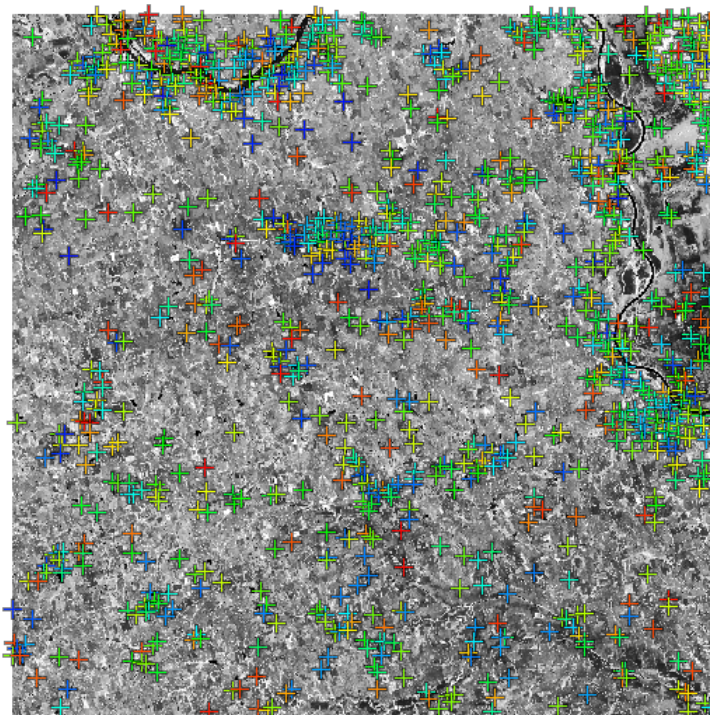# Style Control Points by Residual

Control points are displayed in the Georeference process as an independent layer in the Input and Reference views. You can set the styles used for the control points and their labels and choose to auto-hide point labels to prevent crowding when many points are shown in the view. You can also assign colors to control points based on residual values. This option is especially useful when you are evaluating the spatial distribution of residuals for a large number of control points created using the Auto-Register procedure (see the Technical Guide entitled *Georeference: Auto-Register to Reference Image*). Using this option, you can see at once the locations of all points with high residual values, allowing you to assess whether their high residual values may be related to surface topography, sensor optics, or other factors.

The *Color by* menu on the Control Point Layer Settings window lets you choose how to set control point colors. The Status option allows you to choose separate colors in which to display symbols for enabled and disabled control points. The other three options set a color spread based on residual values: Residual (the full XY residual value), Residual X (component in the X direction), or Residual Y (component in the Y direction). When one of these three options is selected, you can choose a predefined color spread or choose Manual, which provides standard controls for setting beginning and ending spread colors and the spread path (RGB, HIS clockwise, and others). The

A SPOT 5 image with 1145 control points generated by Auto-Register, with control point colors set by Residual. A grayscale display of a single image band is shown so that the control point colors are more prominent. Control point labels are not shown at this zoom level because the number of points exceeds the current label limit (100).
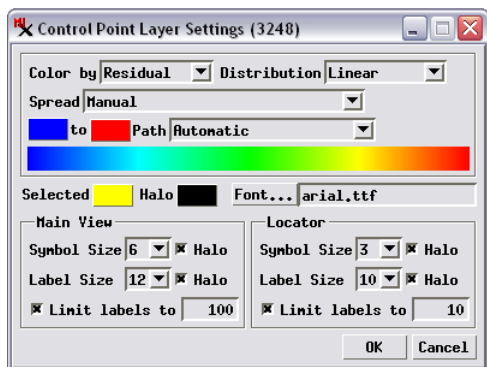
You can open the Control Point Layer Settings window by choosing Control Points / Layer Controls from the Georeference window, or right-click on the Control Point layer name in the view window's sidebar (or the Layer Manager if open) and choose Controls from the popup menu.
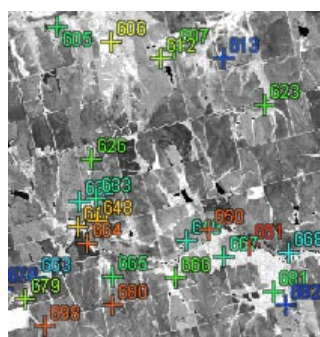
Control point labels automatically appear when you zoom in far enough that the number of points shown in the view is less than the value you have set for the *Limit Labels to* parameter. Points and labels are shown here with the default black halos around the colored symbol and text, making them more visible against backgrounds of different brightness or color.

Distribution menu lets you choose how the residual values are mathematically distributed. You can choose from Linear, Equalize, Normalize, and Logarithmic methods.

The lower part of the Control Point Layer Settings window presents controls allowing you to choose the color to use for control points that are currently selected in the Georeference window's control point list, as well as the font to use for control point labels. It also allows you to set the sizes of the point symbols and their labels (in screen pixels). Separate sets of size controls are provided for the Main View and the Locator; these settings apply to both the Input and Reference views. For both point symbols and label, you also have the option of surrounding point symbols and labels with a different-colored halo to make them stand out against backgrounds of varying

brightness and color. The default halo color is black, but you can pick any color.

The Auto-Register procedure can produce hundreds or thousands of control points for an input image. When the views of an auto-registered image are zoomed out, showing labels in addition to symbols for all points would obscure your view of the image being georeferenced. The Control Point Layer Settings window allows you to set a limit to the number of control point labels shown for the Main views and their Locator views. Labels are automatically hidden when the number of points shown exceeds the limit. Thus zoomed-out views with many points omit the labels, while labels are automatically turned on when you zoom in to a smaller area showing fewer control points.