X, Y [ , D=variable] [ , /KENDALL] [ , PROBD=variable] [ , ZD=variable] )

R_TEST - Runs test for randomness.

Result = R_TEST( X [ , N0=variable] [ , N1=variable] [ , R=variable] )

RADON - Returns the Radon transform of a two-dimensional image.

Radon Transform: Result = RADON( Array [ , /DOUBLE] [ , DRHO=scalar] [ , DX=scalar] [ , DY=scalar] [ , /GRAY] [ , /LINEAR] [ , NRHO=scalar] [ , NTHETA=scalar] [ , RHO=variable] [ , RMIN=scalar] [ , THETA=variable] [ , XMIN=scalar] [ , XMID=scalar] )

Radon Backprojection: Result = RADON( Array, /BACKPROJECT, RHO=variable, THETA=variable [ , /DOUBLE] [ , DX=scalar] [ , DY=scalar] [ , /LINEAR] [ , NX=scalar] [ , NY=scalar] [ , XMIN=scalar] [ , XMID=scalar] [ , XMID=scalar] )
READ_ASCII - Reads data from an ASCII file.

READ_BINARY - Reads the contents of a binary file using a passed template or basic command line keywords.

READ_IMAGE - Reads the image contents of a file and returns the image in an IDL variable.

READ_JPEG - Reads JPEG file.


READ_PICT - Reads Macintosh PICT (version 2) bitmap file.

READ_SPR - Reads a row-indexed sparse matrix from a file.

READ_SRF - Reads Sun Raster Format file.

READ_SYLK - Reads Symbolic Link format spreadsheet file.

READ_TIFF - Reads TIFF format file.

READ_WAV - Reads the audio stream from the named .WAV file.

READ_WAVE - Reads Wavefront Advanced Visualizer file.

READ_X11_BITMAP - Reads X11 bitmap file.

READ_XWD - Reads X Windows Dump file.

READS - Reads formatted input from a string variable.

RANKS - Computes magnitude-based ranks.

RANDOMU - Returns uniformly-distributed pseudo-random numbers.

RANDOMN - Returns normally-distributed pseudo-random numbers.

RDPIX - Interactively displays image pixel values.

READ_INTERFILE - Reads Interfile (v3.3) file.
**READU** - Reads unformatted binary data from a file.

**VMS-Only Keywords:**
- [ KEY_ID=index ]
- [ KEY_MATCH=relation ]
- [ KEY_VALUE=value ]

**REBIN** - Resizes a vector or array by integer multiples.

**RECALL_COMMANDS** - Returns entries in IDL’s command recall buffer.

**RECON3** - Reconstructs a 3D representation of an object from 2D images.

**REDUCE_COLORS** - Reduces the number of colors used in an image by eliminating unused pixel values.

**REFORM** - Changes array dimensions without changing the total number of elements.

**REGRESS** - Computes fit using multiple linear regression.

**REPLICATE** - Creates an array of given dimensions, filled with specified value.

**REPLICATE_INPLACE** - Updates an array by replacing all or selected parts of it with a specified value.

**RESOLVE_ALL** - Compiles any uncompiled routines.

**RESOLVE_ROUTINE** - Compiles a routine.

**RESTORE** - Restores IDL variables and routines saved in an IDL SAVE file.

**REVERSE** - Reverses the order of one dimension of an array.

**ROT** - Rotates an image by any amount.

**ROBERTS** - Returns an approximation of Roberts edge enhancement.

**ROTATE** - Rotates/transposes an array in multiples of 90 degrees.

**ROUND** - Rounds the argument to its closest integer.

**ROUTINE_INFO** - Provides information about compiled procedures and functions.

**RS_TEST** - Performs the Wilcoxon Rank-Sum test.
S

S_TEST - Performs the Sign test.
   Result = S_TEST(X, Y [, ZDIFF=variable] )

SAVGOL - Returns coefficients of Savitzky-Golay smoothing filter.
   Result = SAVGOL(Nleft, Nright, Order, Degree [. /DOUBLE] )

SAVE - Saves variables, system variables, and IDL routines in a file for later use.

SCALE3 - Sets up axis ranges and viewing angles for 3D plots.

SCALE3D - Scales 3D unit cube into the viewing area.
   SCALE3D

SEARCH2D - Finds "objects" or regions of similar data values within a 2D array.
   Result = SEARCH2D(Array, Xpos, Ypos, Min_Val, Max_Val [, /DECREASE, /INCREASE [, LPF_BAND=integer{23}]] [, /DIAGONAL] )

SEARCH3D - Finds "objects" or regions of similar data values within a volume.
   Result = SEARCH3D(Array, Xpos, Ypos, Zpos, Min_Val, Max_Val [, /DECREASE, /INCREASE [, LPF_BAND=integer{23}]] [, /DIAGONAL] )

SET_PLOT - Sets the output device used by the IDL direct graphics procedures.
   SET_PLOT, Device [, /COPY] [, /INTERPOLATE] 

SET_SHADING - Sets the light source shading parameters.
   SET_SHADING [, /GOURAUD] [, LIGHT=[x, y, z]] [, /REJECT] [, VALUES=[darkest, brightest]]

SET_SYMBOL (VMS Only) - Defines a VMS DCL interpreter symbol.
   SET_SYMBOL, Name, Value [, TYPE={1 | 2}] 

SETENV (UNIX/Windows Only) - Adds or changes an environment variable.
   SETENV, Environment_Expression

SETLOG (VMS Only) - Defines a VMS logical name.

SETUP_KEYS - Sets function keys for use with UNIX versions of IDL.

SFIT - Performs polynomial fit to a surface.
   Result = SFIT(Data, Degree [, KX=variable] )

SHADE_SURF - Creates a shaded-surface representation of gridded data.

SHADE_SURF_IRR - Creates a shaded-surface representation of an irregularly gridded dataset.

SHADE_VOLUME - Contours a volume to create a list of vertices and polygons that can be displayed using POLYSHADE.

SHIFT - Shifts elements of vectors or arrays by a specified number of elements.
   Result = SHIFT(Array, S1, ..., Sn)

SHOW3 - Displays array as image, surface plot, and contour plot simultaneously.

SHOWFONT - Displays a TrueType or vector font
   SHOWFONT, Font, Name [, /ENCAPSULATED] [, /TT_FONT]
<table>
<thead>
<tr>
<th>Command</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMOOTH</td>
<td>Returns the boxcar average.</td>
</tr>
<tr>
<td>SINDGEN</td>
<td>Returns a string array with each element set to its subscript.</td>
</tr>
<tr>
<td>SINDH</td>
<td>Returns the hyperbolic sine of X.</td>
</tr>
<tr>
<td>SIZE</td>
<td>Returns array size and type information.</td>
</tr>
<tr>
<td>SKETNESS</td>
<td>Computes statistical skewness of an n-element vector.</td>
</tr>
<tr>
<td>SKIPF</td>
<td>Skips records or files on the designated magnetic tape unit.</td>
</tr>
<tr>
<td>SLICER3</td>
<td>Interactive volume visualization tool.</td>
</tr>
<tr>
<td>SLIDE_IMAGE</td>
<td>Creates a scrolling graphics window for examining large images.</td>
</tr>
<tr>
<td>SMOOTH</td>
<td>Smooths with a boxcar average.</td>
</tr>
<tr>
<td>SOBEL</td>
<td>Returns an approximation of Sobel edge enhancement.</td>
</tr>
<tr>
<td>SOCKET</td>
<td>Opens client-side TCP/IP Internet socket as IDL file unit.</td>
</tr>
<tr>
<td>SPOW</td>
<td>Spawns child process for access to operating system.</td>
</tr>
<tr>
<td>SQR2</td>
<td>Returns the square root of X.</td>
</tr>
<tr>
<td>STANDARDIZE</td>
<td>Computes standardized variables.</td>
</tr>
<tr>
<td>STDDEV</td>
<td>Computes the standard deviation of an n-element vector.</td>
</tr>
<tr>
<td>STOP</td>
<td>Stops the execution of a running program or batch file.</td>
</tr>
</tbody>
</table>
STRARR - Returns string array containing zero-length strings.
Result = STRARR(D1, ..., Dk)

STRCMP - Compares two strings.
Result = STRCMP(String1, String2 [, N]
[ /FOLD_CASE ] )

STRCOMPRESS - Removes whitespace from a string.
Result = STRCOMPRESS(String [, /REMOVE_ALL ] )

STREAMLINE - Generates the visualization graphics from a path.
STREAMLINE, Verts, Conn, Normals, Outverts, Outconn
[ , ANISOTROPY=array ] [, SIZE=vector ]
[ , PROFILE=array ]

STREGEX - Performs regular expression matching.
Result = STREGEX( StringExpression, RegularExpression
[ , /BOOLEAN | , /EXTRACT | , LENGTH=variable

STRJOIN - Collapses a string scalar or array into merged strings.
Result = STRJOIN( String [, Delimiter ] [, /SINGLE ] )

STRLEN - Returns the length of a string.
Result = STRLEN( Expression )

STRLOWCASE - Converts a string to lower case.
Result = STRLOWCASE( String )

STRMATCH - Compares search string against input string expression.
Result = STRMATCH( String, SearchString
[ , /FOLD_CASE ] )

STRMESSAGE - Returns the text of an error number.

STRMID - Extracts a substring from a string.
Result = STRMID( Expression, First_Character [, Length
[ , /REVERSE_OFFSET ] ] )

STRPOS - Finds first occurrence of a substring within a string.
Result = STRPOS( Expression, Search String [, Pos]
[ , /REVERSE_OFFSET ] [, /REVERSE_SEARCH ] )

STRPUT - Inserts the contents of one string into another.
STRPUT, Destination, Source [, Position ]

STRSPLIT - Splits its input string argument into separate substrings,
according to the specified pattern.
Result = STRSPLIT( String [, Pattern ] [, ESCAPE=string
[ , /REGEX | , /FOLD_CASE ] ] [, /EXTRACT ]
[ , LENGTH=variable ] [, /PREERVE_NULL ] )

STRTRIM - Removes leading and/or trailing blanks from string.
Result = STRTRIM( String [, Flag ] )

STRUCT_ASSIGN - Performs "relaxed structure assignment" to copy a structure.
STRUCT_ASSIGN, Source, Destination [, /NOZERO]
[ /VERBOSE ]

STRUCT_HIDE - Prevents the IDL HELP procedure from displaying
information about structures or objects.
STRUCT_HIDE, Arg1 [, Arg2, ..., Argn ]

STRUPCASE - Converts a string to upper case.
Result = STRUPCASE( String )

SURFACE - Plots an array as a wireframe mesh surface.
SURFACE, Z [, X, Y ] [, AX=degrees ] [, AZ=degrees ]
[ , BOTTOM=index ] [, /HORIZONTAL ] [, /LEGO]
[ , /LOWERONLY | , /UPPERONLY ]
[ , MAX_VALUE=value ] [, MIN_VALUE=value ]
[ , /YLOG ] [, ZAXIS={1 2 3 4 } ] [, /ZLOG]

Graphics Keywords: Accepts all graphics keywords
accepted by PLOT except for: PSYM, SYMSIZE.

SURFR - Sets up 3D transformations by duplicating rotation, translation,
and scaling of SURFACE.
SURFR [, AX=degrees ] [, AZ=degrees ]

SVDC - Computes Singular Value Decomposition of an array.
SVDC, A, W, U, V [, /COLUMN ] [, /DOUBLE ]
[ , ITMAX=value ]

SVDFIT - Multivariate least squares fit using SVD method.
Result = SVDFIT( X, Y [, M ] [, A=vector ]
[ , CHISQ=variable ] [, COVAR=variable ] [, /DOUBLE ]
[ , FUNCTION_NAME=string ] [, /LEGENDRE ]
[ , MEASURE_ERRORS=vector ] [, SIGMA=variable ]
[ , SINGULAR=variable ] [, VARIANCE=variable ]
[ , YFIT=variable ] )

SVSOL - Solves set of linear equations using back-substitution.

SWAP_ENDIAN - Reverses the byte ordering of scalars, arrays or structures.
Result = SWAP_ENDIAN( Variable )

SWITCH - Selects one statement for execution from multiple choices,
depending upon the value of an expression.
SWITCH expression OF
eexpression: statement
...expression: statement
ELSE: statement
ENDSWITCH
SYSTIME - Returns the current time as either a date/time string, as the number of seconds elapsed since 1 January 1970, or as a Julian date/time value.

\[
\text{String} = \text{SYSTIME}([0 \ [, \text{ElapsedSeconds}]] [, /UTC])
\]

or

\[
\text{Seconds} = \text{SYSTIME}(1 \ | \text{SECONDS})
\]

or

\[
\text{Julian} = \text{SYSTIME}(\text{JULIAN} [, /UTC])
\]

T

TAPRD - Reads the next record on a tape.

\[
\text{Result} = \text{TAPRD}()
\]

TAG_NAMES - Returns the names of tags in a structure.

\[
\text{Result} = \text{TAG_NAMES}()
\]

TEMPORARY - Returns a temporary copy of a variable, and sets the temporary variable to “undefined”.

\[
\text{Result} = \text{TEMPORARY}([\text{Variable}])
\]

TAN - Returns the tangent of \(X\).

\[
\text{Result} = \text{TAN}(X)
\]

TANH - Returns the hyperbolic tangent of \(X\).

\[
\text{Result} = \text{TANH}(X)
\]

TAPRD - Reads the next record on a tape.

\[
\text{Result} = \text{TAPRD}()
\]

TAPWRT - Writes data to a tape.

\[
\text{Result} = \text{TAPWRT}()
\]

TEK_COLOR - Loads color table based on Tektronix printer.

\[
\text{Result} = \text{TEK_COLOR}()
\]

TOTAL - Sums the elements of an array.

\[
\text{Result} = \text{TOTAL}([\text{Array} [, /Dimension] [, /CUMULATIVE] [, /DOUBLE] [, /NAN]])
\]

TrackBall Object - See “TrackBall” on page 79.

TRACE - Computes the trace of an array.

\[
\text{Result} = \text{TRACE}([A [, /DOUBLE]])
\]

TRANSPOSE - Transposes an array.

\[
\text{Result} = \text{TRANSPOSE}([\text{Array} [, P]])
\]

TRI_SURF - Interpolates gridded set of points with a smooth quintic surface.

\[
\]

TRIANGULATE - Constructs Delaunay triangulation of a planar set of points.

\[
\]

TRIGRID - Interpolates irregularly-gridded data to a regular grid.

\[
\text{Result} = \text{TRIGRID}([X, Y, Z, Triangles] [, G5, Limits])
\]

For spherical gridding: \(\text{Result} = \text{TRIGRID}([F, G5, Limits] [, SPHERE=5])\)


TRIQL - Determines eigenvalues and eigenvectors of tridiagonal array.

\[
\text{Result} = \text{TRIQL}([D, E, A] [, /DOUBLE])
\]
**TRIRED** - Reduces a real, symmetric array to tridiagonal form.

```
TRIRED, A, D, E [, /DOUBLE]
```

**TRISOL** - Solves tridiagonal systems of linear equations.

```
Result = TRISOL( A, B, C, R [, /DOUBLE] )
```

**TRNLOG (VMS Only)** - Searches the VMS logical name tables for a specified logical name.

```
Result = TRNLOG( Lognam [, ACMODE={0 | 1 | 2 | 3}] [, /FULL_TRANSLATION] [, /ISSUE_ERROR] [, RESULT_ACMODE=variable] [, RESULT_TABLE=variable] [, TABLE=string] )
```

**TS_COEF** - Computes the coefficients for autoregressive time-series.

```
Result = TS_COEF( X, P [, /DOUBLE] [, MSE=variable ])
```

**TS_DIFF** - Computes the forward differences of a time-series.

```
Result = TS_DIFF( X [, /DOUBLE] [, MSE=variable ])
```

**TS_FCAST** - Computes future or past values of a stationary time-series.

```
Result = TS_FCAST( X, P, Nvalues [, /BACKCAST] [, /DOUBLE] )
```

**TS_SMOOTH** - Computes moving averages of a time-series.

```
```

**TV** - Displays an image.

```
TV, Image [, Position] or
TV, Image [, X, Y [, Channel]]
```

**TVSCL** - Scales and displays an image.

```
TVSCL, Image [, Position]
```

**TVLCT** - Loads display color tables.

```
```

**TVRD** - Reads an image from a window into a variable.

```
Result = TVRD( [X0 [, Y0 [, N1 [, N2 [, Channel]]]]] [, CHANNEL=value] [, /ORDER] [, TRUE={1 | 2 | 3}] [, /WORDS] )
```

**TVCRS** - Manipulates the image display cursor.

```
TVCRS [, ON_OFF]
```

**TVSCL** - Scales and displays an image.

```
TVSCL, Image [, X, Y [, Channel]]
```

**UL**

**UINDGEN** - Returns unsigned integer array with each element set to its subscript.

```
Result = UINDGEN( D1, ..., D8 )
```

**UINT** - Converts argument to unsigned integer type.

```
Result = UINT( Expression [, Offset [, Dim1, ..., Dim8]] )
```

**UINTARR** - Returns an unsigned integer vector or array.

```
Result = UINTARR( D1, ..., D8 [, /NOZERO] )
```

**UL64INDGEN** - Returns an unsigned 64-bit integer vector or array.

```
Result = UL64INDGEN( D1, ..., D8 )
```

**ULINDGEN** - Returns an unsigned longword integer array with each element set to its subscript.

```
Result = ULINDGEN( D1, ..., D8 )
```

**ULONG** - Converts argument to unsigned longword integer type.

```
Result = ULONG( Expression [, Offset [, Dim1, ..., Dim8]] )
```

**ULONG64** - Converts argument to unsigned 64-bit integer type.

```
Result = ULONG64( Expression [, Offset [, Dim1, ..., Dim8]] )
```

**UNIQ** - Returns subscripts of the unique elements in an array.

```
Result = UNIQ( Array [, Index] )
```

**USERSYM** - Defines a new plotting symbol.

```
USERSYM, X [, Y] [, COLOR=value] [, /FLIP] [, THICK=value]
```
V

VALUE_LOCATE - Finds the intervals within a given monotonic vector that brackets a given set of one or more search values.
Result = VALUE_LOCATE( Vector, Value [, /L64] )

VARIANCE - Computes the statistical variance of an n-element vector.
Result = VARIANCE( X [, /DOUBLE] [, /NAN] )

VAX_FLOAT - Determines the default value for the VAX_FLOAT keyword or if an open file unit has the VAX_FLOAT attribute set.
Result = VAX_FLOAT([Default] [, FILE_UNIT=unit] )

VECTOR_FIELD - Places colored, oriented vectors of specified length at each vertex in an input vertex array.
VECTOR_FIELD, Field, Outverts, Outconn
[, ANISOTROPY=array] [, SCALE=value] [, VERTICES=array]

VEL - Draws a velocity (flow) field with streamlines.
VEL, U, V [, NVECS=value] [, XMAX=value{xsizexsize}] [, LENGTH=value{longeststeps}] [, NSTEPS=value] [, THICK=value]

VELOVECT - Draws a 2D velocity field plot.

VERT_T3D - Transforms a 3D array by a 4x4 transformation matrix.
Result = VERT_T3D(Vertex_List [, /DOUBLE]
[, MATRIX=4x4_array] [, /NO_COPY] [, /NO_DIVIDE
[, SAVE_DIVIDE=variable]] )

VOIGT - Calculates intensity of atomic absorption line (Voight) profile.
Result = VOIGT( A, U )

VORONOI - Computes Voronoi polygon given Delaunay triangulation.
VORONOI, X, Y, I0, C, Xp, Yp, Rect

VOXEL_PROJ - Generates volume visualizations using voxel technique.
Result = VOXEL_PROJ(V [, RGB])
[, BACKGROUND=variable] [, CUTTING_PLANE=variable] [, /INTERPOLATE] [, /MAXIMUM_INTENSITY]
[, STEP=[Sx, Sy, Sz]] [, XSIZE=pixels] [, YSIZE=pixels] [, ZBUFFER=int_array] [, ZPIXELS=byte_array]

W

WAIT - Suspends execution of an IDL program for a specified period.
WAIT, Seconds

WARP_TRI - Warps an image using control points.
Result = WARP_TRI( Xo, Yo, Xi, Yi, Image
[, OUTPUT_SIZE=vector] [, /QUINTIC]
[, /EXTRAPOLATE] )

WATERSHED - Applies the morphological watershed operator to a grayscale image.
Result = WATERSHED( Image
[, CONNECTIVITY=[4 8] ] )

WDELETE - Deletes IDL graphics windows.
WDELETE[. Window_Index [, ...]]

WEOF - Writes an end-of-file mark on the designated tape unit.
WEOF, Unit

WF_DRAW - Draws weather fronts with smoothing.
[, PSYM=value] [, SYM_HT=value] [, SYM_LEN=value] [, THICK=value]

WHERE - Returns subscripts of nonzero array elements.
Result = WHERE(Array_Expression [, Count]
[, COMPLEMENT=variable] [, /L64]
[, NCOMPLEMENT=variable] )

WHILE...DO - Performs statement(s) as long as expression evaluates to true. Subject is never executed if condition is initially false.
WHILE expression DO statement
or
WHILE expression DO BEGIN statements
ENDWHILE

WIDGET_BASE - Creates base widget (containers for other widgets).
Result = WIDGET_BASE( Parent [, /ALIGN_BOTTOM
[, /ALIGN_CENTER | , /ALIGN_LEFT | ,
/ALIGN_RIGHT | , /ALIGN_TOP]
[, APP_MBAR=variable{same as mbar on Windows and Motif} [, /MBAR | , /MODAL]
[, /BASE_ALIGN_BOTTOM | ,
BASE_ALIGN_CENTER | , /BASE_ALIGN_LEFT | ,
BASE_ALIGN_RIGHT | , /BASE_ALIGN_TOP]
[, /COLUMN | , /ROW] [, EVENT_FUNC=string]
[, EVENT_PRO=string] [, /EXCLUSIVE | ,
/NONEXCLUSIVE] [, /FLOATING] [, FRAME=width]
[, FUNC_GET_VALUE=string] [, /GRID_LAYOUT]
[, GROUP_LEADER=widget_id{must specify for modal dialogues}] [, /KBRD_FOCUS_EVENTS]
[, KILL_NOTIFY=string] [, /MAP{not for modal bases}] [, /NO_COPY]
[, NOTIFY_REALIZE=string]
[PRO_SET_VALUE=string] [, SCR_XSIZE=width]
[, SCR_YSIZE=height] [, /SCROLL{not for modal bases} [, /SENSITIVE | , SPACE=value{ignored if exclusive or nonexclusive}]
[, TITLE=string]
[, TLB_FRAMEATTR=value{top-level bases only}]
[, TLB_KILL_REQUEST_EVENTS{top-level bases}]} )
only]] [, /TLB_SIZE_EVENTS{top-level bases only}]
[. /TRACKING_EVENTS] [ . UNAME=string]
[. UNITS={0 | 1 | 2}] [ . UVALUE=value]
[. XOFFSET=value] [ . XPAD=value{ignored if exclusive or nonexclusive}]
[. XSIZE=value] [ . X_SCROLL_SIZE=value ] )
[. YOFFSET=value] [ . YPAD=value{ignored if exclusive or nonexclusive}]
[. YSIZE=value] [ . Y_SCROLL_SIZE=value ] )

X Windows Keywords: [ . DISPLAY_NAME=string]
[ . RESOURCE_NAME=string]
[ . RNAME_MBAR=string]

WIDGET_BUTTON - Creates button widgets.
Result = WIDGET_BUTTON( Parent
[ . /ALIGN_CENTER [ , /ALIGN_LEFT [ ,
[ . /ALIGN_RIGHT [ ] , /BITMAP [ , /DYNAMIC_RESIZE]
[ . EVENT_FUNC=string] [ . EVENT_PROC=string]
[ . FONT=string] [ . FRAME=integer]
[ . FUNC_GET_VALUE=string]
[ . GROUP_LEADER=widget_id] [ , /HELP]
[ . KILL_NOTIFY=string] [ , /MENU] [ , /NO_COPY]
[ . /NO_RELEASE] [ , NOTIFY_REALIZE=string]
[ . PRO_SET_VALUE=string] [ . SCR_XSIZE=width]
[ . SCR_YSIZE=height] [ , /SENSITIVE]
[ . /SEPARATOR] [ , /TRACKING_EVENTS]
[ . UNAME=string] [ . UNITS={0 | 1 | 2}]
[ . UVALUE=value] [ , VALUE=value]
[ . X_BITMAP_EXTRA=integer] [ , XOFFSET=value]
[ . XSIZE=value] [ , YOFFSET=value] [ , YSIZE=value ] )

X Windows Keywords: [ . RESOURCE_NAME=string]

WIDGET_CONTROL - Realizes, manages, and destroys widgets.
WIDGET_CONTROL[ , WIDGET_ID]
[ . /ALIGN_CENTER [ , /ALIGN_LEFT [ ,
[ . /ALIGN_RIGHT [ ] , /BITMAP [ , /DYNAMIC_RESIZE]
[ . EVENT_FUNC=string] [ , EVENT_PROC=string]
[ . FONT=string] [ , FRAME=integer]
[ . FUNC_GET_VALUE=string]
[ . GROUP_LEADER=widget_id] [ , /HELP]
[ . KILL_NOTIFY=string] [ , /MENU] [ , /NO_COPY]
[ . /NO_RELEASE] [ , NOTIFY_REALIZE=string]
[ . PRO_SET_VALUE=string] [ , SCR_XSIZE=width]
[ . SCR_YSIZE=height] [ , /SENSITIVE]
[ . /SEPARATOR] [ , /TRACKING_EVENTS]
[ . UNAME=string] [ , UNITS={0 | 1 | 2}]
[ . UVALUE=value] [ , VALUE=value]
[ . X_BITMAP_EXTRA=integer] [ , XOFFSET=value]
[ . XSIZE=value] [ , YOFFSET=value] [ , YSIZE=value ] )

X Windows Keywords: [ , DISPLAY_NAME=string]
[ , RESOURCE_NAME=string]
[ , RNAME_MBAR=string]

WIDGET_BUTTON [ , /BITMAP [ , /DYNAMIC_RESIZE]
[ . GET_VALUE=value] [ , /INPUT_FOCUS]
[ . SET_BUTTON] [ , SET_VALUE=value]
[ . X_BITMAP_EXTRA=integer]

WIDGET_DRAW [ , /DRAW_BUTTON_EVENTS]
[ , /DRAW_EXPOSE_EVENTS]
[ , /DRAW_MOTION_EVENTS]
[ , /DRAW_VIEWPORT_EVENTS]
[ . DRAW_XSIZE=integer] [ , DRAW_YSIZE=integer]
[ . GET_DRAW_VIEW=variable]
[ . GET_UVALUE=variable] [ , GET_VALUE=variable]
[ , /INPUT_FOCUS] [ , SET_DRAW_VIEW=[x, y]]

WIDGET_DROPLIST [ , /DYNAMIC_RESIZE]
[ , /MAP] 
[ , /NO_COPY] 
[ , /SET_DRAW_VIEW={x, y, z}]

WIDGET_LABEL [ , /DYNAMIC_RESIZE]
[ , /MAP] 
[ , /NO_COPY] 
[ , /SET_DRAW_VIEW={x, y, z}]

WIDGET_LIST [ , /LIST_SELECT=variable]
[ , /MAP] 
[ , /NO_COPY] 
[ , /SET_DRAW_VIEW={x, y, z}]

WIDGET_SLIDER [ , /MAP] 
[ , /NO_COPY] 
[ , /SET_DRAW_VIEW={x, y, z}]

WIDGET_TABLE [ , /ALIGNMENT={0 | 1 | 2}]
[ , /MAP] 
[ , /NO_COPY] 
[ , /SET_DRAW_VIEW={x, y, z}]

X Windows Keywords: [ , DISPLAY_NAME=string]
[ , RESOURCE_NAME=string]
WIDGET_DRAW - Creates drawable widgets.

Result = WIDGET_DRAW(Parent [, /APP_SCROLL]
[. /BUTTON_EVENTS] [. /COLOR_MODEL]
[. COLORS=int] [. EVENT_FUNC=str]
[. EVENT_PRO=str] [. /EXPOSE_EVENTS]
[. FRAME=width] [. FUNC_GET_VALUE=str]
[. GRAPHICS_LEVEL=2]
[. GROUP_LEADER=widget_id]
[. KILL_NOTIFY=str] [. EVENT_PRO]
[. NOTIFY_REALIZE=str]
[. PRO_SET_VALUE=str] [. RENDERNER={0 | 1 | 2}]
[. SCR_XSIZE=width] [. SCR_YSIZE=height]
[. /VIEWPORT_EVENTS] [. XOFFSET=value]
[. XSIZE=width] [. X_SCROLL_SIZE=width]
[. YOFFSET=value] [. YSIZE=height]
[. Y_SCROLL_SIZE=height]

WIDGET_DROPLIST - Creates droplist widgets.

Result = WIDGET_DROPLIST( Parent
[. /DYNAMIC_RESIZE] [. EVENT_FUNC=str]
[. EVENT_PRO=str] [. FONT=str]
[. FRAME=width] [. FUNC_GET_VALUE=str]
[. GROUP_LEADER=widget_id]
[. KILL_NOTIFY=str] [. NO_COPY]
[. NOTIFY_REALIZE=str]
[. PRO_SET_VALUE=str]
[. RESOURCE_NAME=str] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SENSITIVE] [. TITLE=str]
[. /TRACKING_EVENTS] [. Unicode]
[. UNITS={0 | 1 | 2}] [. VALUE=value]
[. XOFFSET=value] [. XSIZE=value]
[. YOFFSET=value] [. YSIZE=value]

WIDGET_EVENT - Returns events for the widget hierarchy.

Result = WIDGET_EVENT([Widget_ID])
[. BAD_ID=variable] [. NOWAIT]
[. SAVE_HOURGLASS]
UNIX Keywords: [. YIELD_TO_TTY]

WIDGET_INFO - Obtains information about widgets.

Result = WIDGET_INFO([Widget_ID])
All widgets: [. /ACTIVE] [. /CHILD] [. /EVENT_FUNC]
[. /EVENT_PRO] [. FIND_BY_UNICODE]
[. /GEOMETRY] [. KBRD_FOCUS_EVENTS]
[. /MANAGED] [. /NAME] [. PARENT] [. REALIZED]
[. /SIBLING] [. /TRACKING_EVENTS] [. /TYPE]
[. UNITS={0 | 1 | 2}] [. Unicode] [. /UPDATE]
[. VALID_ID] [. /VERSION]
widget_base: [. /MODAL]
[. /TLB_REQUEST_EVENTS]
widget_button: [. /DYNAMIC_RESIZE]

WIDGET_LABEL - Returns information about widgets.

Result = WIDGET_LABEL([Widget_ID])
[. /ALIGNED] [. /ALIGN_CENTER]
[. /ALIGN_LEFT] [. /ALIGN_RIGHT]
[. /DYNAMIC_RESIZE] [. FONT=str]
[. FRAME=width] [. /FUNCTION_VALUE=str]
[. GROUP_LEADER=widget_id]
[. KILL_NOTIFY=str] [. /MULTIPLE] [. NO_COPY]
[. NOTIFY_REALIZE=str]
[. PRO_SET_VALUE=str]
[. RESOURCE_NAME=str] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SENSITIVE]
[. /TRACKING_EVENTS] [. Unicode]
[. UNITS={0 | 1 | 2}] [. VALUE=value]
[. XOFFSET=value] [. XSIZE=value]
[. YOFFSET=value] [. YSIZE=value]

WIDGET_LIST - Creates list widgets.

Result = WIDGET_LIST([Widget_ID])
[. EVENT_FUNC=str] [. EVENT_PRO=str]
[. FONT=str] [. FRAME=width]
[. /FUNCTION_VALUE=str]
[. GROUP_LEADER=widget_id]
[. KILL_NOTIFY=str] [. /MULTIPLE] [. NO_COPY]
[. NOTIFY_REALIZE=str]
[. PRO_SET_VALUE=str]
[. RESOURCE_NAME=str] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SENSITIVE]
[. /TRACKING_EVENTS] [. Unicode]
[. UNITS={0 | 1 | 2}] [. VALUE=value]
[. XOFFSET=value] [. XSIZE=value]
[. YOFFSET=value] [. YSIZE=value]
WIDGET_SLIDER - Creates slider widgets.

Result = WIDGET_SLIDER( Parent [, /DRAG]
[. EVENT_FUNC=string] [. EVENT_PRO=string]
[. FONT=string] [. FRAME=width]
[. FUNC_GET_VALUE=string]
[. GROUP_LEADER=widget_id]
[. KILL_NOTIFY=string] [. MAXIMUM=value]
[. MINIMUM=value] [. /NO_COPY]
[. NOTIFY_REALIZE=string]
[. PRO_SET_VALUE=string]
[. RESOURCE_NAME=string] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SCROLL=units]
[. SENSITIVE] [. /SUPPRESS_VALUE]
[. /TRACKING_EVENTS] [. TITLE=string]
[. UNAME=string] [. UNITS={0 | 1 | 2}]
[. /VERTICAL]
[. X_OFFSET=value] [. XSIZE=value]
[. Y_OFFSET=value] [. YSIZE=value] )

WIDGET_TABLE - Creates table widgets.

Result = WIDGET_TABLE( Parent [, ALIGNMENT={0 | 1 | 2}] [. /ALL_EVENTS] [. AM_PM=string] [. COLUMN_LABELS=string]
[. COLUMN_MAJOR] [. /ROW_MAJOR]
[. COLUMN_WIDTHS=string]
[. DAYS_OF_WEEK=string[7 names]]
[. /EDITABLE] [. EVENT_FUNC=string]
[. EVENT_PRO=string] [. FONT=string]
[. FORMAT=string] [. FRAME=width]
[. FUNC_GET_VALUE=string]
[. GROUP_LEADER=widget_id]
[. /KBRD_FOCUS_EVENTS] [. KILL_NOTIFY=string]
[. MONTHS=string[12 names]] [. /NO_COPY]
[. /NO_HEADERS] [. NOTIFY_REALIZE=string]
[. PRO_SET_VALUE=string]
[. /RESIZABLE_COLUMNS]
[. /RESIZABLE_ROWS] [not supported in Windows]
[. RESOURCE_NAME=string]
[. ROW_HEIGHTS=string] [not supported in Windows]
[. ROW_LABELS=string] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SCROLL=units]
[. /SENSITIVE]
[. /TRACKING_EVENTS] [. UNAME=string]
[. UNITS={0 | 1 | 2}] [. UVALUE=value]
[. VALUE=value] [. X_OFFSET=value]
[. X_SCROLL_SIZE=width] [. Y_OFFSET=value]
[. YSIZE=value] [. Y_SCROLL_SIZE=height] )

WIDGET_TEXT - Creates text widgets.

Result = WIDGET_TEXT( Parent [, /ALL_EVENTS]
[. /EDITABLE] [. EVENT_FUNC=string]
[. EVENT_PRO=string] [. FONT=string]
[. FRAME=width] [. FUNC_GET_VALUE=string]
[. GROUP_LEADER=widget_id]
[. /KBRD_FOCUS_EVENTS] [. KILL_NOTIFY=string]
[. /NO_COPY] [. /NO_NEWLINE]
[. NOTIFY_REALIZE=string]
[. PRO_SET_VALUE=string]
[. RESOURCE_NAME=string] [. SCR_XSIZE=width]
[. SCR_YSIZE=height] [. SCROLL=units]
[. /SENSITIVE]
[. /TRACKING_EVENTS] [. UNAME=string]
[. UNITS={0 | 1 | 2}] [. UVALUE=value]
[. VALUE=value] [. /WRAP] [. X_OFFSET=value]
[. XSIZE=value] [. Y_OFFSET=value] [. YSIZE=value] )

WINDOW - Creates window for the display of graphics or text.

WINDOW [. Window_Index] [. COLORS=value]
[. /FREE] [. /PIXMAP] [. RETAIN={0 | 1 | 2}]
[. TITLE=string] [. XPOS=value] [. YPOS=value]
[. XSIZE= pixels] [. YSIZE= pixels]

WRITE_BMP -Writes Microsoft Windows Version 3 device independent bitmap file (.BMP).

[. IHDR=structure] [. HEADER_DEFINE=h{define h before call}] [. /RGB]

WRITE_IMAGE - Writes an image and its color table vectors, if any, to a file of a specified type.

WRITE_IMAGE, Filename, Format, Data [. Red, Green, Blue] [. /APPEND]

WRITE_JPEG - Writes JPEG file.

WRITE_JPEG [. Filename] [. UNIT=lan], Image
[. /ORDER] [. PROGRESSIVE]
[. QUALITY=value{0 to 100}]] [. TRUE={1 | 2 | 3}]

WRITE_NRIF - Writes NCAR Raster Interchange Format rasterfile.

WRITE_NRIF, File, Image [. R, G, B]

WRITE_PICT - Writes Macintosh PICT (version 2) bitmap file.

WRITE_PICT, Filename [. Image, R, G, B]


WRITE_PNG, Filename, Image [. R, G, B] [. /VERBOUSE]
[. TRANSPARENT=any] [. /ORDER]

WRITE_PPM - Writes PPM (true-color) or PGM (gray scale) file.

WRITE_PPM, Filename, Image [. /ASCII]

WRITE_SPR - Writes row-indexed sparse array structure to a file.

WRITE_SPR, AS, Filename

WRITE_SRIF - Writes Sun Raster File (SRF).

[. /WRITE_32]

WRITE_SYLK - Writes SYLK (Symbolic Link) spreadsheet file.

Result = WRITE_SYLK( File, Data
[. STARTCOL=column] [. STARTROW=row] )

WRITE_TIFF - Writes TIFF file with 1 to 3 channels.

WRITE_TIFF, Filename [. Image, Order] [. /APPEND]
[. RED=value] [. GREEN=value] [. BLUE=value]
[. COMPRESSION={0 | 1 | 2}] [. GORANGIF=structure]
[. /LONG] [. /SHORT] [. /FLOAT] [. PLANARCONFIG={1 | 2}]
[. /VERBOUSE] [. XRESOL= pixels/inch]
[. YRESOL= pixels/inch]
WRITE_WAV - Writes the audio stream to the named .WAV file.
WRITE_WAV, Filename [, Data [, Rate]]

WRITE_WAVE - Writes Wavefront Advanced Visualizer (.WAV) file.
WRITE_WAVE, File, Array [, /BIN]
[ , DATANAME=string] [ , MESHNAME=string]
[ , /NOMESHDEF] [ , /VECTOR]

WRITEU - Writes unformatted binary data to a file.
WRITEU, Unit, Expr ... Exprn
[ , TRANSFER_COUNT=variable]

VMS-Only Keywords:
[ , /REWRITE]

WSET - Selects the current window.
WSET [, Window_Index]

WSHOW - Exposes or hides the designated window.
WSHOW [, Window_Index, Show]] [, /ICONIC]

WTN - Returns wavelet transform of the input array.
Result = WTN(A, Coef [, /COLUMN] [, /DOUBLE]
[ [ , /INVERSE] [, /OVERWRITE] )

X

XBM_EDIT - Creates, edits bitmap icons for IDL widget button labels.
XBM_EDIT [, /BLOCK] [, FILENAME=string]
[ , GROUP=widget_id] [, XSIZE=pixels] [, YSIZE=pixels]

XDISPLAYFILE - Displays ASCII text file in scrolling text widget.
XDISPLAYFILE, Filename [, /BLOCK]
[ , DONE_BUTTON=string] [, /EDITABLE]
[ , FONT=string] [, GROUP=widget_id] [, HEIGHT=lines]
[ , /MODAL] [, TEXT=string or string array]
[ , TITLE=string] [, WIDTH=characters]
[ , WTEXT=variable]

XDXF - Utility for displaying and interactively manipulating DXF objects.
XDXF, Filename [, /BLOCK] [, GROUP=widget_id]
[ , /MODAL] [, SCALE=value] [, /TEST]
[keywords to XOBJVIEW]

XFONT - Creates modal widget to select and view an X Windows font.
Result = XFONT( [, GROUP=widget_id]
[ , /PREVIEW_FONT_INFO] )

XINTERANIMATE - Displays animated sequence of images.
XINTERANIMATE [, Rate]
Keywords for initialization:
[ , SET=nframes, sizey, sizex, nfames)] [, /BLOCK] [, /CYCLE] [, GROUP=widget_id]
[ [, /MODAL] [, MPEG_BITRATE=value]
[ , MPEG_IFRAME_GAP=integer value]
[ , MPEG_MOTION_VEC_LENGTH={1 | 2 | 3}]
[ [, MPEG_OPEN, MPEG_FILENAME=string]
[ , MPEG_QUALITY=value{0 to 100}] [, /SHOWLOAD]
[ [, /TRACK] [, TITLE=string]

Keywords for loading images:
[ , FRAME=value{0 to (nframes-1)}] [, IMAGE=value] [, /ORDER]
[ , WINDOW=[window_num [, x0, y0, sx, sy]]]

Keywords for running animations:
[ , /CLOSE]
[ , /KEEP_PIXMAPS] [, /MPEG_CLOSE]
[ , XOFFSET=pixels] [, YOFFSET=pixels]

XLOADCT - Provides GUI to interactively select and load color tables.
XLOADCT [, /BLOCK] [, BOTTOM=value]
[ , FILE=string] [, GROUP=widget_id] [, /MODAL]
[ , NCOLORS=value] [, /SILENT]
[ , UPDATECALLBACK='procedure_name'
[ , UPDATECBDATA=value] [, /USE_CURREN]

XMANAGER - Provides event loop manager for IDL widgets.
XMANAGER [, Name, ID] [, /CATCH]
[ , CLEANUP=string] [, EVENT_HANDLER=procedure]
[ , GROUP_LEADER=widget_id] [, /JUST_REG]
[ [, /NO_BLOCK]

XMNG_TMPL - Template for creating widgets.
XMNG_TMPL [, /BLOCK] [, GROUP=widget_id]

XMTOOL - Displays tool for viewing XMANAGER widgets.
XMTOOL [, /BLOCK] [, GROUP=widget_id]

XOBJVIEW - Displays object viewer widget.
XOBJVIEW, Obj [, BACKGROUND=[r, g, b]]
[ [, /BLOCK] [, /DOUBLE_VIEW] [, GROUP=widget_id]
[ [, /MODAL] [, REFRESH=widget_id] [, SCALE=value]
[ [, STATIONARY=objref(s)] [, /TEST]] [, TITLE=string]
[ [, TLB=variable] [, XSIZE=pixels] [, YSIZE=pixels]

XPALETTE - Displays widget used to create and modify color tables.
XPALETTE [, /BLOCK] [, GROUP=widget_id]
[ , UPDATECALLBACK='procedure_name'
[ , UPDATECBDATA=value]

XPCOLOR - Adjusts the value of the current foreground plotting color.
XPCOLOR [, GROUP=widget_id]

XPLT3D - Utility for creating and interactively manipulating 3D plots.
XPLT3D, X, Y, Z [, /BLOCK] [, COLOR=[r,g,b]]
[ [, /DOUBLE_VIEW] [, GROUP=widget_id]
[ , LINESYLE=[0 | 1 | 2 | 3 | 4 | 5 | 6]] [, /MODAL]
[ , NAME=string] [, /OVERPLOT] [, SYMBOL=objref(s)]
[ [, /TEST]] [, THICK=points{1.0 to 10.0}] [, TITLE=string]
[ [, XRANGE=[min, max]] [, YRANGE=[min, max]]
[ , ZRANGE=[min, max]] [, XTITLE=string]
[ , YTITLE=string] [, ZTITLE=string]

XREGISTERED - Returns registration status of a given widget.
Result = XREGISTERED(Name [, /NO_SHOW] )
**XROI** - Utility for interactively creating and obtaining information about ROIs.


**XSQ_TEST** - Computes Chi-square goodness-of-fit test.

`Result = XSQ_TEST( Obsfreq, Exfreq [, EXCELL=variable] [, OBCELL=variable] [, RESIDUAL=variable] )`

**XSURFACE** - Provides GUI to SURFACE and SHADE_SURF.

`XSURFACE, Data [, /BLOCK] [, GROUP=widget_id]`

**XVAREDIT** - Provides widget-based editor for IDL variables.

`XVAREDIT, Var [, NAME='variable_name' {ignored if variable is a structure}] [, GROUP=widget_id] [, X_SCROLL_SIZE=columns] [, Y_SCROLL_SIZE=rows]`

**XVOLUME** - Utility for viewing and interactively manipulating volumes and isosurfaces.


**XYOUTS** - Draws text on currently-selected graphics device.


**ZOOM** - Zooms portions of the display.


**ZOOM_24** - Zooms portions of true-color (24-bit) display.

`ZOOM_24 [, FACT=integer] [, /RIGHT] [, XSIZE=value] [, YSIZE=value]`
Scientific Data Formats

CDF Routines

CDF_ATTCREATE - Creates a new attribute.
\[ Result = \text{CDF\_ATTCREATE}( \text{Id}, \text{Attribute\_Name}[, /GLOBAL\_SCOPE] [, /VARIABLE\_SCOPE] ) \]

CDF_ATTDELETE - Deletes attribute from specified CDF file.
CDF_ATTDELETE, \text{Id}, \text{Attribute} [, EntryNum]
[, /ZVARIABLE]

CDF_ATTEXIST - Determines whether specified attribute exists.
\[ Result = \text{CDF\_ATTEXIST}( \text{Id}, \text{Attribute}[, EntryNum] [, /ZVARIABLE] ) \]

CDF_ATTGET - Reads an attribute entry from a CDF file.
CDF_ATTGET, \text{Id}, \text{Attribute}, \text{EntryNum}, \text{Value}[, CDF\_TYPE=\text{variable}][, /ZVARIABLE]

CDF_ATTINQ - Obtains information about specified attribute.
CDF_ATTINQ, \text{Id}, \text{Attribute}, \text{Name}, \text{Scope}, \text{MaxEntry}[, MaxZEntry]

CDF_ATTNUM - Returns an attribute number.
\[ Result = \text{CDF\_ATTNUM}( \text{Id}, \text{Attribute\_Name} ) \]

CDF_ATTPUT - Writes an attribute entry to a CDF file.
CDF_ATTPUT, \text{Id}, \text{Attribute}, \text{EntryNum}, \text{Value}[, /ZVARIABLE]

CDF_ATTRENAME - Renames an existing attribute.
CDF_ATTRENAME, \text{Id}, \text{OldAttr}, \text{NewName}

CDF_CLOSE - Closes specified Common Data Format file.
CDF_CLOSE, \text{Id}

CDF_COMPRESSION - Sets or returns the compression mode for a CDF file and/or variables.
CDF_COMPRESSION, \text{Id}[, GET\_COMPRESSION=\text{variable}]
[, GET\_ZIP\_LEVEL=\text{variable}]
[, GET\_VAR\_COMPRESSION=\text{variable}]
[, GET\_VAR\_ZIP\_LEVEL=\text{variable}]
[, SET\_COMPRESSION={0 | 1 | 2 | 3 | 5}]
[, SET\_ZIP\_LEVEL=\text{integer}{1 to 9}]
[, SET\_VAR\_COMPRESSION={0 | 1 | 2 | 3 | 5}]
[, SET\_VAR\_ZIP\_LEVEL=\text{integer}{1 to 9}]
[, VARIABLE=\text{variable name or index}][, /ZVARIABLE]

CDF_CONTROL - Obtains or sets information for a CDF file.
CDF_CONTROL, \text{Id}[, GET\_ATTR\_INFO=\text{variable}]
[, GET\_CACHE\_SIZE=\text{variable}]
[, GET\_COPYRIGHT=\text{variable}]
[, GET\_FILENAME=\text{variable}]
[, GET\_FORMAT=\text{variable}]
[, GET\_NEG\_POS\_FP\_0\_MODE=\text{variable}]

CDF_CREATE - Creates a new Common Data Format file.
\[ Result = \text{CDF\_CREATE}( \text{Filename}, [\text{Dimensions}] [, /CLOBBER] [, /MULTI\_FILE] [, /SINGLE\_FILE] [, /COL\_MAJOR] [, /ROW\_MAJOR]) \]

Encoding Keywords (pick one):
[, /ALPHA\_OSF1\_ENCODING]
[, /ALPHA\_VMSD\_ENCODING]
[, /ALPHA\_VMSG\_ENCODING]
[, /DEC\_STATION\_ENCODING]
[, /HOST\_ENCODING]
[, /HP\_ENCODING]
[, /IBM\_RS\_ENCODING]
[, /IBM\_PC\_ENCODING]
[, /MAC\_ENCODING]
[, /NETWORK\_ENCODING]
[, /NEXT\_ENCODING]
[, /SGI\_ENCODING]
[, /SUN\_ENCODING]

Decoding Keywords (pick one):
[, /ALPHA\_OSF1\_DECODING]
[, /ALPHA\_VMSD\_DECODING]
[, /ALPHA\_VMSG\_DECODING]
[, /DEC\_STATION\_DECODING]
[, /HOST\_DECODING]
[, /HP\_DECODING]
[, /IBM\_RS\_DECODING]
[, /IBM\_PC\_DECODING]
[, /MAC\_DECODING]
[, /NETWORK\_DECODING]
[, /NEXT\_DECODING]
[, /SGI\_DECODING]
[, /SUN\_DECODING]
CDF_DELETE - Deletes specified Common Data Format file.
CDF_DELETE, Id

CDF_DOC - Gets documentation information about a CDF file.
CDF_DOC, Id, Version, Release, Copyright
[. INCREMENT=variable]

CDF_ENCODE_EPOCH - Encodes CDF_EPOCH variable into a string.
Result = CDF_ENCODE_EPOCH(Epoch [, EPOCH=[0 | 1 | 2 | 3]])

CDF_EPOCH - Computes/breaks down CDF_EPOCH values.
CDF_EPOCH, Epoch, Year [, Month, Day, Hour, Minute, Second, Milli] [, /BREAKDOWN_EPOCH]
[. /COMPUTE_EPOCH]

CDF_ERROR - Returns explanation of a given status code.
Result = CDF_ERROR(Status)

CDF_EXISTS - Returns True if CDF data format library is supported on the current IDL platform.
Result = CDF_EXISTS()

CDF_INQUIRE - Returns global information about CDF file.
Result = CDF_INQUIRE(Id)

CDF_LIB_INFO - Returns information about the CDF Library being used.
CDF_LIB_INFO [, COPYRIGHT=variable]
[. INCREMENT=variable] [, RELEASE=variable]
[. SUBINCREMENT=variable] [, VERSION=variable]

CDF_OPEN - Opens an existing Common Data Format file.
Result = CDF_OPEN(Filename)

CDF_PARSE_EPOCH - Parses input string into a double precision value properly formatted for use as CDF_EPOCH variable.
Result = CDF_PARSE_EPOCH(Epoch_string)

CDF_VARCREATE - Creates new variable in CDF file.
Result = CDF_VARCREATE(Id, Name [, DimVarY]
[, ALLOCATERECS=records] [, DIMENSIONS=arrays]
[, NUMELEM=characters] [, /REC_NOVARY] [, /REC_VARY] [, /ZVARIABLE])

CDF_VARDELETE - Deletes variable from a SINGLE_FILE CDF file.
CDF_VARDELETE, Id, Variable [, /ZVARIABLE]

CDF_VARGET - Reads multiple values from CDF file variable.
CDF_VARGET, Id, Variable, Value [, COUNT=vector]
[, INTERVAL=vector] [, OFFSET=vector]
[, REC_COUNT=records] [, REC_INTERVAL=value]
[, REC_START=record] [, /STRING](data in CDF file must be type CDF_CHAR or CDF_UCHAR])
[. /ZVARIABLE]

CDF_VARGET1 - Reads one value from a CDF file variable.
CDF_VARGET1, Id, Variable, Value [, OFFSET=vector]
[, REC_START=record] [, /STRING](data in CDF file must be type CDF_CHAR or CDF_UCHAR])
[. /ZVARIABLE]

CDF_VARINQ - Returns structure containing information about specified variable.
Result = CDF_VARINQ(Id, Variable [, /ZVARIABLE])

CDF_VARNUM - Returns variable number associated with given variable name.
Result = CDF_VARNUM(Id, VarName [, IsZVar])

CDF_VARPUT - Writes value to a variable.
CDF_VARPUT, Id, Variable, Value [, COUNT=vector]
[, INTERVAL=vector] [, OFFSET=vector]
[, REC_INTERVAL=value] [, REC_START=record]
[, /ZVARIABLE]

CDF_VARRENAME - Renames existing variable.
CDF_VARRENAME, Id, OldVariable, NewName [, /ZVARIABLE]

EOS Routines

EOS_EH_CONVANG - Converts angles between decimal degrees, radians, and packed degrees-minutes-seconds.
Result = EOS_EH_CONVANG(inAngle, code)

EOS_EH_GETVERSION - Retrieves the HDF-EOS version string of an HDF-EOS file.
Result = EOS_EH_GETVERSION(fid, version)

EOS_EH_IDINFO - Returns the HDF file IDs corresponding to the HDF-EOS file ID returned by EOS_SW_OPEN, EOS GD_OPEN, or EOS PT OPEN.
Result = EOS_EH_IDINFO(fid, HDFfid, sdInterfaceID)

EOS_EXISTS - Returns True if HDF EOS format library is supported on the current IDL platform.
Result = EOS_EXISTS()

EOS GD_ATTACH - Attaches to the grid using the gridname parameter as the identifier.
Result = EOS GD_ATTACH(fid, gridname)

EOS GD_ATTRINFO - Returns number type and number of elements (count) of a grid attribute.
Result = EOS GD_ATTRINFO(gridID, attrname, numbertype, count)

EOS GD_CLOSE - Closes the HDF grid file.
Result = EOS GD_CLOSE(fid)

EOS GD_COMPINFO - Returns the compression code and compression parameters for a given field.
Result = EOS GD_COMPINFO(gridID, fieldname, compcode, compparm)

EOS GD create - Creates a grid within the file.
Result = EOS GD create(fid, gridname, xdimsize, ydimsize, upleftfpt, lowrightfpt)
EOS_GD_DEFBOXREGION - Defines a longitude-latitude box region for a grid.
Result = EOS_GD_DEFBOXREGION(gridID, cornerlon, cornerlat)

EOS_GD_DEFCOMP - Sets the HDF field compression for subsequent grid field definitions.
Result = EOS_GD_DEFCOMP(gridID, compcode [, compparm])

EOS_GD_DEFDIM - Defines dimensions used by field definition routines to establish size of the field.
Result = EOS_GD_DEFDIM(gridID, dimname, dim)

EOS_GD_DEFFIELD - Defines data fields to be stored in the grid.
Result = EOS_GD_DEFFIELD(gridID, fieldname, dimlist, numbertype [, /MERGE])

EOS_GD_DEFORIGIN - Defines the origin of the grid data.
Result = EOS_GD_DEFORIGIN(gridID, origincode)

EOS_GD_DEFPIXREG - Defines whether the pixel center or pixel corner is used when requesting the location of a given pixel.
Result = EOS_GD_DEFPIXREG(gridID, pixreg)

EOS_GD_DEFPROJ - Defines the GCTP projection and projection parameters of the grid.
Result = EOS_GD_DEFPROJ(gridID, projcode, zonecode, spherecode, proparm)

EOS_GD_DEF TILE - Defines the tiling dimensions for fields defined following this function call.
Result = EOS_GD_DEF TILE(gridID, tilecode [, tilerank, tiledims])

EOS_GD_DEFTIMEPERIOD - Defines a time period for a grid.
Result = EOS_GD_DEF TIMEPERIOD(gridID, periodID, starttime, stoptime)

EOS_GD_DEFVRTREGION - Subsets on a monotonic field or contiguous elements of a dimension.
Result = EOS_GD_DEFVRTREGION(gridID, regionID, vertObj, range)

EOS_GD_DETACH - Detaches from grid interface.
Result = EOS_GD_DETACH(gridID)

EOS_GD_DIMINFO - Retrieves the size of the specified dimension.
Result = EOS_GD_DIMINFO(gridID, dimname)

EOS_GD_DUPREGION - Copies information stored in current region or period to a new region or period.
Result = EOS_GD_DUPREGION(regionID)

EOS_GD_EXTRACTREGION - Reads data into the data buffer from a subsetted region as defined by EOS_GD_DEFBOXREGION.
Result = EOS_GD_EXTRACTREGION(gridID, regionID, filename, buffer)

EOS_GD_FIELDINFO - Retrieves information on a specific data field.
Result = EOS_GD_FIELDINFO(gridID, fieldname, rank, dims, numbertype, dimlist)

EOS_GD_GETFILLVALUE - Retrieves fill value for specified field.
Result = EOS_GD_GETFILLVALUE(gridID, fieldname, fillvalue)

EOS_GD_GETPIXELS - Returns the pixel rows and columns for specified longitude/latitude pairs.
Result = EOS_GD_GETPIXELS(gridID, nLonLat, lonVal, latVal, pixRow, pixCol)

EOS_GD_GETPIXVALUES - Reads data from a data field for the specified pixels.
Result = EOS_GD_GETPIXVALUES(gridID, nPixels, pixRow, pixCol, fieldname, buffer)

EOS_GD_GRIDINFO - Returns number of rows, columns, and the location of the upper left and lower right corners of the grid image.
Result = EOS_GD_GRIDINFO(gridID, xdimsize, ydimsize, ulon, ulat, lright)

EOS_GD_INQATTRS - Retrieves information about attributes defined in grid.
Result = EOS_GD_INQATTRS(gridID, attrlist [, LENGTH(OUT)=value])

EOS_GD_INQDIMS - Retrieves information about dimensions defined in grid.
Result = EOS_GD_INQDIMS(gridID, dimname, dims)

EOS_GD_INQFIELDS - Retrieves information about the data fields defined in grid.
Result = EOS_GD_INQFIELDS(gridID, fieldlist, rank, numbertype)

EOS_GD_INQGRID - Retrieves number and names of grids defined in HDF-EOS file.
Result = EOS_GD_INQGRID(filename, gridlist [, LENGTH(OUT)=value])

EOS_GD_INTERPOLATE - Performs bilinear interpolation on a grid field.
Result = EOS_GD_INTERPOLATE(gridID, Interp, lonVal, latVal, filename, interpVal)

EOS_GD_NENTRIES - Returns number of entries and descriptive string buffer size for a specified entity.
Result = EOS_GD_NENTRIES(gridID, entrycode [, LENGTH(OUT)=value])

EOS_GD_OPEN - Opens an existing file or creates a new file.
Result = EOS_GD_OPEN(filename, access [, /CREATE] [, /RDWR [, /READ]])

EOS_GD_ORIGININFO - Retrieves origin code.
Result = EOS_GD_ORIGININFO(gridID, origincode)

EOS_GD_PIXREGINFO - Retrieves the pixel registration code.
Result = EOS_GD_PIXREGINFO(gridID, pixregcode)

EOS_GD_PROJINFO - Retrieves GCTP projection code, zone code, spheroid code, and projection parameters of the grid.
Result = EOS_GD_PROJINFO(gridID, projcode, zonecode, spherecode, proparm)
EOS_GD_QUERY - Returns information about a specified grid.  
Result = EOS_GD_QUERY( Filename, GridName, [Info] )

EOS_GD_READATTR - Reads attribute from a grid.  
Result = EOS_GD_READATTR( gridID, attrname, datbuf )

EOS_GD_READFIELD - Reads data from a grid field.  

EOS_GD_READTILE - Reads from tile within field.  
Result = EOS_GD_READTILE( gridID, fieldname, tilecoords, buffer )

EOS_GD_REGIONINFO - Returns information about a subsetted region for a particular field.  
Result = EOS_GD_REGIONINFO( gridID, fieldname, ntype, rank, dims, size, upleftpt, lowrightpt )

EOS_GD_SETFILLVALUE - Sets fill value for the specified field.  
Result = EOS_GD_SETFILLVALUE( gridID, fieldname, fillvalue )

EOS_GD_SETTILECACHE - Sets tile cache parameters.  
Result = EOS_GD_SETTILECACHE( gridID, fieldname, maxcache, cachecode )

EOS_GD_TILEINFO - Returns tiling code, tiling rank, and tiling dimensions for a given field.  
Result = EOS_GD_TILEINFO( gridID, fieldname, tilecode, tilerank, tiledims )

EOS_GD_WRITEATTR - Writes/updates attribute in a grid.  
Result = EOS_GD_WRITEATTR( gridID, attrname, datbuf [, COUNT=value] [, HDF_TYPE=value] )

EOS_GD_WRITEFIELD - Writes data to a grid field.  

EOS_GD_WRITEFIELDMETA - Writes field metadata for a grid field not defined by the Grid API.  
Result = EOS_GD_WRITEFIELDMETA( gridID, fieldname, dimlist, numbertype )

EOS_GD_WRITETILE - Writes a single tile of data to a field.  
Result = EOS_GD_WRITETILE( gridID, fieldname, tilecoords, data )

EOS_PT_ATTACH - Attaches to point using the pointname parameter as the identifier.  
Result = EOS_PT_ATTACH( fid, pointname )

EOS_PT_ATTRINFO - Returns number type and number of elements of a point attribute.  
Result = EOS_PT_ATTRINFO( pointID, attrname, numbertype, count )

EOS_PT_BCKLINKINFO - Returns linkfield to the previous level.  
Result = EOS_PT_BCKLINKINFO( pointID, level, linkfield )

EOS_PT_CLOSE - Closes the HDF point file.  
Result = EOS_PT_CLOSE( fid )

EOS_PT_CREATE - Creates point as a Vgroup within the HDF file.  
Result = EOS_PT_CREATE( fid, pointname )

EOS_PT_DEFBOXREGION - Defines area of interest for a point.  
Result = EOS_PT_DEFBOXREGION( pointID, cornerlon, cornerlat )

EOS_PT_DEFLEVEL - Defines a level within a point.  
Result = EOS_PT_DEFLEVEL( pointID, levelname, fieldlist, fieldtype, fieldorder )

EOS_PT_DEFLINKAGE - Defines linkfield between two levels.  
Result = EOS_PT_DEFLINKAGE( pointID, parent, child, linkfield )

EOS_PT_DEFTIMEPERIOD - Defines a time period for a point.  
Result = EOS_PT_DEFTIMEPERIOD( pointID, starttime, stoptime )

EOS_PT_DEFVTRREGION - Selects records within a level whose field values are within a given range.  
Result = EOS_PT_DEFVTRREGION( pointID, regionID, vertObj, range )

EOS_PT_DETACH - Detaches from a point data set.  
Result = EOS_PT_DETACH( pointID )

EOS_PT_EXTRACTPERIOD - Reads data from the designated level fields into the data buffer from the subsetted time period.  
Result = EOS_PT_EXTRACTPERIOD( pointID, periodID, level, fieldlist, buffer )

EOS_PT_EXTRACTREGION - Reads data from the designated level fields into the data buffer from the subsetted area of interest.  
Result = EOS_PT_EXTRACTREGION( pointID, regionID, levelID, fieldlist, buffer )

EOS_PT_FWDLINKINFO - Returns linkfield to the given level.  
Result = EOS_PT_FWDLINKINFO( pointID, level, linkfield )

EOS_PT_GETLEVELNAME - Returns the name of a level given the level number (0-based).  
Result = EOS_PT_GETLEVELNAME( pointID, level, levelname [, LENGTH(OUT)=variable] )

EOS_PT_GETRECNUMS - Returns record numbers in one level that are connected to a given set of records in a different level.  
Result = EOS_PT_GETRECNUMS( pointID, inlevel, outlevel, inNrec, inRecs, outNrec, outRecs )

EOS_PT_INQATTRS - Returns attribute list as a comma-separated string.  
Result = EOS_PT_INQATTRS( pointID, attrlist [, LENGTH=value] )
EOS_PT_QUERY - Returns information about a specified point.
Result = EOS_PT_QUERY(pointID, level, nrec, recs, data)

EOS_PT_REGIONINFO - Returns information about a subsetted geographic region for a given level.
Result = EOS_PT_REGIONINFO(pointID, regionID, level, fieldlist, size)

EOS_PT_REGIONRECS - Returns the record numbers within a subsetted geographic region for a given level.
Result = EOS_PT_REGIONRECS(pointID, regionID, level, nrec, recs)

EOS_PT_SIZEOF - Returns information about specified fields in a point regardless of level.
Result = EOS_PT_SIZEOF(pointID, fieldlist, fldlevel)

EOS_PT_UPDATELEVEL - Updates the specified fields and records of a single level.
Result = EOS_PT_UPDATELEVEL(pointID, level, field, list, nrec, recs, data)

EOS_PT_WRITEATTR - Writes/updates an attribute in a point.
Result = EOS_PT_WRITEATTR(pointID, attrname, datbuf[, COUNT=\{value\}[,, HDF_TYPE=\{value\}] )

EOS_PT_WRITELEVEL - Writes (appends) full records to a level.
Result = EOS_PT_WRITELEVEL(pointID, level, nrec, data)

EOS_QUERY - Returns information about the makeup of an HDF-EOS file.
Result = EOS_QUERY(Filename, [Info])

EOS_SW_ATTACH - Attaches to the swath using the swathname parameter as the identifier.
Result = EOS_SW_ATTACH(fid, swathname)

EOS_SW_ATTRINFO - Returns number type and number of elements of a swath attribute.
Result = EOS_SW_ATTRINFO(swathID, attrname, numbertype, count)

EOS_SW_CLOSE - Closes the HDF swath file.
Result = EOS_SW_CLOSE(fid)

EOS_SW_COMPINFO - Returns compression code and compression parameters for a given field.
Result = EOS_SW_COMPINFO(swathID, fieldname, compcode, compparm)

EOS_SW_CREATE - Creates a swath within the file.
Result = EOS_SW_CREATE(fid, swathname)

EOS_SW_DEFBOXREGION - Defines a longitude-latitude box region for a swath.
Result = EOS_SW_DEFBOXREGION(swathID, cornerlon, cornerlat, mode)

EOS_SW_DEFCOMP - Sets HDF field compression for subsequent swath field definitions.
Result = EOS_SW_DEFCOMP( swathID, compcode[, , compparm] )

EOS_SW_DEFDATAFIELD - Defines geolocation fields to be stored in the swath.
Result = EOS_SW_DEFDATAFIELD( swathID, fieldname, dimlist, numbertype[, , /MERGE] )

EOS_SW_DEFDIM - Defines dimensions that are used by the field definition routines to establish the size of the field.
Result = EOS_SW_DEFDIM(swathID, fieldname, dim)

EOS_SW_DEFDIMMAP - Defines monotonic mapping between the geolocation and data dimensions.
Result = EOS_SW_DEFDIMMAP(swathID, geodim, datadim, offset, increment)
**EOS_SW_DEFGEOFIELD** - Defines geolocation fields to be stored in the swath.

```
Result = EOS_SW_DEFGEOFIELD( swathID, fieldname,
  dimlist, numbertype [, /MERGE ] )
```

**EOS_SW_DEFIDXMAP** - Defines mapping between a geolocation and data dimension.

```
Result = EOS_SW_DEFIDXMAP(swathID, geodim, datadim, index)
```

**EOS_SW_DEFTIMEPERIOD** - Defines a time period for a swath.

```
Result = EOS_SW_DEFTIMEPERIOD(swathID, starttime , stoptime, mode)
```

**EOS_SW_DEFVRTREGION** - Subsets along any dimension.

```
Result = EOS_SW_DEFVRTREGION(swathID, regionID, vertObj, range)
```

**EOS_SW_DETACH** - Detaches from the swath interface.

```
Result = EOS_SW_DETACH(swathID)
```

**EOS_SW_DIMINFO** - Retrieves the size of the specified dimension.

```
Result = EOS_SW_DIMINFO(swathID, dimname)
```

**EOS_SW_DUPREGION** -Copies information stored in a current region or period to a new region or period.

```
Result = EOS_SW_DUPREGION(regionID)
```

**EOS_SW_EXTRACTPERIOD** - Reads data into the data buffer from the subsetted time period.

```
Result = EOS_SW_EXTRACTPERIOD(swathID, periodID, fieldname, external_mode, buffer)
```

**EOS_SW_EXTRACTREGION** - Reads data into the data buffer from the subsetted region.

```
Result = EOS_SW_EXTRACTREGION(swathID, regionID, fieldname, external_mode, buffer)
```

**EOS_SW_FIELDINFO** - Retrieves information on a specific data field.

```
Result = EOS_SW_FIELDINFO(swathID, fieldname, rank, dims, numbertype, dimlist)
```

**EOS_SW_GETFILLVALUE** - Retrieves fill value for given field.

```
Result = EOS_SW_GETFILLVALUE(swathID, fieldname, fillvalue)
```

**EOS_SWIDXMAPINFO** - Retrieves size of the indexed array and the array of indexed elements of the specified geolocation mapping.

```
Result = EOS_SWIDXMAPINFO(swathID, geodim, datadim, index)
```

**EOS_SW_INQATTRS** - Retrieves information about attributes defined in swath.

```
Result = EOS_SW_INQATTRS( swathID, attrlist [, /LENGTH (OUT)=value ] )
```

**EOS_SW_INQDATAFIELDS** - Retrieves information about all of the data fields defined in swath.

```
Result = EOS_SW_INQDATAFIELDS(swathID, fieldlist, rank, numbertype)
```

**EOS_SW_INQDIM** - Retrieves information about all of the dimensions defined in swath.

```
Result = EOS_SW_INQDIM(swathID, dimname, dim)
```

**EOS_SW_INQGEOFIELDS** - Retrieves information about all of the geolocation fields defined in swath.

```
Result = EOS_SW_INQGEOFIELDS(swathID, fieldlist, rank, numbertype)
```

**EOS_SW_INQIDXMAPS** - Retrieves information about all indexed geolocation/data mappings in swath.

```
Result = EOS_SW_INQIDXMAPS(swathID, idxmap, idxsizes)
```

**EOS_SW_INQMAPS** - Retrieves information about all non-indexed geolocation relations in swath.

```
Result = EOS_SW_INQMAPS(swathID, dimmap, offset, increment)
```

**EOS_SW_INQSWATH** - Retrieves number and names of swaths defined in HDF-EOS file.

```
Result = EOS_SW_INQSWATH( filename, swathlist [, LENGTH=value] )
```

**EOS_SW_MAPINFO** -Retrieves offset and increment of the specified geolocation mapping.

```
Result = EOS_SW_MAPINFO(swathID, geodim, datadim, offset, increment)
```

**EOS_SW_NENTRIES** - Returns number of entries and descriptive string buffer size for specified entity.

```
Result = EOS_SW_NENTRIES( swathID, entrycode [, LENGTH (OUT)=value ] )
```

**EOS_SW_OPEN** - Opens an existing file, or creates a new file.

```
Result = EOS_SW_OPEN( filename [, /CREATE] [/.RDWR | /.READ ] )
```

**EOS_SW_PERIODINFO** - Returns information about a subsetted time period for a given field.

```
Result = EOS_SW_PERIODINFO(swathID, periodID, fieldname, ntype, rank, dims, size)
```

**EOS_SW_QUERY** - Returns information about a specified swath.

```
Result = EOS_SW_QUERY( Filename, SwathName, [Info] )
```

**EOS_SW_READATTR** - Reads attribute from a swath field.

```
Result = EOS_SW_READATTR(swathID, attrname, datbuf)
```

**EOS_SW_READFIELD** - Reads data from a swath field.

```
Result = EOS_SW_READFIELD( swathID, fieldname, buffer [ , EDGE=array ] [ , START=array ]
  [, STRIDE=array ] )
```

**EOS_SW_REGIONINFO** - Returns information about a subsetted region for a given field.

```
Result = EOS_SW_REGIONINFO(swathID, regionID, fieldname, ntype, rank, dims, size)
```

**EOS_SW_SETFILLVALUE** - Sets fill value for the specified field.

```
Result = EOS_SW_SETFILLVALUE(swathID, fieldname, fillvalue)
```
EOS_SW_WRITEATTR - Writes/updates attribute in a swath.
Result = EOS_SW_WRITEATTR(swathID, attrname, datbuf [, COUNT=value] [, HDF_TYPE=value])

EOS_SW_WRITEDATAMETA - Writes field metadata for an existing data field.
Result = EOS_SW_WRITEDATAMETA(swathID, fieldname, dimlist, numbertype)

EOS_SW_WRITEFIELD - Writes data to a swath field.
Result = EOS_SW_WRITEFIELD(swathID, fieldname, cut, data [, EDGE=array] [, START=array] [, STRIDE=array])

EOS_SW_WRITEGEOMETA - Writes field metadata for an existing geolocation field.
Result = EOS_SW_WRITEGEOMETA(swathID, fieldname, dimlist, numbertype)

EOS_SW_WRITEATTR - Writes/updates attribute in a swath.
Result = EOS_SW_WRITEATTR(swathID, attrname, datbuf [, COUNT=value] [, HDF_TYPE=value])

EOS_SW_WRITEDATAMETA - Writes field metadata for an existing data field.
Result = EOS_SW_WRITEDATAMETA(swathID, fieldname, dimlist, numbertype)

EOS_SW_WRITEFIELD - Writes data to a swath field.
Result = EOS_SW_WRITEFIELD(swathID, fieldname, cut, data [, EDGE=array] [, START=array] [, STRIDE=array])

EOS_SW_WRITEGEOMETA - Writes field metadata for an existing geolocation field.
Result = EOS_SW_WRITEGEOMETA(swathID, fieldname, dimlist, numbertype)

HDF Routines

HDF_AN_NUMANN - Returns total number of annotations of a given type.
Result = HDF_AN_NUMANN(ann_id, annot_type, obj_tag, obj_ref)

HDF_AN_WRITEANN - Writes annotation text.
Result = HDF_AN_WRITEANN(ann_id, annotation [LENGTH=characters])

HDF_AN_TAG2ATYPE - Returns annotation type of corresponding HDF tag.
Result = HDF_AN_TAG2ATYPE(ann_tag)

HDF_AN_TAGREF2ID - Returns ID of annotation with given tag.
Result = HDF_AN_TAGREF2ID(ann_id, ann_tag, ann_ref)

HDF_AN_WRITEANN - Writes annotation text.
Result = HDF_AN_WRITEANN(ann_id, annotation [LENGTH=characters])

HDF_BROWSER - See “HDF_BROWSER” on page 29.

HDF_CLOSE - Closes HDF file associated with the given file handle.
HDF_CLOSE, FileHandle

HDF_DELDD - Deletes tag or reference from list of data descriptors.
HDF_DELDD, FileHandle, Tag, Ref

HDF_DF24_ADDIMAGE - Writes 24-bit raster image to HDF file.
HDF_DF24_ADDIMAGE, Filename, Image [:FORCE_BASELINE{useful only if QUALITY<25}] [:JPEG | , /RLE] [:QUALITY=value{0 to 100}]

HDF_DF24_GETIMAGE - Reads 24-bit raster image from HDF file.
HDF_DF24_GETIMAGE, Filename, Image [, /LINE | , /PIXEL | , /PLANE]

HDF_DF24_GETINFO - Retrieves information about the current 24-bit HDF image.
HDF_DF24_GETINFO, Filename, Width, Height, Interlace

HDF_DF24_LASTREF - Returns reference number of most recently read or written 24-bit image in an HDF file.
Result = HDF_DF24_LASTREF()

HDF_DF24_NIMAGES - Returns the number of 24-bit images in an HDF file.
Result = HDF_DF24_NIMAGES(Filename)

HDF_DF24_READREF - Sets reference number of image in an HDF file.
HDF_DF24_READREF, Filename, Refno
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<td>Returns number of 8-bit images in specified HDF file.</td>
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<td>Sets reference number of image to be read from a HDF file by the next call to HDF_DFR8_GETIMAGE.</td>
</tr>
<tr>
<td>HDF_DD88_RESTART</td>
<td>Causes next call to HDF_DFR8_GETIMAGE to read from first image in HDF file.</td>
</tr>
<tr>
<td>HDF_DFP_APPENDPALETE</td>
<td>Sets current palette to be used for subsequent images in a HDF file.</td>
</tr>
<tr>
<td>HDF_EXISTS</td>
<td>Returns True if HDF format library is supported on the current IDL platform.</td>
</tr>
<tr>
<td>HDF_GR_ATTRINFO</td>
<td>Retrieves information about specified HDF data object.</td>
</tr>
</tbody>
</table>

**IDL HandiGuide**
HDF_GR_CREATE - Creates HDF GR raster image.
Result = HDF_GR_CREATE(gr_id, name, ncomp, data_type, interface_mode, dim_sizes)

HDF_GR_END - Terminates specified HDF GR interface session.
HDF_GR_END, gr_id

HDF_GR_ENDACCESS - Terminates access to specified raster image.
HDF_GR_ENDACCESS, ri_id

HDF_GR_FILEINFO - Retrieves number of raster images and global attributes for the specified HDF GR interface.
Result = HDF_GR_FILEINFO(gr_id, n_images, n_file_attrs)

HDF_GR_FINDATTR - Finds index of HDF data object's attribute given its attribute name.
Result = HDF_GR_FINDATTR(obj_id, attr_name)

HDF_GR_GETATTR - Obtains all values of HDF GR attribute.
Result = HDF_GR_GETATTR(obj_id, attr_index, values)

HDF_GR_GETCHUNKINFO - Retrieves chunking information about HDF GR raster image.
Result = HDF_GR_GETCHUNKINFO(ri_id, dim_length, flag)

HDF_GR_GETIMINFO - Retrieves general information about HDF GR raster image.
Result = HDF_GR_GETIMINFO(ri_id, gr_name, ncomp, data_type, interface_mode, dim_sizes, num_attrs)

HDF_GR_GETLUTID - Gets identifier of HDF GR palette.
Result = HDF_GR_GETLUTID(ri_id, pal_index)

HDF_GR_GETLUTINFO - Retrieves information about a palette.
Result = HDF_GR_GETLUTINFO(pal_id, ncomp, data_type, interface_mode, num_entries)

HDF_GR_IDTOREF - Returns HDF reference number of specified raster image.
Result = HDF_GR_IDTOREF(ri_id)

HDF_GR_LUTTOREF - Returns HDF reference number of the specified palette.
Result = HDF_GR_LUTTOREF(pal_id)

HDF_GR_NAMETOINDEX - Returns index of raster image given its name.
Result = HDF_GR_NAMETOINDEX(gr_id, gr_name)

HDF_GR_READIMAGE - Reads subsample of raster image.
Result = HDF_GR_READIMAGE(ri_id, data
[, EDGE=vector] [, /INTERLACE] [, START=vector] [, STRIDE=vector])

HDF_GR_READLUT - Reads specified palette.
Result = HDF_GR_READLUT(pal_id, pal_data [, /INTERLACE])

HDF_GR_REFTOINDEX - Returns index of specified raster image.
Result = HDF_GR_REFTOINDEX(gr_id, gr_ref)

HDF_GR_SELECT - Obtains identifier of specified raster image.
Result = HDF_GR_SELECT(gr_id, index)

HDF_GR_SETATTR - Attaches attribute to specified object.
Result = HDF_GR_SETATTR(attr_id, attr_name, data_type, count, values)

HDF_GR_SETCHUNK - Makes specified raster image a chunked raster image.
Result = HDF_GR_SETCHUNK(ri_id, dim_length, comp_type, comp_prm)

HDF_GR_SETCHUNKCACHE - Sets maximum number of chunks to be cached.
Result = HDF_GR_SETCHUNKCACHE(ri_id, maxcache, flags)

HDF_GR_SETCOMPRESS - Specifies whether specified raster image will be stored in compressed format.
Result = HDF_GR_SETCOMPRESS(ri_id, comp_type, comp_prm)

HDF_GR_SETEXTERNALFILE - Specifies that raster image will be written to external file.
Result = HDF_GR_SETEXTERNALFILE(ri_id, filename, offset)

HDF_GR_START - Initializes interface for the specified file.
Result = HDF_GR_START(file_id)

HDF_GR_WRITEIMAGE - Writes subsample of raster image data.
Result = HDF_GR_WRITEIMAGE(ri_id, data
[, EDGE=vector] [, /INTERLACE={0 | 1 | 2}] [, START=vector] [, STRIDE=vector])

HDF_GR_WITELUT - Writes a palette.
Result = HDF_GR_WITELUT(pal_id, pal_data
[, DATA_TYPE=value] [, /INTERLACE_MODE={0 | 1 | 2}] [, NENTRIES=value])

HDF_HDF2IDLTYPE - Converts HDF data type code into IDL variable type code.
Result = HDF_HDF2IDLTYPE(hdftypecode)

HDF_IDL2HDFTYPE - Converts IDL variable type code into HDF data type code.
Result = HDF_IDL2HDFTYPE(idltypecode)

HDF_ISHDF - Determines whether specified file is HDF file.
Result = HDF_ISHDF(Filename)

HDF_LIB_INFO - Returns information about the HDF Library being used.

HDF_NEWREF - Returns next available reference number for HDF file.
Result = HDF_NEWREF(Filename)

HDF_NUMBER - Returns number of tags in HDF file or the number of references associated with a given tag.
Result = HDF_NUMBER(FileName [, TAG=integer])
HDF_OPEN - Opens or creates HDF file for reading and/or writing.


HDF_PACKDATA - Packs a set IDL variable into an array of raw byte data.

Result = HDF_PACKDATA(data [, data2 [, data3 [data4 [, data5 [, data6 [, data7 [, data8]]]]]])

[, HDF.ORDER=vector] [, HDF.TYPE=vector] [, NREC=records]

HDF_READ - See “HDF_READ” on page 29.

HDF_SD_ADDDATA - Writes hyperslab of values to an SD dataset.

HDF_SD_ADDDATA, SDS_ID, Data [, COUNT=vector] [, /NOREVERSE] [, START=vector] [, STRIDE=vector]

HDF_SD_ATTRFIND - Locates index of HDF attribute given its name.

Result = HDF_SD_ATTRFIND(S_ID, Name)

HDF_SD_ATTRINFO - Reads or retrieves information about SD attribute.

HDF_SD_ATTRINFO, S_ID, Attr_Index [, COUNT=variable] [, DATA=variable] [, HDF_TYPE=variable] [, NAME=variable] [, TYPE=variable]

HDF_SD_ATTRSET - Writes attributes to an open HDF SD dataset.


HDF_SD_CREATE - Creates and defines a Scientific Dataset for an HDF file.


HDF_SD_DIMGET - Retrieves info. about SD dataset dimension.


HDF_SD_DIMGETID - Returns dimension ID given a dataset "SDS_ID" and dimension number.

Result = HDF_SD_DIMGETID(SDS_ID, Dimension_Number)

HDF_SD_DIMSET - Sets scale and data strings for SD dimension.


HDF_SD_END - Closes SD interface to an HDF file.

HDF_SD_END, SD_ID

HDF_SD_ENDACCESS - Closes SD dataset interface.

HDF_SD_ENDACCESS, SD_ID

HDF_SD_FILEINFO - Retrieves the number of datasets and global attributes in HDF file.

HDF_SD_FILEINFO, SD_ID, Datasets, Attributes

HDF_SD_GETDATA - Retrives a hyperslab of values from SD dataset.

HDF_SD_GETDATA, SDS_ID, Data [, COUNT=variable] [, /NOREVERSE] [, START=vector] [, STRIDE=vector]

HDF_SD_GETINFO - Retrives information about SD dataset.


HDF_SD_IDTOREF - Converts SD data set ID into SD data set reference number.

Result = HDF_SD_IDTOREF(SDS_ID)

HDF_SD_ISCOORDVAR - Determines whether supplied dataset ID represents NetCDF "coordinate" variable.

Result = HDF_SD_ISCOORDVAR(SDS_ID)

HDF_SD_NAMETOINDEX - Returns SD dataset index given its name and SD interface ID.

Result = HDF_SD_NAMETOINDEX(SD_ID, SDS_Name)

HDF_SD_REFTOINDEX - Returns SD dataset index given its reference number and SD interface ID.

Result = HDF_SD_REFTOINDEX(SD_ID, Refno)

HDF_SD_SELECT - Returns SD dataset ID.

Result = HDF_SD_SELECT(SD_ID, Number)

HDF_SD_SETCOMPRESS - Compresses an existing HDF SD dataset or sets the compression method of a new HDF SD dataset.

HDF_SD_SETCOMPRESS, SDS_ID, comptype [, EFFORT=integer(1 to 9)]

HDF_SD_SETTEXTFILE - Moves data values from a dataset into an external file.

HDF_SD_SETTEXTFILE, SDS_ID, Filename [, OFFSET=bytes]

HDF_SD_SETINFO - Sets information about SD dataset.

HDF_SD_SETINFO, SDS_ID [, FILL=value] [, FORMAT=string] [, LABEL=string] [, RANGE={max, min}] [, UNIT=string] [, COORDSYS=string] [, CALDATA=structure]
HDF_SD_START - Opens or creates HDF file and initializes SD interface.
\[ Result = HDF_SD_START( Filename [, /READ | , /RDWR] [, /CREATE] ) \]

HDF_UNPACKDATA - Unpacks array of byte data into IDL variables.
\[ HDF_UNPACKDATA, packeddata, data1 [, data2 [, data3 [, data4 [, data5 [, data6 [, data7 [, data8]]]]]]] \]
\[ HDF_ORDER=variable [, HDF_TYPE=variable] [, NREC=records] \]

HDF_VD_ATTACH - Accesses a VData with the given ID.
\[ Result = HDF_VD_ATTACH( FileHandle, VDataId [, /READ | , /WRITE] ) \]

HDF_VD_DETACH - Called when done accessing a VData.
\[ HDF_VD_DETACH, VData \]

HDF_VD_FDEFINE - Adds new field specification for VData.
\[ HDF_VD_FDEFINE, VData, Fieldname [, /BYTE | , /DLONG | , /DOUBLE | , /DULONG | , /FLOAT | , /INT | , /LONG | , /UINT | , /ULONG] [, ORDER=value] \]

HDF_VD_FEXIST - Returns true if specified fields exist in HDF file.
\[ Result = HDF_VD_FEXIST(VData, Fieldnames) \]

HDF_VD_FIND - Returns reference number of specified VData.
\[ Result = HDF_VD_FIND( FileHandle, Name ) \]

HDF_VD_GET - Returns information about a VData.

HDF_VD_GETID - Returns VData reference number for next VData.
\[ Result = HDF_VD_GETID( FileHandle, VDataId ) \]

HDF_VD_GETINFO - Returns information about each Vdata field.
\[ HDF_VD_GETINFO, VData, Index [, NAME=variable] [, ORDER=variable] [, SIZE=variable] [, TYPE=variable] \]

HDF_VD_GETNEXT - Returns reference number of the next object inside a VData.
\[ Result = HDF_VD_GETNEXT( VData, Id ) \]

HDF_VD_INSERT - Adds VData or VGroup to contents of VGroup.
\[ HDF_VD_INSERT, VGroup, VData(or Vgroup)[, POSITION=variable] \]

HDF_VD_ISVD - Returns True (1) if an object is a VData.
\[ Result = HDF_VD_ISVD( VGroup, Id ) \]

HDF_VD_ISVGG - Returns True (1) if object is a VGroup.
\[ Result = HDF_VG_ISVGG( VGroup, Id ) \]

HDF_VD_LONE - Returns array containing all VDatas that are not contained in another VData.
\[ Result = HDF_VD_LONE( FileHandle [, MAXSIZE=value] ) \]

HDF_VD_READ - Reads data from a VData.
\[ Result = HDF_VD_READ( VData, Data [, FIELDS=string] [, /FULL_INTERLACE | , /NO_INTERLACE] [, NRECORDS=records] ) \]

HDF_VD_SEEK - Moves read pointer in specified VData to specific record number.
\[ HDF_VD_SEEK, VData, Record \]

HDF_VD_SETINFO - Specifies general information about a VData.
\[ HDF_VD_SETINFO, VData [, CLASS=string] [, /FULL_INTERLACE | , /NO_INTERLACE] [, NAME=string] \]

HDF_VD_WRITE - Stores data in a VData
\[ HDF_VD_WRITE, VData, Fields, Data [, /FULL_INTERLACE | , /NO_INTERLACE] [, NRECORDS=records] \]

HDF_VG_ADDTR - Adds tag and reference to specified VGroup.
\[ HDF_VG_ADDTR, VGroup, Tag, Ref \]

HDF_VG_ATTACH - Attaches (opens) a VGroup.
\[ Result = HDF_VG_ATTACH( FileHandle, VGroupId [, /READ | , /WRITE] ) \]

HDF_VG_DETACH - Called when finished accessing a VGroup.
\[ HDF_VG_DETACH, VGroup \]

HDF_VG_GETID - Returns VGroup ID for specified VGroup.
\[ Result = HDF_VG_GETID( FileHandle, VGroupId ) \]

HDF_VG_GETINFO - Returns information about a VGroup.

HDF_VG_GETNEXT - Returns reference number of the next object in a VGroup.
\[ Result = HDF_VG_GETNEXT( VGroup, Id ) \]

HDF_VG_GETTR - Returns tag/reference pair at specified position within a VGroup.
\[ HDF_VG_GETTR, VGroup, Index, Tags, Refs \]

HDF_VG_GETTRS - Returns tag/reference pairs of HDF file objects belonging to the specified VGroup.
\[ HDF_VG_GETTRS, VGroup, Tags, Refs [, MAXSIZE=value] \]

HDF_VG_INQTR - Returns true if specified tag/reference pair is linked to the specified Vgroup.
\[ Result = HDF_VG_INQTR( VGroup, Tag, Ref ) \]

HDF_VG_INSERT - Adds VData or VGroup to contents of VGroup.
\[ HDF_VG_INSERT, VGroup, VData(or Vgroup)[, POSITION=variable] \]
**NetCDF Routines**

**NCDF_ATTCOPY** - Copies attribute from one netCDF file to another.
- \[ Result = NCDF_ATTCOPY( Incdf [, Invar ] , /IN_GLOBAL] , Name , Outcdf [, Outvar] [, /OUT_GLOBAL] ) \]

**NCDF_ATTDEL** - Deletes an attribute from a netCDF file.
- NCDF_ATTDEL, Cdfid [, Varid] , /GLOBAL , Name

**NCDF_ATTGET** - Retrieves value of an attribute from a netCDF file.
- NCDF_ATTGET, Cdfid [, Varid] , /GLOBAL , Name , Value

**NCDF_ATTINQ** - Returns information about a netCDF attribute.
- \[ Result = NCDF_ATTINQ( Cdfid [, Varid] , /GLOBAL] , Name ) \]

**NCDF_ATTNAME** - Returns the name of an attribute given its ID.
- \[ Result = NCDF_ATTNAME( Cdfid [, Varid] , /GLOBAL] , Attnum ) \]

**NCDF_ATTPUT** - Creates an attribute in a netCDF file.

**NCDF_ATTRENAME** - Renames an attribute in a netCDF file.
- NCDF_ATTRENAME, Cdfid [, Varid] , /GLOBAL] Oldname , Newname

**NCDF_CLOSE** - Closes an open netCDF file.
- NCDF_CLOSE, Cdfid

**NCDF_CONTROL** - Performs miscellaneous netCDF operations.

**NCDF_CREATE** - Creates a new netCDF file.
- \[ Result = NCDF_CREATE( Filename [, /CLOBBER] , /NOCLOBBER] ) \]

**NCDF_DIMDEF** - Defines a dimension given its name and size.
- \[ Result = NCDF_DIMDEF( Cdfid, DimName, Size [, /UNLIMITED] ) \]

**NCDF_DIMID** - Returns the ID of a netCDF dimension, given the name of the dimension.
- \[ Result = NCDF_DIMID( Cdfid, DimName ) \]

**NCDF_DIMINQ** - Retrieves the name and size of a dimension in a netCDF file, given its ID.
- NCDF_DIMINQ, Cdfid, Dimid , Name , Size

**NCDF_DIMRENAME** - Renames an existing dimension in a netCDF file that has been opened for writing.
- NCDF_DIMRENAME, Cdfid, Dimid, NewName

**NCDF_EXISTS** - Returns True if the netCDF format library is supported on the current IDL platform.
- \[ Result = NCDF_EXISTS() \]

**NCDF_INQUIRE** - Returns information about an open netCDF file.
- \[ Result = NCDF_INQUIRE(Cdfid) \]

**NCDF_OPEN** - Opens an existing netCDF file.
- \[ Result = NCDF_OPEN( Filename [, /NOWRITE] , /WRITE) \]

**NCDF_VARDEF** - Adds a new variable to an open netCDF file in define mode.

**NCDF_VARGET** - Retrieves a hyperslab of values from a netCDF variable.
- NCDF_VARGET, Cdfid, Varid, Value [, COUNT=vector] [, OFFSET=vector] [, STRIDE=vector]

**NCDF_VARGET1** - Retrieves one element from a netCDF variable.
- NCDF_VARGET1, Cdfid, Varid, Value [, OFFSET=vector]

**NCDF_VARID** - Returns the ID of a netCDF variable.
- \[ Result = NCDF_VARID(Cdfid, Name) \]

**NCDF_VARINQ** - Returns information about a netCDF variable, given its ID.
- \[ Result = NCDF_VARINQ(Cdfid, Varid) \]

**NCDF_VARPUT** - Writes a hyperslab of values to a netCDF variable.
- NCDF_VARPUT, Cdfid, Varid, Value [, COUNT=vector] [, OFFSET=vector] [, STRIDE=vector]

**NCDF_VARRENAME** - Renames a netCDF variable.
- NCDF_VARRENAME, Cdfid, Varid, Name
This section lists all IDL objects and their methods. In addition to the syntax conventions discussed in “IDL Syntax Conventions” on page 16, note the following:

- The `Object_Name::Init` method for each object has keywords that are followed by either {Get}, {Set}, or {Get, Set}. Properties retrievable via `Object_Name::GetProperty` are indicated by {Get}; properties settable via `Object_Name::SetProperty` are indicated by {Set}. Properties that are both retrievable and settable are indicated by {Get, Set}. Do not include the braces, Get, or Set in your call.

- Each object’s Cleanup method lists two possible syntaxes. The second syntax (`Obj`–>`Object_Name::Cleanup`) can be used only in a subclass’ Cleanup method.

- Some objects have Init methods that list two possible syntaxes. The second syntax (`Obj`–>`Object_Name::Init`) can be used only in a subclass’ Init method.

IDL_Container - Object used to hold other objects. No superclasses. Subclasses: IDL_grModel IDL_grScene IDL_grView IDL_grViewGroup.

IDL_Container::Add - Adds a child object to the container.

IDL_Container::Count - Returns the number of objects contained by the container object.

IDL_Container::Get - Returns an array of object references to objects in a container.

IDL_Container::Init - Initializes the container object.

IDL_Container::IsContained - Returns true (1) if the specified object is in the container, or false (0) otherwise.

IDL_Container::Move - Moves an object from one position in a container to a new position.

IDL_Container::Remove - Removes an object from the container.

IDLanROI - Represents a region of interest. Superclass of IDLgrROI.

IDLanROI::AppendData - Appends vertices to the region.

IDLanROI::ComputeGeometry - Computes the geometrical values for area, perimeter, and/or centroid of the region.

IDLanROI::ComputeMask - Prepares a two-dimensional mask for the region.

IDLanROI::ContainsPoints - Determines whether the given data coordinates are contained within the closed polygon region.

IDLanROI::GetProperty - Retrieves the value of a property or group of properties for the region.

IDLanROI::Init - Initializes a region of interest object.

IDLanROI::Cleanup - Performs all cleanup for the object.

IDLanROI::Move - Moves an object from one position in a container to a new position.

IDLanROI::Remove - Removes an object from the container.
IDLanROI::RemoveData - Removes vertices from the region.

_Example:_

```
Obj->IDLanROI::RemoveData[ COUNT=vertices
[, START=index] [, XRANGE=variable
[, YRANGE=variable] [, ZRANGE=variable]

IDLanROI::ReplaceData - Replaces vertices in the region with alternate values.

_Example:_

```
Obj->IDLanROI::ReplaceData, X[, Y[, Z]]
[, START=index] [, FINISH=index]
[, XRANGE=variable] [, YRANGE=variable]
[, ZRANGE=variable]

IDLanROI::Rotate - Modifies the vertices for the region by applying a rotation.

_Example:_

```
Obj->IDLanROI::Rotate, Axis, Angle
[, CENTER=[x, y[, z]]]

IDLanROI::Scale - Modifies the vertices for the region by applying a scale.

_Example:_

```
Obj->IDLanROI::Scale, Sx[, Sy[, Sz]]

IDLanROI::SetProperty - Sets the value of a property or group of properties for the region.

_Example:_

```
Obj->IDLanROI::SetProperty

IDLanROI::Translate - Modifies the vertices for the region by applying a translation.

_Example:_

```
Obj->IDLanROI::Translate, Tx[, Ty[, Tz]]

IDLanROIGroup - This object is an analytical representation of a group of regions of interest. Subclass of IDL_Container. Superclass of IDLgrROIGroup.

IDLanROIGroup::Add - Adds a region to the region group.

_Example:_

```
Obj->IDLanROIGroup::Add, ROI

IDLanROIGroup::Cleanup - Performs all cleanup for the object.

_Example:_

```
OBJ_DESTROY, Obj
or
Obj->IDLanROIGroup::Cleanup

IDLanROIGroup::ContainsPoints - Determines whether the given points (in data coordinates) are contained within the closed polygon regions within this group.

_Example:_

```
Result = Obj->IDLanROIGroup::ContainsPoints( X[, Y[, Z]])

IDLanROIGroup::ComputeMask - Prepares a 2-D mask for this group of regions.

_Example:_

```
Result = Obj->IDLanROIGroup::ComputeMask(
[, INITIALIZE=[-1 | 0 | 1]]
[, DIMENSIONS=[xdim, ydim]] [, MASK_IN=variable
[, LOCATION=[fx, y[, z]]] [, MASK_RULE=[ 0 | 1 | 2 ]])

IDLanROIGroup::ComputeMesh - Triangulates a surface mesh with optional capping from the stack of regions contained within this group.

_Example:_

```
Result = Obj->IDLanROIGroup::ComputeMesh( Vertices, Conn [, CAPPED=[ 0 | 1 | 2 ]]
[, SURFACE_AREA=variable]

IDLanROIGroup::GetProperty - Retrieves the value of a property or group of properties for the region group.

_Example:_

```
Obj->IDLanROIGroup::GetProperty[, ALL=variable
[, ROIGROUP_XRANGE=variable]

[, ROIGROUP_YRANGE=variable]
[, ROIGROUP_ZRANGE=variable]

IDLanROIGroup::Init - Initializes a region of interest group object.

_Example:_

```
Obj = OBJ_NEW('IDLanROIGroup') or
Result = Obj->[IDLanROIGroup::Init( )

IDLanROIGroup::Rotate - Modifies the vertices for all regions within the group by applying a rotation.

_Example:_

```
Obj->[IDLanROIGroup::]Rotate, Axis,
Angle[, CENTER=[ x, y[, z ]] ]

IDLanROIGroup::Scale - Modifies the vertices for the region by applying a scale.

_Example:_

```
Obj->[IDLanROIGroup::]Scale, Sx[, Sy[, Sz]]

IDLanROIGroup::Translate - Modifies the vertices of all regions within the group by applying a translation.

_Example:_

```
Obj->[IDLanROIGroup::]Translate, Tx[, Ty[, Tz]]

IDLffDICOM - Contains the data for one or more images embedded in a DICOM part 10 file. No superclasses. No subclasses.

IDLffDICOM::Cleanup - Destroys the IDLffDICOM object.

_Example:_

```
OBJ_DESTROY, Obj
or
OBJ -> [IDLffDICOM::]Cleanup

IDLffDICOM::DumpElements - Dumps a description of the DICOM data elements of an IDLffDICOM object to the screen or to a file.

_Example:_

```
Obj -> [IDLffDICOM::]DumpElements, [ Filename]

IDLffDICOM::GetChildren - Finds the member element references of a DICOM sequence.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetChildren(Reference)

IDLffDICOM::GetDescription - Takes optional DICOM group and element arguments and returns an array of STRING descriptions.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetDescription( [ Group
[, Element]] [, REFERENCES=list of element references] )

IDLffDICOM::GetElement - Takes optional DICOM group and/or element arguments and returns an array of DICOM Element numbers for those parameters.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetElement( [ Group
[, Element]] [, REFERENCES=list of element references] )

IDLffDICOM::GetGroup - Takes optional DICOM group and/or element arguments and returns an array of DICOM Group numbers for those parameters.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetGroup( [ Group
[, Element]] [, REFERENCES=list of element references] )

IDLffDICOM::GetLength - Takes optional DICOM group and/or element arguments and returns an array of longs.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetLength( [ Group
[, Element]] [, REFERENCES=list of element references] )

IDLffDICOM::GetParent - Finds the parent references of a set of elements in a DICOM sequence.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetParent( ReferenceList )

IDLffDICOM::GetPreamble - Returns the preamble of a DICOM file.

_Example:_

```
array = Obj -> [IDLffDICOM::]GetPreamble( )
IDLffDICOM::GetReference - Takes optional DICOM group and/or element arguments and returns an array of references to matching elements in the object.

\[
array = Obj \rightarrow \langle \text{IDLffDICOM::GetReference( [Group } \\
\text{ [. Element]] } [., \text{ DESCRIPTION=string}] [., \text{ VR=DICOM VR string}] \rangle
\]

IDLffDICOM::GetValue - Takes optional DICOM group and/or element arguments and returns an array of POINTERs to the values of the elements matching those parameters.

\[
ptrArray = Obj \rightarrow \langle \text{IDLffDICOM::GetValue( [Group} \\
\text{ [. Element]]} [., \text{ REFERENCE=list of element references}] [., \text{ /NO_COPY}] \rangle
\]

IDLffDICOM::GetVR - Takes optional DICOM group and/or element arguments and returns an array of VR (Value Representation) STRINGs for those parameters.

\[
array = Obj \rightarrow \langle \text{IDLffDICOM::GetVR( [Group}\ \\
\text{ [. Element]]} [., \text{ REFERENCE=list of references}] \rangle
\]

IDLffDICOM::Init - Creates a new IDLffDICOM object and optionally reads the specified file as defined in the IDLffDICOM::Read method.

\[
Result = \text{OBJ\_NEW( 'IDLffDICOM' [}, \text{ Filename} \\
\text{ [., /VERBOSE ] } \rangle \text{ or } \\
Result = Obj \rightarrow \langle \text{IDLffDICOM::Init( [ Filename} \\
\text{ [. /VERBOSE] } \rangle
\]

IDLffDICOM::Read - Opens and reads from the specified disk file, places the information into the DICOM object, then closes the file.

\[
result = Obj \rightarrow \langle \text{IDLffDICOM::Read( Filename} \\
\text{ [, ENDIAN=\{1 | 2 | 3 | 4\}] } \rangle
\]

IDLffDICOM::Reset - Removes all of the elements from the IDLffDICOM object, leaving the object otherwise intact.

\[
Obj \rightarrow \langle \text{IDLffDICOM::Reset} \rangle
\]

IDLffDXF::Read - Reads a file, parsing the DXF object information contained in the file, and inserts it into itself.

\[
Result = Obj \rightarrow \langle \text{IDLffDXF::Read( Filename) \rangle}
\]

IDLffDXF::RemoveEntity - Removes the specified entity or entities from the DXF object.

\[
Obj \rightarrow \langle \text{IDLffDXF::RemoveEntity[, Type} \\
\text{ [. INDEX=value] } \rangle
\]

IDLffDXF::Reset - Removes all the entities from the DXF object.

\[
Obj \rightarrow \langle \text{IDLffDXF::Reset} \rangle
\]

IDLffDXF::SetPalette - Sets the current color table in the object.

\[
Obj \rightarrow \langle \text{IDLffDXF::SetPalette, Red, Green, Blue} \rangle
\]

IDLffDXF::Write - Writes a file for the DXF entity information this object contains.

\[
Result = Obj \rightarrow \langle \text{IDLffDXF::Write( Filename) } \rangle
\]

IDLffLanguageCat - Provides an interface to IDL language catalog files.

IDLffLanguageCat::IsValid - Determines whether the object has a valid catalog.

\[
Result = Obj \rightarrow \langle \text{IDLffLanguageCat::IsValid( )} \rangle
\]

IDLffLanguageCat::Query - Returns the language string associated with the given key.

\[
Result = Obj \rightarrow \langle \text{IDLffLanguageCat::Query( key [., DEFAULT\_STRING=string] } \rangle
\]

IDLffLanguageCat::SetCatalog - Sets appropriate catalog file.

\[
Result = Obj \rightarrow \langle \text{IDLffLanguageCat::SetCatalog( application [., FILENAME=string] [., LOCALE=string] [., PATH=string] } \rangle
\]

IDLffShape - Contains geometry, connectivity, and attributes for graphics primitives accessed from ESRI Shapefiles. No superclass. No subclasses.

IDLffShape::AddAttribute - Adds an attribute to a shapefile.

\[
Obj \rightarrow \langle \text{IDLffShape::AddAttribute, Name, Type, Width [., PRECISION=integer] } \rangle
\]

IDLffShape::Cleanup - Performs all cleanup on a Shapefile object.

\[
OBJ\_DESTROY, Obj or Obj \rightarrow \langle \text{IDLffShape::Cleanup} \rangle
\]

IDLffShape::Close - Closes a Shapefile.

\[
Obj \rightarrow \langle \text{IDLffShape::Close} \rangle
\]

IDLffShape::DestroyEntity - Frees memory associated with the entity structure.

\[
Obj \rightarrow \langle \text{IDLffShape::DestroyEntity, Entity} \rangle
\]

IDLffShape::GetAttributes - Retrieves the attributes for the entities you specify from a Shapefile.

\[
Result = Obj \rightarrow \langle \text{IDLffShape::GetAttributes([Index} \\
\text{ [. /ALL] [., /ATTRIBUTE\_STRUCTURE] } \rangle
\]

IDLffShape::GetEntity - Returns an array of entity structures from a Shapefile.

\[
Result = Obj \rightarrow \langle \text{IDLffShape::GetEntity( [Index} [., /ALL] \\
\text{ [. /ATTRIBUTES] } \rangle
\]

IDLffShape::PutEntity - Inserts an entity into the DXF object.

\[
Obj \rightarrow \langle \text{IDLffDXF::PutEntity, Data} \rangle
\]
IDLffShape::GetProperty - Returns the values of properties associated with a Shapefile object.

Obj->[IDLffShape::GetProperty

[. N_ENTITIES=variable ] [. ENTITY_TYPE=variable ]

[. N_ATTRIBUTES=variable ] [. ATTRIBUTE_NAMES=variable ]

[. ATTRIBUTE_INFO=variable ] [. IS_OPEN=variable ]

[. FILENAME=variable ]

IDLffShape::Init - Initializes or constructs a Shapefile object.

Result = OBJ_NEW(‘IDLffShape’ [. Filename ]

[. /UPDATE ] [. ENTITY_TYPE=Value ]

IDLffShape::Open - Opens a specified Shapefile.

Result = Obj->[IDLffShape::Open(‘Filename’

[. /UPDATE ] [. ENTITY_TYPE=Value ]

IDLffShape::PutEntity - Inserts an entity into the Shapefile object.

Obj->[IDLffShape::PutEntity, Data ]

IDLffShape::SetAttributes - Modifies the attributes for a specified entity in a Shapefile object.

Obj->[IDLffShape::SetAttributes, Index, Attribute_Num, Value

or

Obj->[IDLffShape::SetAttributes, Index, Attributes ]

IDLgrAxis - Represents a single vector that may include a set of tick marks, tick labels, and a title. No superclasses. No subclasses.

IDLgrAxis::Cleanup - Performs all cleanup on the object.

OBJ_DESTROY, Obj or Obj -> [IDLgrAxis:::Cleanup

IDLgrAxis::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.

Result = Obj -> [IDLgrAxis:::GetCTM( [. DESTINATION=objetref ] [. PATH=objetref ]

[. TOP=objetref ]

IDLgrAxis::GetProperty - Retrieves the value of a property or group of properties for the axis.

Obj -> [IDLgrAxis:::GetProperty [. ALL=variable ]

[. CRANGE=variable ] [. PARENT=variable ]

[. X RANGE=variable ] [. Y RANGE=variable ]

[. Z RANGE=variable ]

Note: See also the {Get} properties in IDLgrAxis::Init

IDLgrAxis::Init - Initializes an axis object.

Obj = OBJ_NEW(‘IDLgrAxis’ [. Direction ]

[. AM_PM=Get, Set]=array ] [. COLOR=Get, Set]=index or RGB_vector ]


[. EXACT=Get, Set ] [. EXTECTEXT=Get, Set ]

[. GRIDSTYLE=Get, Set]=integer ]

[. HIDE=Get, Set ] [. LOCATION=Get, Set]=[x, y, z ] [. /LOG=Get, Set ]


[. NOTEXT=Get, Set ] [. PALETTE=Get, Set]=objetref ]

[. RANGE=Get, Set]=[min, max ] [. SUBTICKLEN=Get, Set]=value ]

[. TEXTALIGNMENTS=Get, Set]={[horiz(0.0 to 1.0), vert(0.0 to 1.0)] ]

[. TEXTBASELINE=Get, Set]=vector ] [. TEXTPOS=Get, Set]=[0, 1 ] [. TEXTUPDIR=Get, Set]=vector ]

[. THICK=Get, Set]=points(1.0 to 10.0) ]

[. TICKDIR=Get, Set]=[0, 1 ] [. TICKFORMAT=Get, Set]=string or array of strings ]

[. TICKFRMTDATA=Get, Set]=value ]

[. TICKINTERVAL=Get, Set]=value ]


[. TICKTEXT=Get, Set]=objetref or vector ]

[. TICKUNITS=Get, Set]=string or a vector of strings ]


[. YCOORD_CONV=Get, Set]=vector ]

[. ZCOORD_CONV=Get, Set]=vector ]

or

Result = Obj -> [IDLgrAxis:::Init( [Direction ]

IDLgrAxis::SetProperty - Sets the value of a property or group of properties for the axis.

Obj -> [IDLgrAxis:::SetProperty ]

Note: See also the {Set} properties in IDLgrAxis::Init

IDLgrBuffer - An in-memory, off-screen destination object. No superclasses. No subclasses.

IDLgrBuffer::Cleanup - Performs all cleanup on the object.

OBJ_DESTROY, Obj or Obj -> [IDLgrBuffer:::Cleanup

IDLgrBuffer::Draw - Draws picture to this graphics destination.

Obj -> [IDLgrBuffer:::Draw [. Picture ]

[. CREATE_INSTANCE={1 | 2} ]

[. /DRAW_INSTANCE ]

IDLgrBuffer::Erase - Erases this graphics destination.

Obj -> [IDLgrBuffer:::Erase [. COLOR=index or RGB vector ]

IDLgrBuffer::GetContiguousPixels - Returns an array of long integers whose length is equal to the number of colors available in the index color mode (value of the N_COLORS property).

Return = Obj -> [IDLgrBuffer:::GetContiguousPixels( )

IDLgrBuffer::GetDeviceInfo - Returns information that allows the IDL applications to make decisions for optimal performance.

Obj->[IDLgrBuffer:::GetDeviceInfo [. ALL=variable ]

[. MAX_TEXTURE_DIMENSIONS=variable ]

[. MAX_VIEWPORT_DIMENSIONS=variable ]

[. NAME=variable ] [. NUM_CPUS=variable ]

[. VENDOR=variable ] [. VERSION=variable ]

IDLgrBuffer::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.

Return = Obj -> [IDLgrBuffer:::GetFontnames( [FamilyName [. IDL_FONTS=[0 | 1 | 2 ]]

[./styles=string ]

IDLgrBuffer::GetProperty - Retrieves the value of a property or group of properties for the buffer.

Obj -> [IDLgrBuffer:::GetProperty [. ALL=variable ]

[. IMAGE_DATA=variable ]
[, SCREEN_DIMENSIONS=variable]
[, ZBUFFER_DATA=variable]

Note: See also the {Get} properties in IDLgrBuffer::Init

IDLgrBuffer::GetTextDimensions - Retrieves the dimensions of a text object that will be rendered in the buffer.
Result = Obj -> [IDLgrBuffer::GetTextDimensions( 
TextObj [, DESCENT=variable] [, PATH=objref(s)])]

IDLgrBuffer::Init - Initializes the buffer object.

Obj = OBJ_NEW('IDLgrBuffer'
[, COLOR_MODEL={Get}={0 | 1}]
[, DIMENSIONS={Get, Set}={width, height}]
[, GRAPHICS_TREE={Get, Set}={objref}]
[, N_COLORS={Get}={integer[2 to 256]}
[, PALETTE={Get, Set}={objref}]
[, QUALITY={Get, Set}={0 | 1 | 2}]
[, RESOLUTION={Get, Set}={xres, yres}]
[, UNITS={Get, Set}={0 | 1 | 2 | 3}]
[, UVALUE={Get, Set}={value}])
or
Result = Obj -> [IDLgrBuffer::Init()]

IDLgrBuffer::PickData - Maps a point in the 2D device space of the buffer to a point in the 3D data space of an object tree.
Result = Obj -> [IDLgrBuffer::PickData( View, Object, Location, XYZLocation, PATH=objref(s))]

IDLgrBuffer::Read - Reads an image from a buffer.
Result = Obj -> [IDLgrBuffer::Read()]

IDLgrBuffer::Select - Returns a list of objects selected at a specified location.
Result = Obj -> [IDLgrBuffer::Select(Picture, XY
[, DIMENSIONS={width, height}]
[, UNITS={0 | 1 | 2 | 3}])]

IDLgrBuffer::SetProperty - Sets the value of a property or group of properties for the buffer.

Obj -> [IDLgrBuffer::SetProperty]

Note: See also the {Set} properties in IDLgrBuffer::Init

IDLgrClipboard - A destination object representing the native clipboard. No superclasses. No subclasses.

IDLgrClipboard::Cleanup - Performs all cleanup on the object.

OBJ_DESTROY, Obj or Obj -> [IDLgrClipboard::Cleanup]

IDLgrClipboard::Draw - Draws a picture to a graphics destination.

Obj -> [IDLgrClipboard::Draw [Picture]
[, FILENAME=string] [POSTSCRIPT=value]
[, VECTOR={0 | 1}]]

IDLgrClipboard::GetContiguousPixels - Returns array of long integers whose length is equal to the number of colors available in the index color mode (value of the N_COLORS property).

Return = Obj -> [IDLgrClipboard::GetContiguousPixels()]

IDLgrClipboard::GetDeviceInfo - Returns information that allows IDL applications to make decisions for optimal performance.

Obj->[IDLgrClipboard::GetDeviceInfo [, ALL=variable]
[, MAX_TEXTURE_DIMENSIONS=variable]
[, MAX_VIEWPORT_DIMENSIONS=variable]
[, NAME=variable] [, NUM_CPUS=variable]
[, VENDOR=variable] [, VERSION=variable]

IDLgrClipboard::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.

Return = Obj -> [IDLgrClipboard::GetFontnames( 
FamilyName [, IDL_FONTS={0 | 1 | 2}]
[, STYLES=string])]

IDLgrClipboard::GetProperty - Retrieves the value of a property or group of properties for the clipboard buffer.

Obj -> [IDLgrClipboard::GetProperty [, ALL=variable]
[, SCREEN_DIMENSIONS=variable]

Note: See also the {Get} properties in IDLgrClipboard::Init

IDLgrClipboard::GetTextDimensions - Retrieves the dimensions of a text object that will be rendered in the clipboard buffer.

Result = Obj -> [IDLgrClipboard::GetTextDimensions( 
TextObj [, DESCENT=variable] [, PATH=objref(s)])]

IDLgrClipboard::Init - Initializes the clipboard object.

Obj = OBJ_NEW('IDLgrClipboard'
[, COLOR_MODEL={Get}={0 | 1}]
[, DIMENSIONS={Get, Set}={width, height}]
[, GRAPHICS_TREE={Get, Set}={objref}]
[, N_COLORS={Get}={integer[2 to 256]}
[, PALETTE={Get, Set}={objref}]
[, QUALITY={Get, Set}={0 | 1 | 2}]
[, RESOLUTION={Get, Set}={xres, yres}]
[, UNITS={Get, Set}={0 | 1 | 2 | 3}]
[, UVALUE={Get, Set}={value}])
or
Result = Obj -> [IDLgrClipboard::Init()]

IDLgrClipboard::SetProperty - Sets the value of a property or group of properties for the clipboard buffer.

Obj -> [IDLgrClipboard::SetProperty]

Note: See also the {Set} properties in IDLgrClipboard::Init

IDLgrColorbar - Consists of a color-ramp with an optional framing box and annotation axis. Superclasses: IDLgrModel. No subclasses.

IDLgrColorbar::Cleanup - Performs all cleanup on the object.

OBJ_DESTROY, Obj or Obj -> [IDLgrColorbar::Cleanup]

IDLgrColorbar::ComputeDimensions - Retrieves the dimensions of a colorbar object for the given destination object.

Result = Obj -> [IDLgrColorbar::ComputeDimensions( 
DestinationObj [, PATH=objref(s)])]

IDLgrColorbar::GetProperty - Retrieves the value of a property or group of properties for the colorbar.

Obj -> [IDLgrColorbar::GetProperty [, ALL=variable]
[, PARENT=variable] [, XRANGE=variable]
[, YRANGE=variable] [, ZRANGE=variable]

Note: See also the {Get} properties in IDLgrColorbar::Init
IDLgrColorbar::Init - Initializes the colorbar object.

IDLgrColorbar::SetProperty - Sets the value of a property or group of properties for the colorbar.

IDLgrContour::Init - Initializes the contour object.

IDLgrContour::GetProperty - Retrieves the value of a property or group of properties for the contour.

IDLgrContour::SetProperty - Sets the value of a property or group of properties for the contour.
IDL HandiGuide

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Objects

IDLgrImage::GetProperty - Retrieves the value of the property or group of properties for the image.

```
Obj -> [IDLgrImage::GetProperty [ ALL=variable ]
[, PARENT=variable ]
[, XRANGE=variable ]
[, YRANGE=variable ]
[, ZRANGE=variable ]

Note: See also the {Get} properties in IDLgrImage::Init
```

IDLgrImage::Init - Initializes the image object.

```
Obj = OBJ_NEW('IDLgrImage' [ , ImageData ]
[, BLENDFUNCTION=Get, Set]=vector]
[, CHANNEL=Get, Set]=hexadecimal bitmask]
[, DATA=Get, Set]=nxm, 2nxm, 3nxm, or 4nxm array of image data]
[, DIMENSIONS=Get, Set]=width, height]
[, GREYSCALE=Get, Set]
[, HIDE=Get, Set]
[, INTERLEAVE=Get, Set]=0 | 1 | 2]
[, LOCATION=Get, Set]
[, NAME=string]
[, NO_COPY=Get, Set][, ORDER=Get, Set]
[, PALETTE=Get, Set]
[, RESET_DATA=Set[]]
[, SHAREDATA=Get, Set]
[, SUB_RECT=Get, Set]=x, y, xdim, ydim]
[, UVVALUE=Get, Set]=value
[, XCOORD_CONV=Get, Set]=vector
[, YCOORD_CONV=Get, Set]=vector
[, ZCOORD_CONV=Get, Set]=vector

Result = Obj -> [IDLgrImage::Init( ImageData )]
```

IDLgrImage::SetProperty - Sets the value of the property or group of properties for the image.

```
Obj -> [IDLgrImage::SetProperty ]

Note: See also the {Set} properties in IDLgrImage::Init
```

IDLgrLegend::Init - Provides a simple interface for displaying a legend. Superclass: IDLgrModel. No subclasses.

```
IDLgrLegend::ComputeDimensions - Performs all cleanup on the object.

IDLgrLegend::Cleanup - Performs all cleanup on the object.

IDLgrLegend::GetProperty - Retrieves the dimensions of a legend object for the given destination object.

```
Result = Obj -> [IDLgrLegend::ComputeDimensions( DestinationObj [, PATH=objcset(s)] )]
```

IDLgrLegend::GetProperty - Retrieves the value of a property or group of properties for the legend.

```
Obj -> [IDLgrLegend::GetProperty [ ALL=variable ]
[, PARENT=variable ]
[, XRANGE=variable ]
[, YRANGE=variable ]
[, ZRANGE=variable ]

Note: See also the {Get} properties in IDLgrLegend::Init
```

IDLgrLegend::Init - Initializes the legend object.

```
Obj = OBJ_NEW('IDLgrLegend' [ , altItemNames ]
[, BORDER_GAP=Get, Set]=value]
[, COLUMNS=Get, Set]=integer]
[, FILL_COLOR=Get, Set]=index or RGB vector]
[, FONT=Get, Set]=object]
[, GAP=Get, Set]=value]
[, GLYPH_WIDTH=Get, Set]=value]
[, HIDE=Get, Set]
[, ITEM_OBJECT=Get, Set]=array of objrefs of type IDLgrSymbol or IDLgrPattern]
[, ITEM_THICK=Get, Set]=float array (each element 1.0 to 10.0)]
[, ITEM_TYPE=Get, Set]=int array (each element 0 or 1)]
[, NAME=Get, Set]=string]
[, OUTLINE_COLOR=Get, Set]=index or RGB vector]
[, OUTLINE_THICK=Get, Set]=points (1.0 to 10.0)]
[, /SHOW_FILL=Get, Set]
[, /SHOW_OUTLINE=Get, Set]
[, /TEXT_COLOR=Get, Set]=index or RGB vector]
[, /TITLE=Get, Set]=object]
[, UVVALUE=Get, Set]=value]
[, XCOORD_CONV=Get, Set]=vector]
[, YCOORD_CONV=Get, Set]=vector]
[, ZCOORD_CONV=Get, Set]=vector]

Result = Obj -> [IDLgrLegend::Init( altItemNames )]
```

IDLgrLegend::SetProperty - Sets the value of a property or group of properties for the legend.

```
Obj -> [IDLgrLegend::SetProperty [ , RECOMPUTE={0 | 1} ]
[, /NO_COPY=Get, Set]
[, /ORDER=Get, Set]
[, /RESET_DATA=Get, Set]
[, /SHOW_FILL=Get, Set]
[, /SHOW_OUTLINE=Get, Set]
[, /TEXT_COLOR=Get, Set]=index or RGB vector]
[, /TITLE=Get, Set]=object]
[, /UVVALUE=Get, Set]=value]
[, /XCOORD_CONV=Get, Set]=vector]
[, /YCOORD_CONV=Get, Set]=vector]
[, /ZCOORD_CONV=Get, Set]=vector]

Note: See also the {Set} properties in IDLgrLegend::Init
```

IDLgrLight - Represents a source of illumination for 3D graphic objects. No superclasses. No subclasses.

```
IDLgrLight::Cleanup - Performs all cleanup on the object.

IDLgrLight::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object.

```
Result = Obj -> [IDLgrLight::GetCTM()]
```

IDLgrLight::GetProperty - Retrieves the value of a property or group of properties for the light.

```
Obj -> [IDLgrLight::GetProperty [ ALL=variable ]
[, PARENT=variable ]
[, XRANGE=variable ]
[, YRANGE=variable ]
[, /NO_COPY=Get, Set]
[, /ORDER=Get, Set]
[, /RESET_DATA=Get, Set]
[, /SHOW_FILL=Get, Set]
[, /SHOW_OUTLINE=Get, Set]
[, /TEXT_COLOR=Get, Set]=index or RGB vector]
[, /TITLE=Get, Set]=object]
[, /UVVALUE=Get, Set]=value]
[, /XCOORD_CONV=Get, Set]=vector]
[, /YCOORD_CONV=Get, Set]=vector]
[, /ZCOORD_CONV=Get, Set]=vector]

Note: See also the {Get} properties in IDLgrLight::Init
```

IDLgrLight::Init - Initializes the light object.

```
Obj = OBJ_NEW('IDLgrLight' [ , ATTENUATION=[Get, Set]=constant, linear, quadratic ]
[, COLOR=Get, Set]=[R, G, B], ]
[, CONEANGLE=[Get, Set]=degrees]
[, DIRECTION=[Get, Set]=3-element vector]
[, FOCUS=Get, Set]=value]
[, /HIDE=Get, Set]
[, INTENSITY=Get, Set]=value]
[, /LOCATION=Get, Set]=[x, y, z]
[, NAME=Get, Set]=string]
[, TYPE=[Get, Set]=0 | 1 | 2 | 3]
[, UVVALUE=Get, Set]=value]
[, XCOORD_CONV=Get, Set]=vector]
[, YCOORD_CONV=Get, Set]=vector]
[, ZCOORD_CONV=Get, Set]=vector]

Result = Obj -> [IDLgrLight::Init( )]
```

IDLgrLight::SetProperty - Sets the value of a property or group of properties for the light.

```
Obj -> [IDLgrLight::SetProperty ]

Note: See also the {Set} properties in IDLgrLight::Init
```
IDLgrModel - Represents a graphical item or group of items that can be transformed (rotated, scaled, and/or translated). Superclass: IDL_CONTAINER. The following classes are subclassed from this class: IDLgrColorbar, IDLgrLegend.

IDLgrModel::Add - Adds a child to this Model.

IDLgrModel::Cleanup - Performs all cleanup on the object.

IDLgrModel::Draw - Draws the specified picture to the specified graphics destination. This method is provided for purposes of subclassing only, and is intended to be called only from the Draw method of a subclass of IDLgrModel.

IDLgrModel::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object.

IDLgrModel::GetProperty - Retrieves the value of a property or group of properties for the model. Ojb -> [IDLgrModel::GetProperty [], ALL=variable] [, PARENT=variable] [, /PREMULTIPLY]

IDLgrModel::Init - Initializes the model object.

IDLgrModel::Reset - Sets the current transform matrix for the model object to the identity matrix.

IDLgrModel::Rotate - Rotates the model about the specified axis by the specified angle.

IDLgrModel::Scale - Scales model by the specified scaling factors.

IDLgrModel::Translate - Translates the model by the specified translation offsets.

IDLgrMPEG - Creates an MPEG movie file from an array of image frames. No superclasses. No subclasses.

IDLgrMPEG::Cleanup - Performs all cleanup on the object.

IDLgrMPEG::GetProperty - Retrieves the value of a property or group of properties for the MPEG object.

IDLgrMPEG::Init - Initializes the MPEG object.

IDLgrMPEG::Put - Puts a given image into the MPEG sequence at the specified frame.

IDLgrMPEG::Save - Encodes and saves an MPEG sequence to a file.

IDLgrPalette - Represents a color lookup table that maps indices to red, green, and blue values. No superclasses. No subclasses.

IDLgrPalette::Cleanup - Performs all cleanup on the object.

IDLgrPalette::GetRGB - Returns the RGB values contained in the palette at the given index.

IDLgrPalette::GetProperty - Retrieves the value of a property or group of properties for the palette.

IDLgrPalette::Init - Initializes a palette object.
IDLgrPattern::SetProperty - Sets the value of a property or group of properties for the pattern.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPattern::} \text{SetProperty} \{ \text{[Style]} \}] \]

or

\[ \text{Result} = \text{Object} \to [\text{IDLgrPalette::} \text{SetProperty} \{ \text{[Red, aGreen, aBlue]} \}] \]

IDLgrPalette::LoadCT - Loads one of the IDL predefined color tables into an IDLgrPalette object.

\[ \text{Object} \to [\text{IDLgrPalette::} \text{LoadCT, TableNum} \{ \text{, FILENAME=\text{colorable filename}} \}] \]

IDLgrPalette::NearestColor - Returns the index of the color in the palette that best matches the given RGB values.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPalette::} \text{NearestColor(\{Red, Green, Blue\})} \}] \]

IDLgrPalette::SetRGB - Sets the color values at a specified index in the palette to the specified Red, Green and Blue values.

\[ \text{Object} \to [\text{IDLgrPalette::} \text{SetRGB, Index, Red, Green, Blue} \{ \text{, FILENAME=\text{colortable filename}} \}] \]

IDLgrPattern - Describes which pixels are filled and which are left blank when an area is filled. No superclasses. No subclasses.

IDLgrPattern::Cleanup - Performs all cleanup on the object.

\[ \text{OBJ_DESTROY, Object} \to [\text{IDLgrPattern::} \text{Cleanup} \{ \text{, ALL=variable} \}] \]

IDLgrPolygon::Init - Initializes the polygons object.

\[ \text{Object} = \text{OBJ_NEW('IDLgrPolygon')} \{ \text{,//STRING=} \text{objref} \}] \]

IDLgrPlot - Creates sets of polylines connecting data points in 2D space. No superclasses. No subclasses.

IDLgrPlot::Cleanup - Performs all cleanup on the object.

\[ \text{OBJ_DESTROY, Object} \to [\text{IDLgrPlot::} \text{Cleanup} \{ \text{, Obj=variable} \}] \]

IDLgrPlot::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPlot::} \text{GetCTM} \{ \text{, DESTINATION=\text{objref}}, \text{PATH=\text{objref(s)}} \}] \]

IDLgrPolygon - Represents one or more polygons that share a set of vertices and rendering attributes. No superclasses. No subclasses.

IDLgrPolygon::Cleanup - Performs all cleanup on the object.

\[ \text{OBJ_DESTROY, Object} \to [\text{IDLgrPolygon::} \text{Cleanup} \{ \text{, Obj=variable} \}] \]

IDLgrPolygon::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPolygon::} \text{GetCTM} \{ \text{, DESTINATION=\text{objref}}, \text{PATH=\text{objref(s)}} \}] \]

IDLgrPlot - Initializes the plot object.

\[ \text{Object} = \text{OBJ_NEW('IDLgrPlot')} \{ \text{,//STRING=} \text{objref} \}] \]

IDLgrPlot::Properties - Retrieves the value of the property or group of properties for the plot.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPlot::} \text{GetProperty} \{ \text{, ALL=variable} \}] \]

Note: See also the {Get} properties in IDLgrPlot::Init

IDLgrPalette::Properties - Retrieves the value of the property or group of properties for the palette.

\[ \text{Result} = \text{Object} \to [\text{IDLgrPalette::} \text{GetProperty} \{ \text{, ALL=variable} \}] \]

or

\[ \text{Result} = \text{Object} \to [\text{IDLgrPalette::} \text{GetProperty} \{ \text{, ALL=variable} \}] \]

Note: See also the {Get} properties in IDLgrPlot::Init

IDLgrPlot::Init - Initializes the plot object.

\[ \text{Object} = \text{OBJ_NEW('IDLgrPlot')} \{ \text{,//STRING=} \text{objref} \}] \]

Note: See also the {Get} properties in IDLgrPlot::Init
IDLgrPolyline::Init - objref to IDLgrPattern object]
[.HIDDEN_LINES=[.HIDE=Get, Set]=array]
[.LINESTYLE=[Get, Set]=value]
[.NAME=[Get, Set]=string]
[.NORMALS=[Get, Set]=array]
[.PALETTE=objcref]
[.POLYGONS=[Get, Set]=array of polygon descriptions]
[.REJECT[Get, Set]=[0 | 1 | 2]]
[.RESET_DATA[Set]=array]
[.SHADING[Get, Set]=[0 | 1 | 2]]
[.SHARE_DATA[Set]=objcref]
[.STYLE=[Get, Set]=[0 | 1 | 2]]
[.TEXTURE_COORD=[Get, Set]=array]
[.TEXTURE_INTERP=[Get, Set]=]
[.TEXTURE_MAP[Get, Set]=objcref to IDLgrImage object]
[.THICK[Get, Set]=points[1.0 to 10.0]]
[.XCOORD_CONV[Get, Set]=vector]
[.YCOORD_CONV[Get, Set]=vector]
[.ZCOORD_CONV[Get, Set]=vector]
[.ZERO_OPACITY_SKIP=[Get, Set]=[0 | 1]]

Result = Obj -> [IDLgrPolyline::Init( X, [Y, [Z]])] }  

IDLgrPolygon::SetProperty - Sets the value of the property or group of properties for the polygons.
Obj = IDLgrPolygon::SetProperty
Note: See also the {Set} properties in IDLgrPolygon::Init

IDLgrPolylone - Represents one or more polylines that share a set of vertices and rendering attributes. No superclasses. No subclasses.

IDLgrPolylone::Cleanup - Performs all cleanup on the object.
OBJ_DESTROY, Obj or Obj = [IDLgrPolylone::Cleanup]

IDLgrPolylone::GetCTM - Returns the current object upward through the graphics tree.
Result = Obj = [IDLgrPolylone::GetCTM(
[.DESTINATION=objcref
[.PATH=objcref(s)]
[.TOP=objcref to IDLgrModel object])]

IDLgrPolylone::GetProperty - Retrieves the value of a property or group of properties for the polylines.
Obj = IDLgrPolylone::GetProperty
Note: See also the {Get} properties in IDLgrPolylone::Init

IDLgrPolylone::Init - Initializes the polylines object.
Obj = OBJ_NEW("IDLgrPolylone" [, X, [Y, [Z]]])
[.COLOR=[Get, Set]=index or RGB vector]
[.VERT_COLORS=[Get, Set]=vector]
[.DATA=[Get, Set]=array]
[.DOUBLE=[Get, Set]=value]
[.HIDE=[Get, Set]=string]
[.PALETTE=objcref]
[.POLYLINES=[Get, Set]=array of polyline descriptions]
[.RESET_DATA[Set]=array]
[.SHADING=[Get, Set]=[0 | 1 | 2]]
[.SHARE_DATA[Set]=objcref]
[.SYMBOL=[Get, Set]=objref]
[.THICK[Get, Set]=points[1.0 to 10.0]]
[.UVALUE=[Get, Set]=value]
[.XCOORD_CONV=[Get, Set]=vector]
[.YCOORD_CONV=[Get, Set]=vector]

or
Result = Obj -> [IDLgrPolylone::Init( X, [Y, [Z]])] }  

IDLgrPolylone::SetProperty - Sets the value of the property or group of properties for the polylines.
Obj = IDLgrPolylone::SetProperty
Note: See also the {Set} properties in IDLgrPolylone::Init

IDLgrPrinter - Represents a hardcopy graphics destination. No superclasses. No subclasses.

IDLgrPrinter::Cleanup - Performs all cleanup on the object.
OBJ_DESTROY, Obj or Obj = [IDLgrPrinter::Cleanup]

IDLgrPrinter::Draw - Draws a picture to this graphics destination.
Obj = IDLgrPrinter::Draw
[.VECTOR=[0 | 1]]

IDLgrPrinter::GetContiguousPixels - Returns an array of long integers whose length is equal to the number of colors available in the index color mode (value of N_COLORS property).
Return = Obj = [IDLgrPrinter::GetContiguousPixels()]

IDLgrPrinter::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.
Return = Obj = [IDLgrPrinter::GetFontnames( FamilyName [, IDL_FONTS=0 | 1 | 2]
[.STYLES=string)]

IDLgrPrinter::GetProperty - Retrieves the value of a property or group of properties for the printer.
Obj = IDLgrPrinter::GetProperty
Note: See also the {Get} properties in IDLgrPrinter::Init

IDLgrPrinter::GetTextDimensions - Retrieves the dimensions of a text object that will be rendered on the printer.
Return = Obj = [IDLgrPrinter::GetTextDimensions( TextObj [, DESCENT=variable]
[.PATH=objcref(s)])]

IDLgrPrinter::Init - Initializes the printer object.
Obj = OBJ_NEW("IDLgrPrinter"
[.COLOR_MODEL=[Get]=0 | 1]]
[.GRAPHICS_TREE=[Get, Set]=objcref of type
IDLgrScene, IDLgrViewgroup, or IDLgrView]
[.LANDSCAPE=[Get, Set]]
[.N_COLOR=[Get]=integer[2 to 256]]
[.N_COPIES=[Get, Set]=integer]
[.PALETTE=[Get, Set]=objcref]
[.PRINT_QUALITY=[Get, Set]=0 | 1 | 2]]
[.QUALITY=[Get, Set]=[0 | 1 | 2]]
[.UNITS=[Get, Set]=[0 | 1 | 2 | 3]]
[.VALUE=[Get, Set]=value]

or
Result = Obj -> [IDLgrPrinter::Init()]  

IDLgrPrinter::NewDocument - Closes current document (page or group of pages), which causes pending output to be sent to the printer, finishing the printer job.
Obj = IDLgrPrinter::NewDocument
**IDLgrROI::PickVertex** - Picks a vertex of the region that, when projected onto the given destination device, is nearest to the given 2D device coordinate.

Result = Obj -&gt; [IDLgrROI::PickVertex(Dest, View, Point [ , PATH=objref] )]

**IDLgrROI::SetProperty** - Sets the value of a property or group of properties for the Object Graphics region group.

Result = Obj -&gt; [IDLgrROI::SetProperty[ALL=variable] [ , XRANGE=variable] [ , YRANGE=variable] [ , ZRANGE=variable] ]

**IDLgrROI::Init** - Initializes an Object Graphics region of interest group object.

Obj = OBJ_NEW('IDLgrROIGroup' [, COLOR={Get, Set}=vector] [ , /HIDE={Get, Set}] [, NAME={Get, Set}=string] [, XCOORD_CONV={Get, Set}=s0, s1] [, YCOORD_CONV={Get, Set}=s0, s1] [, ZCOORD_CONV={Get, Set}=s0, s1] ) or Result = Obj -&gt; [IDLgrROIGroup::Init()]

**IDLgrROIGroup::PickRegion** - Picks a region within the group that, when projected onto the given destination device, is nearest to the given 2D device coordinate.

Result = Obj -&gt; [IDLgrROIGroup::PickRegion(Dest, View, Point [ , PATH=objref] )]

**IDLgrROIGroup::SetProperty** - Sets the value of a property or group of properties for the region group.

Result = Obj -&gt; [IDLgrROIGroup::SetProperty [ , ALL=variable] [ , XRANGE=variable] [ , YRANGE=variable] [ , ZRANGE=variable] ]

**IDLgrROI::Cleanup** - Performs all cleanup for the object.

Result = Obj -&gt; [IDLgrROI::Cleanup()]
IDLgrSurface::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.
Result = Obj -> [IDLgrSurface::]GetCTM([, DESTINATION=obref] [, PATH=obref(s)] [, TOP=obref to IDLgrModel object])

IDLgrSurface::GetProperty - Retrieves the value of a property or group of properties for the surface.
Note: See also the {Get} properties in IDLgrSurface::Init

IDLgrSurface::Init - Initializes the surface object.
or
Result = Obj -> [IDLgrSurface::]Init( [Z [, X, Y]])

IDLgrSurface::SetProperty - Sets the value of a property or group of properties for the surface.
Obj -> [IDLgrSurface::]SetProperty
Note: See also the {Set} properties in IDLgrSurface::Init

IDLgrSymbol - Represents a graphical element that is plotted relative to a particular position. No superclasses. No subclasses.

IDLgrSymbol::Cleanup - Performs all cleanup on the object.
IDLgrSymbol::SetProperty - Sets the value of a property or group of properties for the symbol.
Obj -> [IDLgrSymbol::]SetProperty
Note: See also the {Set} properties in IDLgrSymbol::Init

IDLgrSymbol::Init - Initializes the plot symbol.
Note: See also the {Get} properties in IDLgrSymbol::Init

IDLgrTessellator - Converts a simple concave polygon (or a simple polygon with "holes") into a number of simple convex polygons (general triangles). No superclasses. No subclasses.

IDLgrTessellator::AddPolygon - Adds a polygon to the tessellator object.
Obj -> [IDLgrTessellator::]AddPolygon(X [, Y, Z]) [, POLYGON=Get, Set]=array of polygon descriptions]
[. /INTERIOR]

IDLgrTessellator::Cleanup - Performs all cleanup on the object.
OBJ_DESTROY, Obj or
Obj -> [IDLgrTessellator::]Cleanup

IDLgrTessellator::Init - Initializes the tessellator object.
Obj = OBJ_NEW('IDLgrTessellator') or
Result = Obj -> [IDLgrTessellator::]Init()

IDLgrTessellator::Reset - Resets the object's internal state.
Obj -> [IDLgrTessellator::]Reset

IDLgrTessellator::Tessellate - Performs the actual tessellation.
Result = Obj -> [IDLgrTessellator::]Tessellate( Vertices, Poly [, /QUIET])

IDLgrText - Represents one or more text strings that share common rendering attributes. No superclasses. No subclasses.

IDLgrText::Cleanup - Performs all cleanup on the object.
OBJ_DESTROY, Obj or
Obj -> [IDLgrText::]Cleanup

IDLgrText::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.
Result = Obj -> [IDLgrText::]GetCTM([, DESTINATION=obref] [, PATH=obref(s)] [, TOP=obref to IDLgrModel object])

IDLgrText::GetProperty - Retrieves the value of a property or group of properties for the text.
Note: See also the {Get} properties in IDLgrText::Init

IDLgrText::Init - Initializes the text object.
Obj = OBJ_NEW('IDLgrText' [, String/string array] [, /ALIGNMENT=Get, Set]=value(0.0 to 1.0]) [, BASELINE=Get, Set]=vector] [, CHAR_DIMENSIONS=Get, Set]=[width, height])
IDLgrView::SetProperty - Sets the value of the property or group of properties for the view.

IDLgrView::GetProperty - Retrieves the value of the property or group of properties for the view.

IDLgrView::Cleanup - Performs all cleanup on the object.

IDLgrView::GetByName - Finds contained objects by name.

IDLgrViewgroup::Add - Adds a child to this view group.

IDLgrViewgroup::Cleanup - Performs all cleanup on the object.

IDLgrViewgroup::GetByName - Finds contained objects by name.

IDLgrViewgroup::GetProperty - Retrieves the value of a property or group of properties for the view group.

IDLgrViewgroup::Init - Initializes the view group object.

IDLgrViewgroup::SetProperty - Sets the value of a property or group of properties for the view group.

IDLgrVolume::GetCTM - Returns the 4 x 4 graphics transform matrix from the current object upward through the graphics tree.

IDLgrVolume::GetDimensions - Returns the width, height and depth of an IDLgrVolume.

IDLgrVolume::GetOpacity - Gets the opacity of a voxel.

IDLgrVolume::GetRect - Returns the smallest bounding box that contains all voxels whose opacity lookup is greater than a given opacity value.

IDLgrVolume::GetTransform - Returns a 4 x 4 graphics transform matrix from the current object upward through the graphics tree.

IDLgrVolume::GetVoxels - Returns the voxel indices associated with the specified voxel.

IDLgrVolume::GetVoxelData - Returns an array containing the data for the specified voxel.

IDLgrVolume::GetVoxelDataForRect - Returns an array containing the data for the specified voxel.

IDLgrVolume::GetVoxelRange - Returns the range of voxel indices associated with the specified voxel.

IDLgrVolume::GetVolume - Returns an IDLgrVolume object.

IDLgrVolume::Init - Initializes the view group object.
IDLgrVolume::Init - Initializes the volume object.

\( Obj = \text{OBJ\_NEW('IDLgrVolume', vol0 \[, vol1 \[, vol2 \[, vol3\]])} \)

[36x304] IDLgrVolume::PickVoxel - Computes the coordinates of the voxel projected to a location specified by the 2D device coordinates point, \( [x, y, z] \), and the current Z-buffer.

Result = \( Obj \rightarrow \text{IDLgrVolume::PickVoxel( Win, View, Point \[, \text{PATH=\.procobjref{s}} \])} \)

IDLgrVolume::SetProperty - Sets the value of a property or group of properties for the volume.

Obj = \( \text{IDLgrVolume::SetProperty} \)

Note: See also the \{Get\} properties in IDLgrVolume::Init

IDLgrVRML - Saves the contents of an Object Graphics hierarchy into a VRML 2.0 format file. No superclasses. No subclasses.

IDLgrVRML::Cleanup - Performs all cleanup on the object.

OBJ\_DESTROY, Obj or Obj -> \( \text{IDLgrVRML::Cleanup} \)

IDLgrVRML::Draw - Draws a picture to this graphics destination.

Obj -> \( \text{IDLgrVRML::Draw} \)

IDLgrVRML::GetDeviceInfo - Returns information that allows IDL applications to make decisions for optimal performance.

Obj -> \( \text{IDLgrVRML::GetDeviceInfo} \)

IDLgrVRML::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.

Return = \( Obj \rightarrow \text{IDLgrVRML::GetFontnames()} \)

[36x304] IDLgrVRML::GetProperty - Retrieves the value of a property or group of properties for the VRML object.

Obj -> \( \text{IDLgrVRML::GetProperty} \)

Note: See also the \{Get\} properties in IDLgrVRML::Init

IDLgrVRML::GetTextDimensions - Retrieves the dimensions of a text object that will be rendered in the clipboard buffer.

Result = \( Obj \rightarrow \text{IDLgrVRML::GetTextDimensions( TextObj \[, DESCENT=variable] \[, \text{PATH=\.procobjref{s}} \])} \)

or

Result = \( Obj \rightarrow \text{IDLgrVRML::Init( )} \)

IDLgrVRML::Init - Initializes the VRML object.

Obj = \( \text{OBJ\_NEW('IDLgrVRML')} \)

[36x304] IDLgrWindow::GetContiguousPixels - Erases the entire contents of the window.

Obj -> \( \text{IDLgrWindow::GetContiguousPixels( )} \)

Note: See also the \{Set\} properties in IDLgrVRML::Init

IDLgrWindow - Represents an on-screen area on a display device that serves as a graphics destination. No superclasses. No subclasses.

IDLgrWindow::Cleanup - Performs all cleanup on the object.

OBJ\_DESTROY, Obj or Obj -> \( \text{IDLgrWindow::Cleanup} \)

IDLgrWindow::Draw - Draws the specified scene or view object to this graphics destination.

Obj -> \( \text{IDLgrWindow::Draw} \)

[36x304] IDLgrWindow::GetDeviceInfo - Returns information that allows IDL applications to make decisions for optimal performance.

Obj->\( \text{IDLgrWindow::GetDeviceInfo} \)

[36x304] IDLgrWindow::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.
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IDLgrWindow::GetFontnames - Returns the list of available fonts that can be used in IDLgrFont objects.

Return = Obj ->
[IDLgrWindow::GetFontnames(FamilyName
[, IDL_FONTS={0 | 1 | 2}][, STYLES=string])]

IDLgrWindow::GetProperty - Retrieves the value of a property or group of properties for the window.

Obj -> [IDLgrWindow::]GetProperty [, ALL=variable]
[, IMAGE_DISPLAY=variable] [, SCREEN_DIMENSIONS=variable]
[, ZBUFFER_DATA=variable]

Note: See also the {Get} properties in IDLgrWindow::Init

IDLgrWindow::GetTextDimensions - Retrieves the dimensions of a text object that will be rendered in the window.

Result = Obj -> [IDLgrWindow::]GetTextDimensions(TextObj
[, DESCENT=variable] [, PATH=objref(s)])

IDLgrWindow::Iconify - Iconifies or de-iconifies the window.

Obj -> [IDLgrWindow::]Iconify, IconFlag

IDLgrWindow::Init - Initializes the window object.

Obj = OBJ_NEW('IDLgrWindow'
[, COLOR_MODEL{Get}={0 | 1}][, DIMENSIONS{Get, Set}={[width, height]}][, GRAPHICS_TREE{Get, Set}=objref of type IDLgrScene, IDLgrViewgroup, or IDLgrView] [, LOCATION{Get, Set}={[x, y]}]
[, N_COLORS{Get}={integer 2 to 256}] [, PALETTE{Get, Set}=objref] [, QUALITY{Get, Set}={0 | 1 | 2}][, RENDERER{Get}={0 | 1}]
[, RETAIN{Get}={0 | 1 | 2}][, TITLE{Get, Set}=string]
[, UNITS{Get, Set}={0 | 1 | 2 | 3}][, UVALUE{Get, Set}=value])
or
Result = Obj -> [IDLgrWindow::]Init()

X Windows Keywords:
[, DISPLAY_NAME{Get}=string]

IDLgrWindow::Pickdata - Maps a point in the 2D device space of the window to a point in the 3D data space of an object tree.

Result = Obj -> [IDLgrWindow::]Pickdata(View, Object, Location, XYZLocation[, PATH=objref(s)])

IDLgrWindow::Read - Reads an image from a window.

Result = Obj -> [IDLgrWindow::]Read()

IDLgrWindow::Select - Returns a list of objects selected at a specified location.

Result = Obj -> [IDLgrWindow::]Select(Picture, XY
[, DIMENSIONS={width, height}][, UNITS={0 | 1 | 2 | 3}])

IDLgrWindow::SetCurrentCursor - Sets the current cursor image to be used while positioned over a drawing area.

Obj -> [IDLgrWindow::]SetCurrentCursor
[, CursorName] [, IMAGE=16 x 16 bitmap] [, MASK=16 x 16 bitmap] [, HOTSPOT={[x, y]}]

X Windows Only Keywords: [, STANDARD=index]

IDLgrWindow::SetProperty - Sets the value of a property or group of properties for the window.

Obj -> [IDLgrWindow::]SetProperty

Note: See also the {Set} properties in IDLgrWindow::Init

IDLgrWindow::Show - Exposes or hides a window.

Obj -> [IDLgrWindow::]Show, Position

TrackBall - Translates widget events from a draw widget (created with the WIDGET_DRAW function) into transformations that emulate a virtual trackball (for transforming object graphics in three dimensions). No superclasses. No subclasses.

TrackBall::Init - Initializes the TrackBall object.

Obj = OBJ_NEW('TrackBall', Center, Radius [, AXIS={0 | 1 | 2}][, /CONSTRAIN][, MOUSE=bitmask])
or
Result = Obj -> [TrackBall::]Init(Center, Radius)

TrackBall::Reset - Resets the state of the TrackBall object.

Obj -> [TrackBall::]Reset, Center, Radius [, AXIS={0 | 1 | 2}][, /CONSTRAIN][, MOUSE=bitmask]

TrackBall::Update - Updates the state of the TrackBall object based on the information contained in the input widget event structure.

Result = Obj -> [TrackBall::]Update(sEvent
[, MOUSE=bitmask] [, TRANSFORM=variable][, /TRANSLATE])
Statements

Assignment

\[ \text{variable} = \text{expression} \] - Assigns a value to a variable.
\[ \text{variable}[\text{subscripts}] = \text{expression} \] - Assigns a value to the elements of an array specified by the array subscripts.
\[ \text{variable}[\text{subscript\_range}] = \text{expression} \] - Assigns a value to the elements of an array specified by the array subscript range.

Program Control

Compound Statements

BEGIN...END - Defines a block of statements.

\begin{verbatim}
BEGIN
  statements
END | ENDF | ENDELSE | ENDFOR | ENDREP |
ENDWHILE
\end{verbatim}

Conditional Statements

IF...THEN...ELSE - Conditionally executes a statement or block of statements.

\begin{verbatim}
IF \text{expression} \; \text{THEN} \; \text{statement} \; [\; \text{ELSE \; statement} \; ]
or
IF \text{expression} \; \text{THEN BEGIN}
  statements
ENDIF \; [\; \text{ELSE \; BEGIN}
  statements
ENDELSE \; ]
\end{verbatim}

CASE - Selects one statement for execution from multiple choices, depending on the value of an expression.

\begin{verbatim}
CASE \text{expression} \; \text{OF}
  \text{expression: \; statement}
  ...\text{expression: \; statement}
  [\; \text{ELSE: \; statement} \; ]
ENDCASE
\end{verbatim}

Loop Statements

FOR...DO - Executes one or more statements repeatedly, while incrementing or decrementing a variable with each repetition, until a condition is met.

\begin{verbatim}
FOR \text{Variable} = \text{Init}, \text{Limit} [\; , \text{Increment}] \; \text{DO \; statement}
or
FOR \text{Variable} = \text{Init}, \text{Limit} [\; , \text{Increment}] \; \text{DO BEGIN}
  statements
ENDIF \; [\; \text{ELSE BEGIN}
  statements
ENDELSE \; ]
ENDFOR
\end{verbatim}

REPEAT...UNTIL - Repeats statement(s) until expression evaluates to true. Subject is always executed at least once.

\begin{verbatim}
REPEAT \; \text{statement} \; UNTIL \; \text{expression}
or
REPEAT \; \text{BEGIN}
  statements
ENDREP \; UNTIL \; \text{expression}
\end{verbatim}

WHILE...DO - Performs statement(s) as long as expression evaluates to true. Subject is never executed if condition is initially false.

\begin{verbatim}
WHILE \; \text{expression} \; \text{DO \; statement}
or
WHILE \; \text{expression} \; \text{DO BEGIN}
  statements
ENDWHILE
\end{verbatim}

Jump Statements

BREAK - Immediately exits from a loop (FOR, WHILE, REPEAT), CASE, or SWITCH statement without resorting to GOTO statements.

\begin{verbatim}
BREAK
\end{verbatim}

CONTINUE - Immediately starts the next iteration of the enclosing FOR, WHILE, or REPEAT loop.

\begin{verbatim}
CONTINUE
\end{verbatim}

GOTO - Transfers program control to point specified by label.

\begin{verbatim}
GOTO, \; \text{label}
\end{verbatim}
Functions and Procedures

**COMPILE_OPT** - Gives IDL compiler information that changes the default rules for compiling functions or procedures.

  COMPILE_OPT *opt1 [ , opt2, ..., optn]*

  **Note:** *optn* can be IDL2, DEFIN32, HIDDEN, OBSOLETE, or STRICTARR

**FORWARD_FUNCTION** - Causes argument(s) to be interpreted as functions rather than variables (versions of IDL prior to 5.0 used parentheses to declare arrays).

  FORWARD_FUNCTION *Name1, Name2, ..., Name_n*

**FUNCTION** - Defines a function.

  FUNCTION *Function_Name, parameter1, ..., parameter_n*

**PRO** - Defines a procedure.

  PRO *Procedure_Name, argument1, ..., argument_n*

**Procedure_Name** - Calls a procedure.

  *Procedure_Name, argument1, ..., argument_n*

**Result = FUNCTION( arg1, ..., argn )** - Calls a function.

---

Variable Scope

**COMMON** - Creates a common block.

  COMMON *Block_Name, Variable1, ..., Variable_n*
Executive Commands

Executive commands must be entered at the IDL command prompt. They cannot be used in programs.

**.COMPILE** - Compiles programs without running.

```
.COMPILE [File1,... File_n]
```

To compile from a temporary file: .COMPILE -f File TempFile

**.CONTINUE** - Continues execution of a stopped program.

```
.CONTINUE
```

**.EDIT** - Opens files in editor windows of the IDLDE (Windows and Motif only). Note that filenames are separated by spaces, not commas.

```
.EDIT File1 [File2 File_n]
```

**.FULL_RESET_SESSION** - Does everything .RESET_SESSION does, plus additional reset tasks such as unloading sharable libraries.

```
.FULL_RESET_SESSION
```

**.GO** - Executes previously-compiled main program.

```
.GO
```

**.OUT** - Continues execution until the current routine returns.

```
.OUT
```

**.RESET_SESSION** - Resets much of the state of an IDL session without requiring the user to exit and restart the IDL session.

```
.RESET_SESSION
```

**.RETURN** - Continues execution until RETURN statement.

```
.RETURN
```

**.RNEW** - Erases main program variables and then does .RUN.

```
.RNEW [File1,... File_n]
```

To save listing in a file: RNEW -L ListFile.lis File1 [. File2,..., File_n]

To display listing on screen: .RNEW -T File1 [. File2,..., File_n]

**.RUN** - Compiles and executes IDL commands from files or keyboard.

```
.RUN [File1,... File_n]
```

To save listing in a file: RUN -L ListFile.lis File1 [. File2,..., File_n]

To display listing on screen: .RUN -T File1 [. File2,..., File_n]

**.SKIP** - Skips over the next \( n \) statements and then single steps.

```
.SKIP [n]
```

**.STEP** - Executes one or \( n \) statements from the current position.

```
.STEP [n] or .S [n]
```

**.STEP_OVER** - Executes a single statement if the statement doesn’t call a routine.

```
.STEP_OVER [n] or .SO [n]
```

**.TRACE** - Similar to .CONTINUE, but displays each line of code before execution.

```
.TRACE
```
Special Characters

**Ampersand (&)** - Separates multiple commands on a single line.

**Apostrophe (‘)** - Delimits strings or indicates octal or hex.

**Asterisk (*)** - Designates an ending subscript range equal to the size of the dimension. Also the multiplication operator and the pointer dereference operator.

**At Sign (@)** - Include character: Used at beginning of a line to cause the IDL compiler to substitute the contents of the file whose name appears after the @ symbol for the line. In interactive mode, the @ symbol is used to execute a batch file.

**Colon (:)** - Ends label identifiers. Also separates start and end subscript ranges.

**Dollar Sign ($)** - Continuation character (at end of line) or spawn operating system command (at start of line).

**Exclamation Point (!)** - First character of system variable names and font-positioning commands.

**Period (.)** - First character of executive commands. Also indicates floating-point numbers.

**Question Mark (?)** - Invokes the online help facility.

**Quotation Mark (")** - String delimiter or indicates octal number.

**Semicolon (;)** - First character of comment field. Everything after the semicolon is ignored by IDL. Semicolon can be used as the first character or after an IDL command:

```
; This is a comment
COUNT = 5 ; Set variable COUNT to 5
```

Subscripts

Subscripts are used to designate array elements to receive new values, and to retrieve the value of one or more array elements. IDL arrays are zero-based, meaning the first element is element 0.


**Array[i, j]** - The element stored at column i, row j of an array.

**Vector[i:j]** - Elements i through j of a vector.

**Vector[i:*]** - Elements from i through the end of a vector.

**Array[i, *]** - Column i of a two-dimensional array.

**Array[* , j]** - The jth row of a two-dimensional array.

**Array[i:j, m:n]** - Subarray of columns i through j, rows m through n.

**Array[Array2]** - The elements of Array whose subscripts are the values of Array2.

**(Array_Expression)[i]** - Element i of an array-valued expression.
Operators

Mathematical Operators

- Addition, String Concatenation
- Subtraction and Negation
- Multiplication, Pointer dereference
- Division
- Exponentiation
- Modulo

Minimum/Maximum Operators

- The Minimum Operator
- The Maximum Operator

Matrix Operators

- # and ## Matrix Multiplication

Boolean Operators

- AND - Boolean AND
- NOT - Boolean complement
- OR - Boolean OR
- XOR - Boolean exclusive OR

Relational Operators

- EQ - Equal to
- GE - Greater than or equal to
- GT - Greater than
- LE - Less than or equal to
- LT - Less than
- NE - Not equal to

Other Operators

- [ ] Array concatenation, enclose array subscripts
- ( ) Group expressions to control order of evaluation
- = Assignment
- ?: Conditional expression

Operator Precedence

The following table lists IDL's operator precedence. Operators with the highest precedence are evaluated first. Operators with equal precedence are evaluated from left to right.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>First (highest)</td>
<td>( ) (parentheses, to group expressions)</td>
</tr>
<tr>
<td>Second</td>
<td>* (pointer dereference)</td>
</tr>
<tr>
<td></td>
<td>^ (exponentiation)</td>
</tr>
<tr>
<td>Third</td>
<td>* (multiplication)</td>
</tr>
<tr>
<td></td>
<td># and ## (matrix multiplication)</td>
</tr>
<tr>
<td></td>
<td>/ (division)</td>
</tr>
<tr>
<td></td>
<td>MOD (modulus)</td>
</tr>
<tr>
<td>Fourth</td>
<td>+ (addition)</td>
</tr>
<tr>
<td></td>
<td>- (subtraction and negation)</td>
</tr>
<tr>
<td></td>
<td>&lt; (minimum)</td>
</tr>
<tr>
<td></td>
<td>&gt; (maximum)</td>
</tr>
<tr>
<td></td>
<td>NOT (Boolean negation)</td>
</tr>
<tr>
<td>Fifth</td>
<td>EQ (equality)</td>
</tr>
<tr>
<td></td>
<td>NE (not equal)</td>
</tr>
<tr>
<td></td>
<td>LE (less than or equal)</td>
</tr>
<tr>
<td></td>
<td>LT (less than)</td>
</tr>
<tr>
<td></td>
<td>GE (greater than or equal)</td>
</tr>
<tr>
<td></td>
<td>GT (greater than)</td>
</tr>
<tr>
<td>Sixth</td>
<td>AND (Boolean AND)</td>
</tr>
<tr>
<td></td>
<td>OR (Boolean OR)</td>
</tr>
<tr>
<td></td>
<td>XOR (Boolean exclusive OR)</td>
</tr>
<tr>
<td>Seventh</td>
<td>?: (conditional expression)</td>
</tr>
</tbody>
</table>
System Variables

IDL system variables contain useful constants, control plotting defaults, and store information about the current IDL session.

Constant System Variables

!DPI - Double-precision pi (p).
!DTOR - Degrees to radians, pi/180 ≈ 0.01745.
!MAP - Read-only system variable used by MAP_SET.
!PI - Single-precision pi (p).
!RADEG - Radians to degrees, 180/pi ≈ 57.2958.
!VALUES - Single- and double-precision NaN and Infinity values.

Graphics System Variables

!D - Information about current graphics device.
   Fields: FILL_DIST - line interval, in device coordinates
           FLAGS - longword of flags
           N.COLORS - number of simultaneously available colors
           NAME - string containing name of device
           ORIGIN - pan/scroll offset (pan, scroll)
           TABLE_SIZE - number of color table indices
           UNIT - logical number of file open for output
           WINDOW - index of currently open window
           X.CH_SIZE, Y.CH_SIZE - width/height of rectangle
           that encloses the average character in current font, in
           device units (usually pixels)
           X.PX_CM, Y.PX_CM - approx. number of pixels/cm
           X_SIZE, Y_SIZE - total size of the display or window, in
           device units
           X.VSIZE, Y.VSIZE - size of visible area of display or
           window
           ZOOM - X and Y zoom factors

!ORDER - Direction of image transfer: 0=bottom up, 1=top down.

!P - Information for plotting procedures.
   Fields: BACKGROUND - background color index
           CHANNEL - default source or destination channel
           CHARSIZE - character size of annotation when Hershey
           fonts are selected
           CHARTHICK - integer specifying thickness of vector
           fonts
           CLIP - device coords of clipping window ( [x0, y0, z0],
                  [x1, y1, z1])
           COLOR - default color index
           FONT - integer specifying graphics text font system to use
                  (-1 for Hershey, 0 for output device font, 1 for TrueType)
LINESTYLE - style of lines that connect points (see “Line Styles” on page 88)
MULTI - integer array: [plots remaining on page, columns
            per page, rows per page, plots in Z direction, 0 for left to
            right or 1 for top to bottom]
NOCLIP - if set, inhibits clipping of graphic vectors
NOERASE - set to nonzero value to prevent erasing
NSUM - number of adjacent points to average
POSITION - normalized coords of plot window (x0, y0, x1,
            y1)
PSYM - plotting symbol index (see “Plotting Symbols” on
        page 88)
REGION - normalized coords of plot region (x0, y0, x1,
        y1)
SUBTITLE - plot subtitle (under X axis label)
T - homogeneous 4 x 4 transformation matrix
T3D - enables 3D to 2D transformation
THICK - thickness of lines connecting points
TITLE - main plot title
TICKLEN - tick mark length (0.0 to 1.0)
   Fields: CHARSIZE - character size of annotation when
           Hershey fonts are selected
           CRANGE - output axis range
           GRIDSTYLE - linestyle for tick marks/grids (see “Line
           Styles” on page 88)
           MARGIN - 2-element array specifying plot window
           margins, in units of char size ([left or bottom, right or top])
           MINOR - number of minor tick marks
           OMARGIN - 2-element array specifying plot window
           outer margins, in units of char size ([left or bottom, right or
           top])
           RANGE - 2-element vector specifying input axis range
                   (min, max)
           REGION - normalized coords of region (2-element
                   floating-point array)
           S - 2-element array specifying scaling factors for
             conversion between data and normalized coords
           STYLE - style of the axis encoded as bits in a longword.
           1=exact, 2=extend, 4=no axis, 8=no box, 16=inhibit setting
           Y axis min to 0 when data are all greater than 0 (add values
           together for multiple effects)
           THICK - thickness of axis line
           TICKFORMAT - format string or string containing name
           of function that returns format string used to format axis
           tick mark labels
           TICKINTERVAL - indicates the interval between major
           tick marks for the first axis level

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TICKLAYOUT - indicates the tick layout style to be used to draw each level of the axis
TICKLEN - tick mark length, in normal coords
TICKNAME - annotation for each tick (string array of up to 30 elements)
TICKS - number of major tick intervals
TICKUNITS - indicates the units to be used for axis tick labeling
TICKV - data values for each tick mark (array of up to 30 elements)
TITLE - string containing axis title
TYPE - type of axis (0 for linear, 1 for logarithmic)
WINDOW - normalized coords of axis end points (2-element floating-point array)

BUTTON - specifies which mouse button was pressed (1 if left, 2 if middle, 4 if right)
TIME - number of milliseconds since a base time

!WARN - Report use of obsolete routines.
Fields: OBS_ROUTINES - if set to 1, IDL generates warnings when it encounters use of obsolete routines
OBS_SYSVARS - if set to 1, IDL generates warnings when it encounters use of obsolete system variables
PARENS - if set to 1, IDL generates warnings when it encounters use parentheses to index array
TRUNCATED_FILENAME - if set to 1, IDL generates warnings when a file can only be found by truncating its full name

Error Handling/Informational System Variables

!ERROR_STATE - Structure containing all error information.
Fields: NAME - string containing error name of IDL-generated component of last error message (read-only)
BLOCK - string containing name of message block for IDL-generated component of last error message (read-only)
CODE - long-integer containing error code of IDL-generated component of last error message
SYS_CODE - long-integer containing error code of operating system component of last error message
MSG - string containing text of IDL-generated component of last error message (read-only)
MSG_PREFIX - string containing prefix string used for error messages
SYS_MSG - string containing text of operating system generated component of last error message (read-only)

!EXCEPT - Controls when IDL checks for math error conditions
(0=never report exceptions, 1=report exceptions when interpreter is returning to interactive prompt, 2=report exceptions at end of each IDL statement).

!MOUSE - Status from the last cursor read operation.
Fields: X, Y - location (in device coords) of cursor when mouse button was pressed

IDL Environment System Variables

!DIR - Location of the main IDL directory.
!DLM_PATH - Indicates where IDL looks for Dynamically Loadable Modules when started. Read-only.
!EDIT_INPUT - Enables/disables keyboard line editing.
!HELP_PATH - Lists directories in which IDL will search for online help files
!JOURNAL - Logical unit number of journal output, or 0.
!MORE - Set to 0 to prevent paginating help text.
!MAKE_DLL - Used to configure how IDL uses the CALL_EXTERNAL, DLMs, and LINKIMAGE for the current platform.
!PATH - Search path for IDL routines.
UNIX: colon-separated list of directories.
VMS: comma-separated list of directories/text libraries.
Windows: semicolon-separated list of directories.
Macintosh: comma-separated list of folders.

!PROMPT - String to be used for IDL prompt.
!QUIET - Suppresses informational messages if set to nonzero.
!VERSION - Type, architecture, and version of IDL.
Graphics Information

Direct Graphics Devices

CGM - The CGM Device
HP - The HP-GL Device
LJ - The LJ Device
MAC - The Macintosh Display Device
NULL - The Null Display Device
PCL - The PCL Device
PRINTER - The Printer Device
PS - The PostScript Device
REGIS - The Regis Terminal Device
TEK - The Tektronix Device
WIN - The Microsoft Windows Device
X - The X Windows Device
Z - The Z-Buffer Device

Graphics Keywords

The following keywords are used with IDL plotting routines (AXIS, CONTOUR, PLOT, OПLOT, SHADE, SURF, and SURFACE) and graphics routines (CURSOR, ERASE, PLOTS, POLYFILL, TV, TVCRS, TVRD, and XYOUTS). Many have system variable equivalents. Not all keywords work with all routines. Listings such as {XYZ}KEYWORD indicate that there are 3 keywords, one for each axis (e.g., XCHARSIZE, YCHARSIZE, ZCHARSIZE).

BACKGROUND - Background color index when erasing.
CHANNEL - Channel index or mask for multi-channel displays.
CHARSIZE - Overall character size.
{XYZ}CHARSIZE - Character size for axes.
CHARTHICK - Overall thickness for vector fonts.
CLIP - Coordinates of clipping window.
COLOR - Color index for data, text, line, or polygon fill.
DATA - Set to plot in data coordinates.
DEDEVICE - Set to plot in device coordinates.
FONT - Text font index: -1 for vector, 0 for hardware fonts.
{XYZ}GRIDSTYLE - Linestyle index for tickmarks and grids.
LINETYPE - Linestyle used to connect data points.
{XYZ}MARGIN - Margin of plot window in character units.
{XYZ}MINOR - number of minor tick marks.
NOCLIP - Set to disable clipping of plot.
NODATA - Set to plot only axes, titles, and annotation w/o data.
NOERASE - Set to inhibit erasing before new plot.
NORMAL - Set to plot in normal coordinates.
ORIENTATION - Angle (in degrees counter-clockwise) for text.
POSITION - Position of plot window.
PSYM - Use plotting symbols to plot data points.
{XYZ}RANGE - Axis range.
{XYZ}STYLE - Axis type.
SUBTITLE - String for subtitle.
SYMSIZE - Size of PSYM plotting symbols.
T3D - Set to use 3D transformation store in !P.T.
THICK - Overall line thickness.
{XYZ}THICK - Thickness of axis and tickmark lines.
{XYZ}TICKFORMAT - Allows advanced formatting of tick labels.
{XYZ}TICKINTERVAL - Set to indicate the interval between major tick marks for the first axis level.
{XYZ}TICKLAYOUT - Set to indicate the tick layout style to be used to draw each level of the axes.
TICKLEN - Length of tickmarks in normal coordinates. 1.0 produces a grid. Negative values extend outside window.
{XYZ}TICKLEN - Tickmark lengths for individual axes.
{XYZ}TICKNAME - String array of up to 30 labels for tickmark annotation.
{XYZ}TICKS - Number of major tick intervals for axes.
{XYZ}TICKUNITS - Set to indicate the units to be used for axis tick labeling.
{XYZ}TICKV - Array of up to 30 elements for tick mark values.
{XYZ}TICK_GET - Variable in which to return values of tick marks.
TITLE - String for plot title.
{XYZ}TITLE - String for specified axis title.
ZVALUE - The Z coordinate for a 2D plot in 3D space.
Z - Z coordinate if Z argument not specified in 3D plot call.
Line Styles

The LINESTYLE keyword to the Direct Graphics plotting routines OPLET, PLOT, PLOTS, and SURFACE accepts the following values:

<table>
<thead>
<tr>
<th>Index</th>
<th>Linestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Solid</td>
</tr>
<tr>
<td>1</td>
<td>Dotted</td>
</tr>
<tr>
<td>2</td>
<td>Dashed</td>
</tr>
<tr>
<td>3</td>
<td>Dash Dot</td>
</tr>
<tr>
<td>4</td>
<td>Dash Dot Dot Dot</td>
</tr>
<tr>
<td>5</td>
<td>Long Dashes</td>
</tr>
</tbody>
</table>

Plotting Symbols

The PSYM keyword to Direct Graphics plotting routines OPLET, PLOT, and PLOTS accepts the following values:

<table>
<thead>
<tr>
<th>PSYM Value</th>
<th>Plotting Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plus sign (+)</td>
</tr>
<tr>
<td>2</td>
<td>Asterisk (*)</td>
</tr>
<tr>
<td>3</td>
<td>Period (.)</td>
</tr>
<tr>
<td>4</td>
<td>Diamond</td>
</tr>
<tr>
<td>5</td>
<td>Triangle</td>
</tr>
<tr>
<td>6</td>
<td>Square</td>
</tr>
<tr>
<td>7</td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>User-defined. See USERSYM procedure.</td>
</tr>
<tr>
<td>9</td>
<td>Undefined</td>
</tr>
<tr>
<td>10</td>
<td>Histogram mode.</td>
</tr>
</tbody>
</table>