Example:

GeoKeyDirectoryTag=( 1, 1, 2, 6,

1024, 0, 1, 2,

1026, 34737,12, 0,

2048, 0, 1, 32767,

2049, 34737,14, 12,

2050, 0, 1, 6,

2051, 34736, 1, 0 )

GeoDoubleParamsTag(34736)=(1.5)

GeoAsciiParamsTag(34737)=("Custom File|My Geographic|")

1, 1, 2, 6,

The **first line** indicates that this is a Version 1 GeoTIFF GeoKey directory, the keys are Rev. 1.2, and there are 6 Keys defined in this tag.

1024, 0, 1, 2,

The next line indicates that the first Key (**ID=1024** = GTModelTypeGeoKey) has the value 2 (Geographic), explicitly placed in the entry list (since TIFFTagLocation=0).

1026, 34737,12, 0,

The next line indicates that the **Key 1026** (the GTCitationGeoKey) is listed in the GeoAsciiParamsTag (34737) array, starting at offset 0 (the first in array), and running for 12 bytes and so has the value "Custom File" (the "|" is converted to a null delimiter at the end).

2051, 34736, 1, 0 )

Going further down the list, the **Key 2051** (GeogLinearUnitSizeGeoKey) is located in the GeoDoubleParamsTag (34736), at offset 0 and has the value 1.5;

2049, 34737,14, 12,

the value of **key 2049** (GeogCitationGeoKey) is "My Geographic".

The TIFF layer handles all the problems of data structure, platform independence, format types, etc, by specifying byte-offsets, byte-order format and count, while the Key describes its key values at the TIFF level by specifying Tag number, array-index, and count. Since all TIFF information occurs in TIFF arrays of some sort, we have a robust method for storing anything in a Key that would occur in a Tag.

With this Key-value approach, there are 65536 Keys which have all the flexibility of TIFF tag, with the added advantage that a TIFF dump will provide all the information that exists in the GeoTIFF implementation.

This GeoKey mechanism will be used extensively in [section 2.7](http://geotiff.maptools.org/spec/geotiff2.7.html#2.7), where the numerous parameters for defining Coordinate Systems and their underlying projections are defined.

Note from Paul:

I suspect we got this mess by the creators of GeoTiff not wanting to haggle around with Adobe (or whoever) about a lot of new keys. (They have to give approval and pulblish the 3rd party tag values.) So they just said, we’ll be clever. Turned out to be a mistake.

Including the header row, that dataset has 7 rows, but only five of them are explained. Apparently we have to go to section 2.7 to find out everything, so here is my attempt.

2048 and 2050 are not discussed:

2048

GeographicTypeGeoKey

Key ID = 2048

Type = SHORT (code)

Values = Section 6.3.2.1 Codes

This key may be used to specify the code for the geographic coordinate system used to map lat-long to a specific ellipsoid over the earth.

GeoKey Requirements for User-Defined geographic CS:

GeogCitationGeoKey

GeogGeodeticDatumGeoKey

GeogAngularUnitsGeoKey (if not degrees)

GeogPrimeMeridianGeoKey (if not Greenwich)

2050

GeogGeodeticDatumGeoKey

Key ID = 2050

Type = SHORT (code)

Values = [Section 6.3.2.2 Codes](http://geotiff.maptools.org/spec/geotiff6.html#6.3.2.1)

This key may be used to specify the horizontal datum, defining the size, position and orientation of the reference ellipsoid used in user-defined geographic coordinate systems.

GeoKey Requirements for User-Defined Horizontal Datum:

GeogCitationGeoKey

GeogEllipsoidGeoKey

Now, what am I finding in the geotiff created by ArcGIS Pro?

[0] { keyID = 1024, field2 = 0, field3 = 1, field4 = 1 }

[1] { keyID = 1025, field2 = 0, field3 = 1, field4 = 1 }

[2] { keyID = 1026, field2 = -30799, field3 = 67, field4 = 0 }

[3] { keyID = 2048, field2 = 0, field3 = 1, field4 = 6318 }

[4] { keyID = 2049, field2 = -30799, field3 = 94, field4 = 67 }

[5] { keyID = 2050, field2 = 0, field3 = 1, field4 = 1116 }

[6] { keyID = 2051, field2 = 0, field3 = 1, field4 = 8901 }

[7] { keyID = 2054, field2 = 0, field3 = 1, field4 = 9102 }

[8] { keyID = 2055, field2 = -30800, field3 = 1, field4 = 0 }

[9] { keyID = 2056, field2 = 0, field3 = 1, field4 = 7019 }

[10] { keyID = 2057, field2 = -30800, field3 = 1, field4 = 1 }

[11] { keyID = 2059, field2 = -30800, field3 = 1, field4 = 2 }

[12] { keyID = 2061, field2 = -30800, field3 = 1, field4 = 3 }

[13] { keyID = 3072, field2 = 0, field3 = 1, field4 = 6543 }

[14] { keyID = 3073, field2 = -30799, field3 = 558, field4 = 161 }

[15] { keyID = 3076, field2 = 0, field3 = 1, field4 = 9003 }

That means:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Key | keyID | Field2 | Field3 | Field4 |
| 1024 | GTModelTypeGeoKey | 0 | 1 | 1 |
| 1025 | GTRasterTypeGeoKey | 0 | 1 | 1 |
| 1026 | GTCitationGeoKey | -30799 | 67 | 0 |
| 2048 | GeographicTypeGeoKey | 0 | 1 | 6318 (note) |
| 2049 | GeogCitationGeoKey | -30799 | 64 | 67 |
| 2050 | GeogGeodeticDatumGeoKey | 0 | 1 | 1116 (note) |
| 2051 | GeogPrimeMeridianGeoKey | 0 | 1 | 8901 (note) |
| 2054 | GeoAngularUnitsGeoKey | 0 | 1 | 9102 (note) |
| 2055 | GeogAngularUnitsSizeGeoKey | -30800 | 1 | 0 |
| 2056 | GeogEllipsoidGeoKey | 0 | 1 | 7019 (note) |
| 2057 | GeogSemiMajorAxisGeoKey | -30800 | 1 | 1 |
| 2059 | GeogInversFlatteningGeoKey | -30800 | 1 | 2 |
| 2061 | GeogPrimeMeridianLongGeoKey | -30800 | 1 | 3 |
| 3072 | ProjectedCSTypeGeoKey | 0 | 1 | 6543 (note) |
| 3073 | PCSCitationGeoKey | -30799 | 558 | 161 |
| 3076 | ProjLinearUnitsGeoKey | 0 | 1 | 9003 (right) |

Notes:

Regarding 1024 (GTModelTypeGeoKey), the values may be as follows:

GeoTIFF defined CS Model Type Codes:

ModelTypeProjected = 1 /\* Projection Coordinate System \*/

ModelTypeGeographic = 2 /\* Geographic latitude-longitude System \*/

ModelTypeGeocentric = 3 /\* Geocentric (X,Y,Z) Coordinate System \*/

The value of 1 is correct for this dataset embedded in NC State Plane Coordinates.

Regarding 1025 (GTRasterTypeGeoKey), the values may be as follows:

6.3.1.2 Raster Type Codes

Ranges:

0 = undefined

[ 1, 1023] = Raster Type Codes (GeoTIFF Defined)

[1024, 32766] = Reserved

32767 = user-defined

[32768, 65535]= Private User Implementations

Values:

RasterPixelIsArea = 1

RasterPixelIsPoint = 2

Note: Use of "user-defined" or "undefined" raster codes is not recommended.

Raster Pixel Is Area would be correct for an image GeoTiff.

6318 is the EPSG number for NAD83(2011), but having it with GeographicTypeGeoKey makes no sense.

1116 is the EPSG number for NAD83.

8901 is the EPSG number for Greenwich.

9102 is the EPSG number for degree as units. This must be referring to GRS 1980

7019 is the EPSG number for GRS 1980

6453 is North Carolina’s EPSG for its US Survey Foot State Plane Coordinate System.

This also applies to the value 9003, which codes US Survey Feet as units.