

Georeferencing images

[Top](#)

The georeferencing of images in ARC/INFO is done with the REGISTER command. REGISTER is an interactive program that allows you to enter a series of links, or displacement vectors, identifying locations in an image and their corresponding locations in map coordinates. Using the links as a series of control points, REGISTER computes a six-parameter affine transformation to determine the amount of scaling, rotating and translating required to align the image to map coordinates. The parameters for the affine transformation are stored in a file called a world file. The following example shows how to initiate the REGISTER program:

```
Arc: usage register
```

```
Usage: REGISTER <image> {cover} {cover_color} {band | COMPOSITE}
        {red_band} {green_band} {blue_band}
        {ARC | POINT | TIC | ALL}
```

```
Arc: register contours streets 2
```

REGISTER creates a multiwindow display with functions to pan and zoom around the image, add and delete links, register the image using the current links, and save the computed transformation. Links are added with the mouse to identify an image point and its corresponding map coordinate point.



Links are used to register the image to real-world coordinates.

The initial transformation can be incrementally refined by adding more links. You can examine and evaluate an overlay of the image and the corresponding coverage that uses the computed transformation before accepting the registration parameters.



The image and the coverage are overlaid using the computed transformation. If the transformation is acceptable, it can be saved.

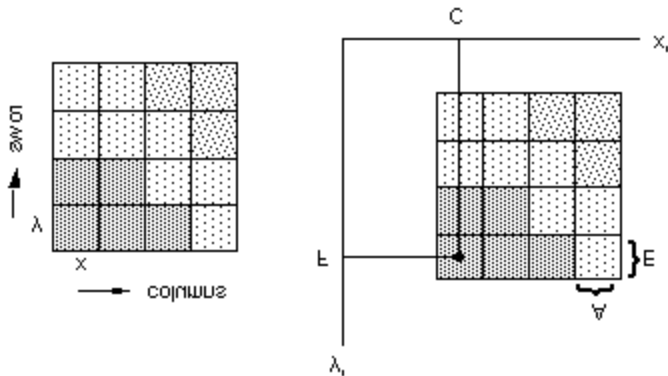
Once you determine that the transformation parameters are acceptable they can be written to a special file called a world file. If the image file has a three-character extension and resides in an 8.3 workspace the output world file will follow the DOS 8.3 file-naming convention. This is done by taking the first and third characters and appending a 'w' to it. For example, if an RLC file were named *red.rlc*, the file registering it to real-world coordinates would be named *red.rcw*. If the image file has an extension longer or shorter than three characters, or no extension, or resides in a non-8.3 workspace, then a 'w' is added to the image file name without changing it. Thus the image *bigimage* would have a world file of *bigimagew*, and the image *lake.tiff* would have a world file of *lake.tiffw*.

The image-to-world transformation is a six-parameter affine transformation in the form of:

$$\begin{aligned}x1 &= Ax + By + C \\y1 &= Dx + Ey + F\end{aligned}$$

where:

- x1 = calculated x-coordinate of the pixel on the map
- y1 = calculated y-coordinate of the pixel on the map
- x = column number of a pixel in the image
- y = row number of a pixel in the image
- A = x-scale; dimension of a pixel in map units in x direction
- B, D = rotation terms
- E = *negative* of y-scale; dimension of a pixel in map units in y direction
(The y-scale is negative because the origins of an image and a geographic coordinate system are different. The origin of an image is located in the upper-left corner, whereas the origin of the map coordinate system is located in the lower-left corner. Row values in the image increase from the origin downward, while y-coordinate values in the map increase from the origin upward.)
- C, F = translation terms; x,y map coordinates of the center of the upper-left pixel



The image, in image space, is mapped onto a real-world coordinate system according to the parameters defined in the world file. The figure above is a graphic representation of the transformation parameters in the case where there is no rotation from image to map space.

The transformation parameters are stored in the world file in this order: A, D, B, E, C, F. The following listing illustrates the contents of a world file - six parameters stored in an ASCII format.

```
red.rcw
    3.20612628172694 - A
    3.57624161821589 - D
    3.58580315303679 - B
    -3.26818030576890 - E
    412859.44583667407278 - C
    4315361.80367969442159 - F
```

The y-scale component (E parameter) is always a negative number.