Raster Color Conversions

The Raster Color Conversions process in TNTmips allows you to make single color-composite rasters from sets of separate RGB rasters, to convert color-composites to RGB separates, and to convert image color components to a different color space. The process provides conversions between RGB, Intensity-Hue-Saturation, Brightness-Hue-Saturation, CMY (cyan-magenta-yellow), and CMYK (cyan-magenta-yellow-black); see descriptions on the next page. Multiple input images of the same type can be converted to the same output type in a single operation. You have the option to apply saved contrast tables or automatic contrast enhancement to the input images during conversions.

Selecting Input Images

Select the type of input images you wish to convert from the Input menu on the Raster Color Conversions window, then press the Add icon button to select the images. For multi-band input images, select the first set of bands; the Multi-band Image Options window (illustrated below) then appears to allow you to confirm or change the color-component assignments for each band. (If you will be selecting additional multi-band images from different files with similar band naming conventions, turning on the *Apply same settings to additional 3-band images* toggle allows you to select all of the additional image band sets at once.) Press the OK button on this window to accept the band assignments.
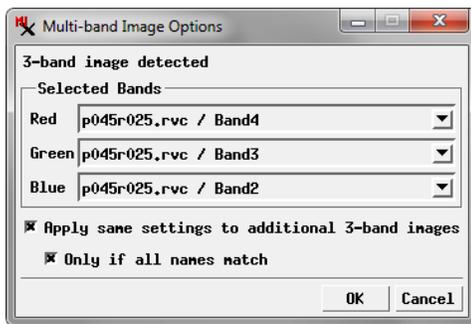
The input images are shown in the Objects list in the Raster Color Conversions window. If you have added an image or image in error, left-click on the list entry to highlight it and press the Remove Selected icon button. (You can select a contiguous range of input images by holding down the Shift key while clicking or toggle selection using <Ctrl> left-click.) Press the Remove All icon button to clear the list.

Applying Contrast

When the input images are multi-band or 24-bit color composites, you have the option to apply contrast enhancements during the conversion. The Objects list includes a contrast column for each color component showing a contrast option. For RGB images, for example, there are Red Contrast, Green Contrast, and Blue Contrast columns in the list. The name of the last-used saved contrast table (if any) is shown in each column by default. Left-clicking on the small black arrow
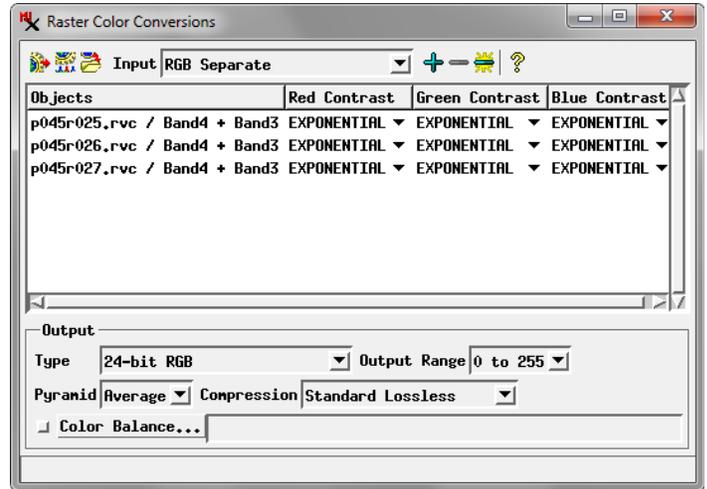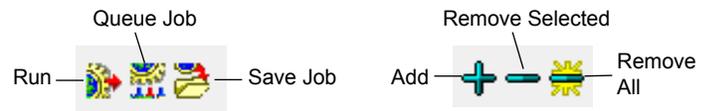
Input Types	Output Types
Single	4-bit color map
RGB Separate	8-bit color map
Intensity-Hue-Saturation	24-bit RGB
Brightness-Hue-Saturation	RGB Separate
CMY	Intensity-Hue-Saturation
CMYK	Brightness-Hue-Saturation
	CMY
	CMYK

icon button in a contrast field opens a menu listing all of the saved contrast tables for that image component, standard auto-contrast options (Linear, Normalize, Equalize, Logarithmic, and Hyperbolic Tangent), and None. Choose the desired contrast option for each image component.

Output

Choose an output image type from the Type menu in the Output box in the lower part of the Raster Color Conversions window. Use the Output Range menu to choose the numeric range to which to scale the color components; the choices are 0 to 255 and 0 to 100. Choose a raster pyramid type from the Pyramid menu and a compression option from the Compression menu. You can apply color balancing to the inputs by turning on the Color Balance checkbox, which prompts you to select a saved color balance object from a Project File.

Running the Process

Press the Run icon button to run the process immediately. Queue Job and Save Job icon buttons are also also provided to allow you to run the conversions using TNTmips Job Processing. See the Technical Guide entitled *TNTmips Job Processing System* for more information.

Color Spaces

Color variations can be defined using various standard color models that are most easily understood as three-dimensional color spaces. Standard color models used in TNTgis include Red-Green-Blue (RGB), Intensity-Hue-Saturation, Brightness-Hue-Saturation, Cyan-Magenta-Yellow (CMY), and Cyan-Magenta-Yellow-Black (CYMK).

RGB Color Space

The RGB color model represents colors as additive mixtures of three primary colors: Red, Green, and Blue. This model can be represented spatially as a cubic volume defined by orthogonal Red, Green, and Blue axes with ranges 0 to 255 (or 0 to 100%).

Black is at the origin of the coordinate system (R=G=B=0), and white is at the diagonally-opposite corner of the cube (R=G=B=255). The diagonal connecting the black and white corners contains the range of neutral gray levels. Complementary colors (such as blue and yellow) lie at diagonally-opposite corners of the cube. An R-G-B color spread includes colors found on a straight line connecting the two end-member colors (for example, the edge connecting red and yellow).
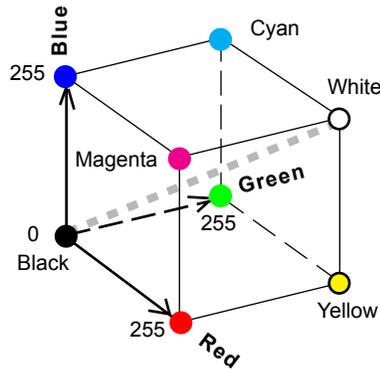
Intensity-Hue-Saturation Color Space

The Intensity-Hue-Saturation (IHS) model also represents colors using three independent components. *Hue* is a basic perceptual property of color that is related to the wavelength of the light stimulus. The primary colors red, green, and blue all are associated with different light wavelengths.

Saturation can be described as the purity of a color. A pure hue would be perceived for light of a single wavelength (monochromatic light). Light reflected or emitted is usually polychromatic, or consisting of a range of wavelengths around the average (which defines the hue). A color with a narrow range of wavelengths is said to be highly saturated. As the range of wavelengths increases, the hue becomes less distinct, and the color fades toward gray (which includes equal amounts of light at all visible wavelengths).

Intensity is the lightness or darkness of a color. For a completely unsaturated color, intensity varies from black through grays to white.

The components of the Intensity-Hue-Saturation color model can be visualized as a double-cone space. The two cones share a common vertical axis and the same circular base in the middle of the space. The vertical axis is intensity, which represents varying gray levels.
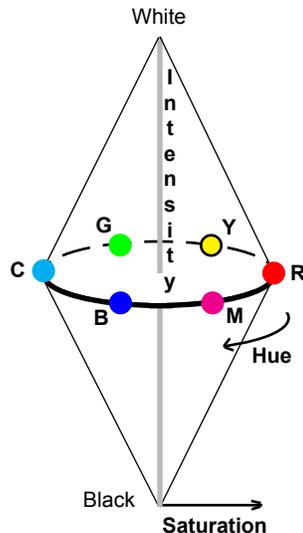
The 0 intensity level is black (the tip of the bottom cone); full intensity is white (the tip of the upper cone). IHS values elsewhere along the intensity axis represent different levels of gray.

In any horizontal (circular) slice through one of the cones in the model space, the hue varies around the slice, in the order Red-Yellow-Green-Cyan-Blue-Magenta clockwise around the circle (assuming an upward view along the intensity axis). The saturation increases radially outward from the central intensity axis. Maximum saturation in this model is at the midpoint of the intensity range, at the shared base of the lower and upper cones.

Brightness-Hue-Saturation Color Space

The Brightness-Hue-Saturation model is closely related to IHS, but the color space is a single vertical cone pointing downward.

The vertical axis is *brightness*, with black at the bottom and white at the top. Maximum saturation in this model is at full brightness, rather than at the midpoint as in the intensity-hue-saturation model.
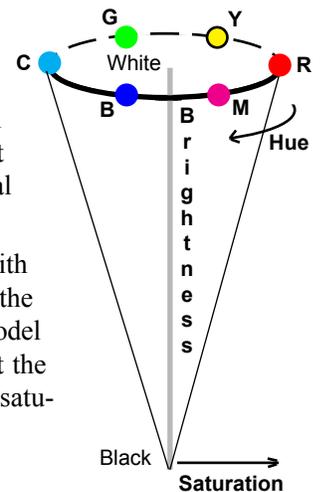
Cyan-Magenta-Yellow and Cyan-Magenta-Yellow-Black Color Space

The Cyan-Magenta-Yellow (CMY) model applies to color produced by mixing or overlaying translucent filters or inks, as in printing. When laid on a white page, inks absorb or subtract certain wavelengths from white light, and the remaining reflected wavelengths determine the color.

The subtractive CMY model is represented as a cubic volume with orthogonal Cyan, Magenta, and Yellow axes with scales 0 to 255 (or 0 to 100%). White is at the origin (C=M=Y=0) and black (C=M=Y=255) at the diagonally-opposite corner of the volume. Equal mixtures of all three subtractive primaries define gray levels along this diagonal of the cube. Equal mixtures of pairs of the primaries produce red (magenta plus yellow), green (yellow plus cyan), and blue (magenta plus cyan).

The Cyan-Magenta-Yellow-Black (CMYK) Model incorporates a black ink component to more economically produce grays and black as well as dark colors.