



6

Enhancing Images

This chapter describes image enhancement tools. You can use these functions to display or analyze the histogram of an image, to produce images with a color palette, to improve the quality of an image or to change its color rendition by editing its color palette.

Overview

The image enhancement tools are used to edit the values of a color palette, create a color composite image through color compression, or render regions of an image transparent or translucent. You can access dialog boxes that support the display of color look-up tables or histograms, the calculation of statistics, and various types of image enhancement tools.

The transparent colors functionality is particularly useful in creating mosaics, since you can hide portions of images that you do not need. The translucent features are also useful in applications that require the display of raster data layers (such as placing a drawing or map over an image).

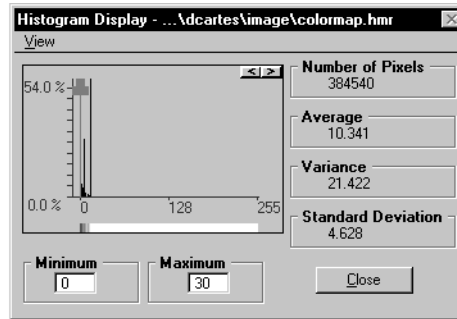
The following options are available:

- Histogram (see page 6-2)
- Image Channels (see page 6-3)
- Color Table Editor (see page 6-5)
- Contrast Stretch (see page 6-7)
- Density Slicing (see page 6-10)
- Color Compression (see page 6-14)
- Transparent Colors (see page 6-18)
- Translucent Colors (see page 6-20)

Histogram Display dialog box

The Histogram Display dialog box displays the histogram of the active image together with various statistics related to the image. A histogram is a representation of the number of pixels for each of the 256 possible indices, from 0 to 255.

Histogram Display dialog box



The title bar of the dialog box displays the name of the active image.

Histogram Display field

The Histogram Display field displays the histogram with a vertical scale that you can set. The display of the histogram is a representation of the number of pixels for each of the 256 possible indices, from 0 to 255.

Exploration Device

The histogram Exploration Device consists of two vertical cursors that can be moved horizontally. The two cursors define the range of indices on which statistics are calculated. Three handles let you move the vertical cursors horizontally. Grab any handle and drag it. The left-hand handle controls the cursor of the minimum. The right-hand handle controls the cursor of the maximum. The center handle controls both cursors by translating the whole range of values, or slice.

The cursors can also be moved by using the step buttons, located at the top right corner of the Histogram Display field. Click any handle to give it the focus. Then click the desired step button to move this handle to the right or to the left, one step at a time.

Color Palette bar

The Color Palette bar displays the color palette of the active image with the effect of the actual manipulation. For example, all pixels included in the slice of indices defined by the cursors turn

red in the Color Palette bar, as do the equivalent pixels in the image.

Statistics Boxes

The Statistics boxes display the following statistics for the range defined by the cursors:

- Number of Pixels
- Average
- Variance
- Standard Deviation

The indices that correspond to the position of both cursors (Minimum and Maximum fields) are included in the calculations.

View > Vertical Scale

The Histogram Display > View menu provides access to the Vertical Scale option which is used to set the vertical scale of the histogram. Choose Vertical Scale to enter the minimum and the maximum values that define the display of the vertical scale of the graph, which represents the histogram.

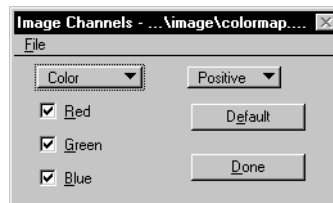
Close

Click Close to close the Histogram Display dialog box.

Image Channels dialog box

Use the Image Channels dialog box to explore or modify the three RGB channels of the active image. Display any combination of the red, green, or blue image channels. Display the channel combination in color or in gray scale, in negative or in positive. To retain your changes, save any combination of settings to a new file.

*Image Channels
dialog box*



The title bar of the dialog box displays the name of the active image. The active image provides the color palette that will be modified.

Use this dialog box to explore each of the three RGB channels of the image by displaying them one, two, or three at a time. The channels can be displayed in color or gray scale, in positive or in negative.

File > Load Color Table

Choose File > Load Color Table to load and apply, to the active image, a previously saved color table file (TBL).

File > Apply

Choose Apply to retain the current color palette in the header of the image file. If your image is write protected, this option is not available.

File > Save As

Choose Save As to save the current color palette to a color table file (TBL) under any filename, in any directory, and on any disk.

Color/Gray Scale

Use the Color/Gray Scale option menu to change a color palette into a gray scale palette. If the color palette of the image is actually a palette of gray, this option has no effect.

Positive/Negative

Use the Positive/Negative option menu to toggle the image between positive and negative.

Red, Green, Blue

Used to turn on or off the display of the red, green, or blue channels.

Default

Click Default to reset all parameters to default values:

- Positive
- Color
- Red, Green, and Blue on

Done

Click Done to close the dialog box. If changes occurred to the color palette since the last save and if your image is not write protected, you are asked if you wish to update the palette in the

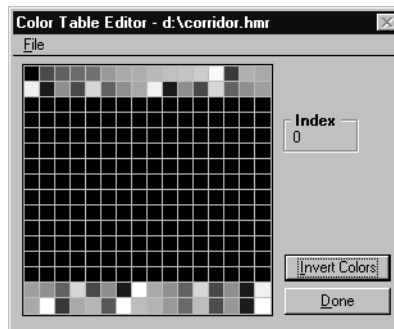
image header. Answer Yes to save the palette in the header of the image. Answer No to restore the previous color palette from the header of the image. Click Cancel to return to the dialog box.

W When you update the color palette in the image header, it overwrites the existing one. Make a backup copy in a TBL file with Save As if you want to retain it.

Color Table Editor dialog box

Use the Color Table Editor dialog box to display the color look-up table (or color palette) of the active image and to explore or edit each of the 256 possible colors.

Color Table Editor
dialog box



The title bar of the dialog box displays the name of the active image. The active image provides the color palette that will be modified.

Invert Colors

The Invert Colors option allows an instantaneous inversion of all the colors in the color table for the Active image.

► To invert the colors for a specific image:

1. Using the *Select Image(s)/Active Image* tool, double-click on the image you want to modify.
This action makes the image the Active image.
2. Open the Color Table Editor dialog box from the *File > Image Properties > Color Table* menu.
The Color Table Editor dialog box opens.
3. Select Invert Colors.
All the colors are now inverted.

4. Click Done.
5. A Warning dialog box requires a confirmation, select Yes. The image redisplay with inverted colors.

⚠ This operation cannot be undone. The Warning dialog box is displayed requiring a second confirmation.

➤ **To edit a color**

1. Double-click on the color you wish to edit.
2. The MicroStation Color Palette dialog box opens and you can then edit the color.

File > Load Color Table

Used to load a color palette from any previously saved TBL file by using the File Selection dialog box.

File > Apply

Choose Apply to retain the current color palette in the header of the image file. If your image is write protected, this option is not available.

File > Save As

Choose Save As to save the current color palette to a color table file (TBL) under any filename, in any directory, and on any disk.

Done

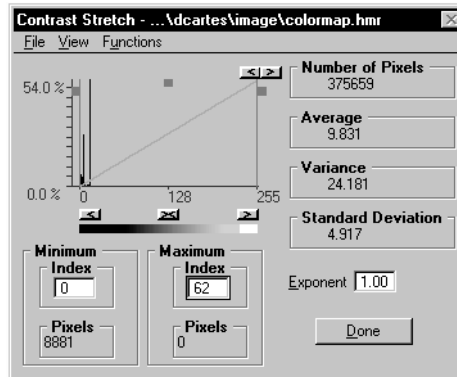
Click Done to close the dialog box. If changes occurred to the color palette since the last save and if the image is not write protected, you are asked if you want to update the palette in the image header. Answer Yes to save the palette in the header of the image. Answer No to restore the previous color palette from the header of the image. Click the Cancel button to return to the dialog box.

⚠ When you update the color palette in the image header, it overwrites the existing one. Make a backup copy in a TBL file with Save As if you want to retain it.

Contrast Stretch dialog box

The Contrast Stretch dialog box is used to display the histogram of the active image and to change the contrast of the image by using the histogram as a reference. Statistics can also be calculated for specific parts of the histogram.

Contrast Stretch dialog box



When the Contrast Stretch dialog box is open:

- The title bar of the dialog box displays the name of the active image.
- The active image provides the histogram and the statistics to be displayed, in addition to the color palette that will be reviewed.

File > Apply

Choose Apply to save the color palette to the header of the image file. If your image is write protected, this option is not available.

File > Save As

Choose Save As to save the color palette to a color table file (TBL).

View > Vertical Scale

Use Vertical Scale to enter the minimum and the maximum values that define the display of the vertical scale of the graph which represents the histogram.

View > Display Curve

Use Display Curve to display the linear on exponential curve used for contrast stretching.

Functions > Negative

Use Functions > Negative to convert the color table from positive to negative. When Off (default), the image displays normally. When On, the image displays in Negative mode.

Histogram Display field

The Histogram Display field displays the histogram with a vertical scale that you can set. The display of the histogram is a representation of the number of pixels that have each of the 256 possible values, from 0 to 255.

Exploration Device

The histogram Exploration Device consists of two vertical cursors that can be moved horizontally. The two cursors define the range of indices that are explored, i.e., which statistics are edited by calculating a custom palette that stretches the contrast. Three handles let you move the vertical cursors horizontally. Grab any handle and drag it. The left-hand handle controls the cursor of the minimum. The right-hand handle controls the cursor of the maximum. The center handle controls both cursors by translating the whole range of values, or slice.

The cursors can also be moved with the step buttons, located at the top right corner of the Histogram Display field. Click any handle to give it the focus. Then click the desired step button to move the handle to the right or to the left, one step at a time.

Color Palette bar

The Color Palette bar displays the color palette of the active image and reflects the result of the actual manipulation. For example, all pixels with indices less than or equal to the minimum are turned black in the Color Palette bar, along with all equivalent pixels on the image. All pixels with indices greater than or equal to the maximum are turned white in the Color Palette bar, along with all equivalent pixels on the image. All pixels with indices above the minimum and below the maximum are scaled in various shades of gray according to the present exponent entered.

Statistics Boxes

These fields display the following statistics for the range defined by the cursors:

- Number of Pixels
- Average
- Variance
- Standard Deviation

The statistics displayed are the ones for all indices between the minimum and the maximum. The minimum and maximum indices, corresponding to the cursor positions, are excluded in the calculations.

The *Number of Pixels* (of the active image) with values less than or equal to the minimum displays in the left Pixels field under Minimum (these pixels turn to black when the image is positive). The number of pixels (of the active image) with values greater than or equal to the maximum displays in the right Pixels field under Maximum (these pixels turn to white when the image is positive).

Use the *Exponent* field to increase the contrast of a specific region on the graph. This operation permits the enhancement of contrast for a target region of the color table by decreasing the contrast on other parts. Gray scale values that fall within the range are attributed using an exponential calculation. The value contained in this field is applied even if the Curve is not displayed.

Only positive values are accepted, values > 0 and < 1 generate a Convex Curve. A value of 1 generates a straight curve, i.e., Contrast is evenly spread. Values > 1 generate a Concave Curve.

Done

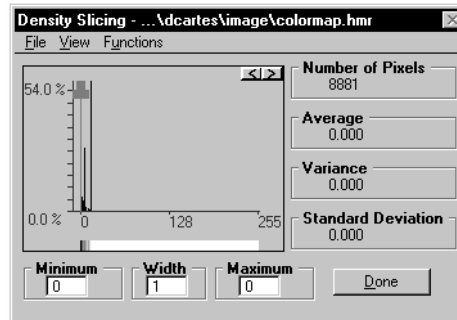
Click Done to close the dialog box. If changes occurred to the color palette since the last save and if the image is not write protected, you are asked if you want to update the palette in the image header. Answer Yes to save the palette in the header of the image. Answer No to restore the previous color palette from the header of the image. Click Cancel to return to the dialog box.

W When you update the color palette in the image header, it overwrites the existing one. Make a backup copy in a TBL file with Save As if you want to retain it.

Density Slicing dialog box

The Density Slicing dialog box is used to display the histogram of the active image and to change the color of a range (or of a “slice”) of color indices by using the histogram as a reference. Statistics can also be calculated for specific parts of the histogram.

Density Slicing dialog box



When the Density Slicing dialog box is open:

- The title bar of the dialog box displays the name of the active image.
- The active image provides the histogram and the statistics to be displayed, in addition to the color palette that will be modified.

File > Load Color Table

Used to load a color palette from any previously saved TBL file by using the File Selection dialog box.

File > Apply

Choose Apply to retain the current color palette in the header of the image file. If your image is write protected, this option is not available.

File > Save As

Choose Save As to save the color palette to a color table file (TBL).

⚠ When you update the color palette in the image header, it overwrites the existing one. Make a backup copy in a TBL file with Save As if you want to retain it.

View > Vertical Scale

Use Vertical Scale to enter the minimum and the maximum values that define the display of the vertical scale of the graph which represents the histogram.

Functions > Slice Coloring

Select Slice Coloring from the Density Slicing > Functions menu to open the Slice Coloring dialog box.

Functions > Restore Slice

Choose Restore Slice from the Functions menu to reset all indices of the slice, including the minimum and the maximum indices corresponding to the positions of the vertical cursors. That restores the red, green, and blue values from the color palette in the header of the active image.

Histogram Display field

The Histogram Display field displays the histogram with a vertical scale that you can set. The display of the histogram is a representation of the number of pixels having each of the 256 possible values, from 0 to 255.

Exploration Device

The histogram Exploration Device consists of two vertical cursors that can be moved horizontally. The two cursors define the range of indices that are explored (on which statistics are calculated) or edited. Three handles permit you to move the vertical cursors horizontally. Grab any handle and drag it. The left-hand handle controls the cursor of the minimum. The right-hand handle controls the cursor of the maximum. The center handle controls both cursors by translating the whole range of values, or slice.

The cursors can also be moved by using the step buttons located at the top right corner of the Histogram Display Field. Click any handle to give it the focus. Then click the desired step button to move the handle to the right or to the left, one step at a time.

Color Palette bar

The Color Palette bar displays the color palette of the active image to reflect the results of the color manipulation. For example, all pixels included in the slice of indices defined by the cursors are turned red in the Color Palette bar, along with all equivalent pixels in the image.

Statistics Boxes

These fields display the following statistics for the range defined by the cursors:

- Number of Pixels
- Average
- Variance
- Standard Deviation

The indices that correspond to the position of both cursors (Minimum and Maximum fields) are included in the calculations. The Width field displays the total number of indices considered.

Done

Click Done to close the dialog box. If changes were made to the color palette since the last save and if the image is not write protected, you are asked if you wish to update the palette in the image header. Answer Yes to save the palette in the header of the image. Answer No to restore the previous color palette from the header of the image. Click Cancel to return to the dialog box.

⚠ When you update the color palette in the image header, it overwrites the existing one. Make a backup copy in a TBL file with Save As if you want to retain it.

Slice Coloring dialog box

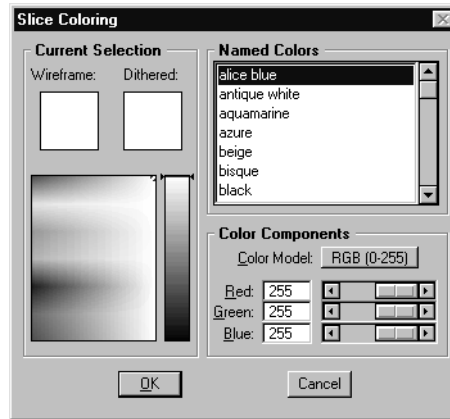
Use the Slice Coloring dialog box to define one color or a gradation of colors. If you have a one-index slice, the MicroStation Color Palette dialog box will be used as the Slice Coloring dialog box. If you have a slice with two or more indices, you will use dialog box described here. With this dialog box, you can compose two colors:

- One color for the minimum color index of the slice.
- A second color for the maximum color index of the slice.

Each color is created by setting its red, green, and blue components with values between 0 and 255. All intermediate indices between the minimum and the maximum take

intermediate colors. If the two extreme colors are equal, all indices of the slice have this unique color.

*Slice Coloring dialog box
when two colors
are selected.*



Color List Box

Use the Color list box to choose the colors for the Min and Max indices.

Min/Max

Use Min/Max to apply the selected color from the Color list box.

Edit

The Edit group provides access to three settings, one for each color channel. Clicking on the arrows increases/decreases the intensity of the channel. Modifying the RGB values yields a different color for the Min or Max selected index.

Resultant Color

Use Resultant Color to visualize the resulting slice before applying it to the color palette (image).

OK

Select OK to close the Slice Coloring dialog box and apply the color scheme to the range of pixels specified by the Exploration Device.

Cancel

Select Cancel to close the Slice Coloring dialog box and revert the settings to their initial values.

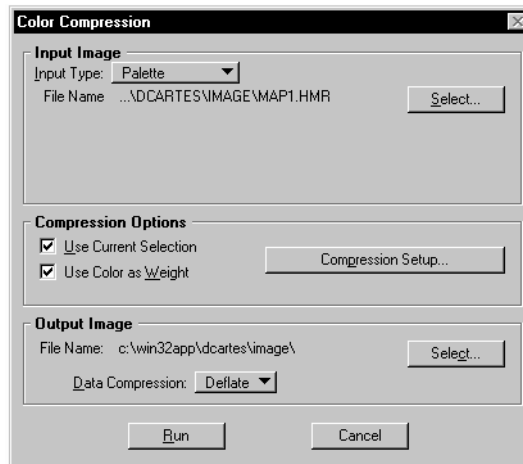
Color Compression dialog box

The Color Compression dialog box is used to enter the parameters for producing a color composite image through color compression. The output image can be a RGB combination of three input images as seen through red, green, and blue filters. It can also be the result of color compression applied to a single HMR file.

Input Type

Choose the RGB Channels option if you want to produce a RGB combination of three input images.

Color Compression dialog box



Choose the Palette option if you want to apply a color compression on a single HMR file.

Input Image

To select each of the input files, click the Select buttons and use the File Selection dialog box.

- ☞ When you use color compression to produce a RGB combination of three input images, use the Contrast Stretch dialog box to enhance each of the input images prior to a color compression. When each of the input images has an appropriate contrast and displays with clarity, the color composite resulting from the color compression should be clear and correctly contrasted.

Compression Options


You can control the calculation of statistics for the preparation of the color compression encoding key by using polygons.

- If Use Current Selection is on, the statistics for creating the encoding key are calculated only inside the polygons that are presently selected and the rest of the image is not considered.

You can give weights to the control polygons by using the Use Color as Weight option. The color of each polygon is then used as a weight.

For example, the pixels inside a polygon with the color number 50 are 10 times as important as pixels within a polygon with the color number 5 for the calculation of statistics.

- If Use Current Selection is off, all pixels of the input images are considered in the calculation of statistics and no weight is used (Use Color as Weight cannot be accessed).

 Only the polygons or the parts of polygons overlapping the image are considered. If the polygons do not overlap the input image, you are asked if you want to use the input image for the calculation of statistics or to end the operation by clicking Cancel.

Compression Setup

Click Compression Setup to open the Color Compression Setup dialog box.

Output Image

To specify the output file, click Select and use the File Selection dialog box.

Data Compression

Use the Data Compression option menu to choose among the following data compression options:

None	Creates an output HMR file without compression.
Deflate	Applies the Deflate compression algorithm to the HMR output image. No data is lost in this compression scheme. The Deflate option is available for 8 bit format images.

Run

The Run button can be accessed only when the parameters have been correctly entered. Click this button to create the output image with color compression. All pixels of the output image are calculated, even if the Use Current Selection button is on. This

button is used only for preparing the encoding key. While the batch program is running, a Progress indicator displays.

Cancel

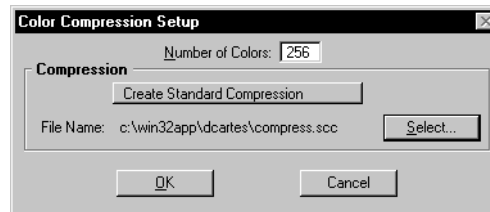
If you decide not to use the present parameters, click Cancel and the dialog box then closes.

Color Compression Setup dialog box

Use the Color Compression Setup dialog box to choose between a standard color compression encoding key or to create and use a custom color compression encoding key. You can also create a color compression encoding key for the present image without saving it in a file.

- ☞ All parameters related to the Color Compression Setup dialog box are saved with a project.

Color Compression Setup dialog box



The color compression is a tridimensional subdivision of intensities into small increments inside the RGB color cube. The algorithm used by this program consists of the following steps:


- The color RGB cube is first fragmented into 32 x 32 x 32 subdivisions resulting from a 32 level quantization along each of the R, G, and B axes.
- Statistics are calculated to indicate how many pixels fall inside each of the 32768 subdivisions of the color cube.
- The encoding key is built by clustering the subdivisions of intensities into a smaller number of classes corresponding to the “number of colors” entered. Each class is given the most appropriate color, based on the representative colors of the component subdivisions.
- The color look-up table is then built by connecting each color to an index of the table, from 0 to 255.

The encoding key consists of two parts:

1. A tridimensional table that indicates which color index is connected to each of the 32768 subdivisions of the RGB color cube.
2. A color look-up table which provides the definition of the color that is connected to each of the table indices, for the red, green, and blue components.

Number of Colors

Use this field to enter the number of colors required in the resulting color look-up table. (If a standard or existing color compression encoding key is used, the Number of Colors field is dimmed.) This number can range from 64 to 256. The higher the number, the better the result for color rendition of the image (since there is less compression). By default, this parameter is set to 255.

-  It is recommended that you use the default value and keep this value constant for a given project.

Compression

Use the button in the Compression Box to set the compression method: Custom, Standard, and Create Standard.

Choose Custom Compression to create a color compression that is applied only to the present image. This option does not use an existing encoding key, nor does it save the key which is created.

Choose Use Standard Compression to use an existing encoding key for the color compression. The encoding key is contained in an SCC (Standard Color Compression) file. To select the SCC input file, click the Select button and use the File Selection dialog box.

Use Create Standard Compression to create an encoding key that is saved in a file for later use with other images. To enter the SCC output file, click on the Select button and use the File Selection dialog box.

OK

Select OK to close the Color Compression Setup dialog box and save the compression settings.

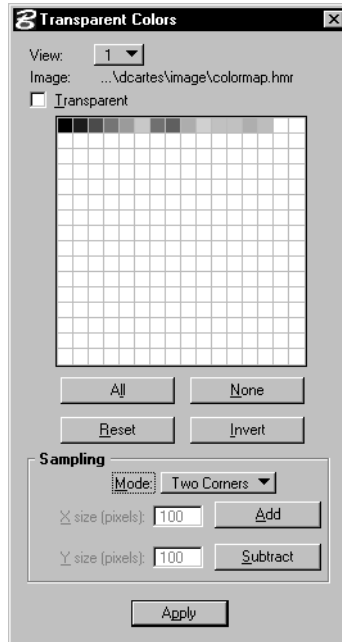
Cancel

Select Cancel to close the Color Compression Setup dialog box and revert the settings to their initial values.

Transparent Colors dialog box

The Transparent Colors dialog box is used to define a set of transparent colors for the active image.

*Transparent Colors
settings box*



The Transparency symbol (“t”) displays in the Image Manager list box to indicate that the transparency mechanism is on for the corresponding image. If the transparency mechanism is on, all pixels of this image that have a color number which belongs to the transparency set are not displayed. Overlapping images stacked underneath can be seen through holes made of transparent pixels.

The Transparency mechanism works only if both the Transparent toggle in this dialog box and the Transparency toggle in the “View Image Attributes” on page 4-20, are on for a given view.

View

The View option menu is used to choose the View to which the present transparency settings will be applied. The transparency properties of a given image can be defined differently from one View to another.

Image

The Image field displays the name of the active image.

Transparent

Transparent sets the on/off status of the transparency for the current image, in the present view.

Color Palette field

The Color Palette field displays the color table of the current image and is used to designate a number of colors as transparent for this image (in this view). Each color of the Color Palette is a button that can be toggled on or off.

All

The All button turns on all colors.

None

The None button turns off all colors.

Reset

The Reset button resets the selection set to its condition at the time of the last Apply (or at the time the dialog box was opened if Apply had not been clicked).

Invert

The Invert button reverses the on or off status of all colors.

Sampling Group

Use the Sampling group to interactively collect colors from the image by using the provided sampling tool. Samples are used to add or subtract colors to or from the selection set.

Mode

Use Mode to configure the sampling tool in one of the following ways:

- **Dimensions**
Enter the size, in screen pixels, of the area prior to using the Sampling group. A sampling tool of the specified size is then attached to the screen pointer and you are prompted to select the anchor point by moving to the appropriate area on the image. Accepting the anchor point copies the content of the sampling tool into a buffer and extracts the colors present to add or subtract them to or from the selection set.
- **Two Corners**
You are prompted to select the origin of the capture area with the screen pointer. When the origin is pinned, the opposite corner is then attached to the screen pointer and the sampling

tool can be sized at will. You are prompted to pin the opposite corner. This action copies the content of the sampling tool into a buffer and proceeds to extract the specified colors.

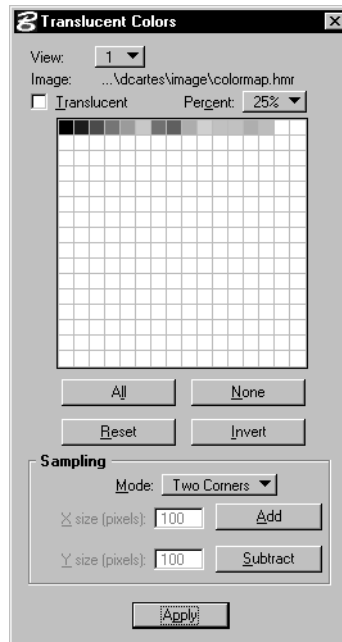
Apply

The Apply button updates the transparent colors selection set. If the Transparent Colors dialog box is closed, the color selection set returned will be the last one applied.

Translucent Colors dialog box

The Set Translucent Colors dialog box is used to set the colors of the images that are displayed with translucency and the percentage (or degree) of the translucency.

*Translucent Colors
settings box*



The Translucency symbol (“r”) displays in the Image Manager list box to indicate that the translucency mechanism is on for the corresponding image. If the translucency mechanism is on, all pixels of this image that have a color number that belongs to the translucency set display using the specified percentage of translucency (see “Percent” on page 6-21).

Overlapping images stacked underneath can be seen through holes made of Translucent pixels.

The Translucent mechanism works only if both the Translucent toggle in this dialog box and the Translucent toggle in the “View Image Attributes” on page 4-20, are on for a given view.

View

The View option menu is used to choose the View to which the present translucency settings will be applied. The translucency properties of a given image can be defined differently from one View to another.

Image

The Image field displays the name of the active image.

Translucent

Translucent sets the on/off status of the translucency for the current image, in the present view.

Percent

Use Percent to choose the degree of translucency, in terms of percentage of the full color. All translucent colors will have the same percentage of translucency for that image.

Color Palette field

The Color Palette field displays the color table of the current image and is used to designate a number of colors as Translucent for this image (in this view). Each color of the Color Palette is a button that can be toggled on or off.

All

The All button turns on all colors.

None

The None button turns off all colors.

Reset

The Reset button resets the selection set to its condition at the time of the last Apply (or at the time the dialog box was opened if Apply had not been clicked).

Invert

The Invert button reverses the on or off status of all colors.

Sampling Group

Use the Sampling group to interactively collect colors from the image by using the provided sampling tool. Samples are used to add or subtract colors to or from the selection set.

Mode

Use Mode to configure the sampling tool in one of the following ways:

- **Dimensions**

Enter the size, in screen pixels, of the area prior to using the Sampling group. A sampling tool of the specified size is then attached to the screen pointer and you are prompted to select the anchor point by moving to the appropriate area on the image. Accepting the anchor point copies the content of the sampling tool into a buffer and extracts the colors present to add them to or subtract them from the selection set.
- **Two Corners**

You are prompted to select the origin of the capture area with the screen pointer. When the origin is pinned, the opposite corner is then attached to the screen pointer and the sampling tool can be sized at will. You are prompted to pin the opposite corner. This action copies the content of the sampling tool into a buffer and proceeds to extract the specified colors.

Apply

The Apply button updates the Translucent colors selection set. If the Translucent Colors dialog box is closed, the color selection set returned will be the last one applied.