Map legend files (R23)

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A legend is a set of specifications linking a set of data with a display attribute. It governs the assignment of the attribute values to data values or data value ranges.

For example, a legend may assign colours to a set of data value ranges.

An **attribute** is a property of a line, point or region in a composition, for example, colour or marker size.

An **attribute value** is one of the possible attribute states. For example, **`red`**, **`0r170g156b`**, **`image213`** are possible values of the attribute **`colour`**.

A **data value** is a possible value from the dataset being linked to the legend.

Legend files can assign a range of attributes (e.g., colour, marker size) using a range of distribution methods (e.g., cutoff levels, histograms, value ranges).

While you may originally create a legend file for use with a particular dataset, it will not retain a link to the original dataset. You can use a legend file with any dataset to which it is relevant.

INTREPID stores legends as text files with the extension **`.leg`**.

Generally speaking you can use the interactive Legend Editor or a text editor interchangeably to create and edit legend files. See Map Legend Editor (T45f) for information about the interactive tool.

Basic structure of a legend file

A legend file consists of a **`legend begin – legend end`** block containing:

- Legend path and file name,
- Legend attribute (attribute being assigned, e.g., colour, marker size),
- Legend type definition block (e.g., **`level begin – level end`**) containing:
  - A table showing cutoff, lookup or range values and corresponding attribute values,
  - Parameters for the legend.

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Example of a legend file

```
Legend Begin
   Name = usr/surveys/ebagoola/colourpointZ
   Type = Colour
   Level Begin
      Table = {
                816.69 000r255g000b
                714.82 000r169g000b
                612.94 000r255g169b
                511.07 000r255g255b
                409.20 000r169g255b
                307.32 000r000g255b
                205.45 169r000g255b
                103.58 255r000g255b
                  1.70 Null
      }
      HighClip = white
      LowClip = black
   Level End
Legend End
```

Legend types

INTREPID supports four types of legend.

Level legends

INTREPID divides the range of possible data values into levels. You specify the cutoff values for each level. INTREPID will then assign the corresponding attribute values to data within each level.

You can create and edit Level legends with the interactive Legend Editor for the current interactive operation with Map Composition. You can also create and edit any Level legend using a text editor.

Dynamic range Level legends

In these legends the cutoff values are set to ***null***, INTREPID will automatically analyse the dataset and assign new cutoff values to the attribute values every time it processes (renders) the composition for printing or viewing. See The bipole line style legend for an example of a dynamic range Level legend.

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Histogram legends

You specify a number of levels and the attribute values for each level. INTREPID analyses the data statistically and assigns cutoff data values to the attribute values based on their positions in a frequency distribution. Several statistical options are available.

Note: You can use Histogram legends with images (grid datasets) but not with Z fields of vector datasets.

Histogram legends are different from the other legend types in their treatment of cutoff values. When a histogram legend is linked to a grid dataset in a composition, INTREPID analyses the dataset and assigns new cutoff values to the attribute values every time it processes (renders) the composition for printing or viewing. It ignores the cutoff values already listed in the legend file. Each time INTREPID performs this process it saves the updated legend file.

You can create and edit Histogram legends with either the interactive Legend Editor or a text editor.

Continuous attribute values

Pseudocolour, grey scale, sun angle and false colour images always use Histogram legends. When INTREPID assigns attribute values to data for these images, it uses the cutoff values in the legend only as a guide and interpolates attribute values between the cutoff data values to give a continuous colour or shade gradation in the image.

Range legends

You specify the upper and lower data values for each attribute value. INTREPID classifies data that does not fall within a range as 'outside range' and assigns it to an 'outside range' attribute value. You must create Range legends using a text editor, since the current version of the interactive Legend Editor does not support Range legends.

Lookup legends

INTREPID assigns each single data value to an attribute value. This type is only suitable for data that has a limited number of different values, such as a line type field.

You must create Lookup legends using a text editor, since the current version of the interactive Legend Editor does not support Lookup legends.

Determining the number of levels

INTREPID determines the number of levels or ranges for dividing up the data by the number of entries in the table.

If you create a legend using the interactive Legend Editor, it will always create Level legends with 8 levels and Histogram legends with 256 levels.

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How to specify a legend in a map composition

You will need to specify a legend file for

- Representing data in a data box and
- Showing the key to attribute values in a data box using a legend object outside the data box.

You must take care to specify a legend file for a legend object that corresponds to the legend file used for the data in the data box (usually the same legend file).

If you are using the interactive Legend Editor as part of an interactive Map Composition session, when you specify the legend file and choose OK, INTREPID will automatically place the legend path into the corresponding text box in the current dialog box. See Map Legend Editor (T45f) for details.

If you are using Map Composition interactively you can also enter the path and file name of the legend file directly into the corresponding text box.

If you are editing a MAPCOMP file directly, place the path and file name of the legend file into the **`Legend =`** statement.

In this example the field **`raw_mag`** will be displayed using the legend **`line_Zcolour`**.

```
Colour Begin
   Z = usr/surveys/ebagoola/raw_mag
   Legend = usr/surveys/line_Zcolour
Colour End
```


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High and low clip, out of range values

For Level legends you specify an overall range of data values within which attribute values will be assigned. Level legends have special 'outside range' attribute values for data outside this overall range.

Histogram legends also require a set of outside range attribute values for extreme data values. In Linear Histogram legends you can specify percentages at the high and low end to classify as 'outside range'.

Data that does not match any value in a Lookup legend or is not within any range in a Range legend also takes an 'outside range' attribute value.

The maximum data value 'of interest' in a Level or Histogram legend (i.e., the highest cutoff value) is the **high clip** value. Level and Histogram legends contain a **`HighClip = <attrib>`** statement defining the attribute value for data values higher than the high clip value.

The minimum data value 'of interest' in a Level or Histogram legend (i.e., the lowest cutoff value) is the **low clip** value. Level and Histogram legends contain a **`LowClip = <attrib>`** statement defining the attribute value for data values lower than the low clip value.

Lookup and Range legends contain an **`OutOfRange = <attrib>`** statement defining the attribute value for out of range data values not matching one of the data values in the table (Lookup) or outside the defined ranges in the table (Range).

The following table summarises the high/low clip and out of range settings for legends, showing how you can configure them.

Legend Type	Out of range type	User configuration
Level	High/Low Clip	Set the first and last cutoff values in the table
Histogram (linear)	High/Low Clip	Set the High and Low Clip Percentage
Histogram (other)	High/Low Clip	none
Range	Out of Range	Set the range values in the table
Lookup	Out of Range	Set the lookup values in the table

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Legend file examples

Histogram legend assigning lookup table colours

```
Legend Begin
   Name = mlevel_grid
   Type = Colour
   Histogram Begin
      HistOp = PLHEQ
      Table = {
               1994.24 Image256
               1994.01 Image255
               1988.66 Image254
   ...
               1961.48 Image3
               1961.03 Image2
               1960.35 Image1
               1959.10 Null
      }
      BinWidth =    0.3
      HighClip = white
      LowClip = black
   Histogram End
Legend End
```

Level legend assigning symbol shape

```
Legend Begin
   Name = markershape
   Type = Symbol
   Level Begin
      Table = {
              1.00 SquareCross
              0.88 SquarePlus
              0.76 Cross
              0.65 Triangle
              0.53 Circle
              0.41 Asterisk
              0.29 Plus
              0.18 Square
              0.06 Null
      }
      HighClip = Dot
      LowClip = Dot
   Level End
Legend End
```


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Level legend assigning marker size

```
Legend Begin
   Name = markers
   Type = MarkerSize
   Level Begin
      Table = {
                816.69  8
                714.82  7
                612.94  6
                511.07  5
                409.20  4
                307.32  3
                205.45  2
                103.58  1
                  1.70  Null
      }
      HighClip = 8
      LowClip = 1
   Level End
Legend End
```

Lookup legend assigning line thickness

```
Legend Begin
   Name = Linetype_thickness
   Type = TextThickness
   Lookup Begin
      Table = {
                2 1
                3 1
                4 0
                5 0
              }
      OutOfRange = 0
   Lookup End
Legend End
```

Range legend assigning rgb colour values

```
Legend Begin
   Name = colourrange
   Type = Colour
   Range Begin
      Table = {
         0.90 1.00 000r255g000b
         0.80 0.88 000r169g000b
         0.70 0.76 000r255g169b
         0.60 0.65 000r255g255b
         0.00 0.41 000r000g255b
      }
      OutOfRange = white
   Range End
Legend End
```


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'Null' attribute value

The attribute value shown as **null** in the tables of level and histogram legends is assigned to the legend's low clip value.

Data values above the **null** level and below the next level cutoff are in the lowest data value range for the legend.

Data values below **null** are low clip data outside the range of interest.

INTREPID will automatically assign values to **null** cutoff values in a dynamic range Level legend. (See Dynamic range Level legends)

MAPCOMP language features in legend files

Legend files may include the following MAPCOMP language features:

- Comment lines
- Multiple line statements
- Declared parameters within a MAPCOMP file
- MAPCOMP macros
- Command line replaceable parameters
- Environment variable references
- References to parameter values in auxiliary files

Legend files are mainly case-insensitive as specified for MAPCOMP.

See the corresponding sections in "MAPCOMP language features" in MAPCOMP Map Specification Language (R20) for details.

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Data types in the legend file syntax

The following table lists the data types that you can use in legend files, and a reference to the section in this manual where the data type is defined.

Data type	Section/Description
<number>	"Data types in the MAPCOMP syntax" in MAPCOMP Map Specification Language (R20) and Available map attribute values (R22)
<string>	
<path>	
<colour>	
<symbol>	
<style>	
<filltype>	
<thickness>	
<attrib>	This is a value of one of the above attributes (depending on the attribute assigned by the legend file).
<legendattrib>	Attributes assigned by legends
<histop>	Histogram operations

MAPCOMP can also contain statements of the type **<parameter assignment>**. See Histogram operations for details.

Attributes assigned by legends

In a legend file the attribute being assigned is shown in the statement

```
Type = <legendattrib>
```

The values of each attribute belong to a particular data type. See "Data types in the MAPCOMP syntax" in MAPCOMP Map Specification Language (R20) for general information about data types in MAPCOMP files, and the corresponding section in Available map attribute values (R22) for information about individual data types where marked in the table below.

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The following table lists the attributes that legend files can assign, including

- The correct value for **<legendattrib>** in the **Type = <legendattrib>** legend file statement and
- The data type of the attribute.

Description	<legendattrib> value	Data type	Section in Appendix
Pseudocolour	**Colour**	**<colour>**	"Colour Specifications" in Available map attribute values (R22)
Grey Scale	**Grey**	**<colour>**	"Colour Specifications" in Available map attribute values (R22)
Numbers (e.g., angle for marker rotation)	**Numeric**	**<number>**	
Symbol shape	**Symbol**	**<symbol>**	"Symbol shape" in Available map attribute values (R22)
Labels (string)	**Label**	**<string>**	
Line style (solid, dotted, etc.)	**LineStyle**	**<style>**	"Line styles" in Available map attribute values (R22)
Fill for polygons	**FillStyle**	**<filltype>**	"Fill types" in Available map attribute values (R22)
Point symbol size (mm)	**MarkerSize**	**<number>**	"Symbol size" in Available map attribute values (R22)
Line thickness	**LineThickness**	**<thickness>**	"Line thickness and font weight" in Available map attribute values (R22)

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Histogram operations

Histogram legends can use a variety of statistical processes for distributing the data amongst the available attribute values. (There are usually 256 attribute values.) When you specify a histogram legend you must include the **`Histop = <histop>`** statement before the table of data and attribute values in the legend type definition block (**`Histogram Begin – Histogram End`**).

The available histogram operations and values of **`<histop>`** are shown in the table in the following section. If you specify **none** INTREPID will divide the range of existing data values equally amongst the attribute values (without using frequency distribution).

Each histogram operation has one or more parameters. You can assign the parameters in statements after the table in the legend type definition block.

Example: `BinWidth = 0.2`

These parameter assignment statements are shown in the formal legend file syntax as **`<parameter assignment>`**. The following table shows the parameters for each histogram type and the default values assumed if you omit the parameter assignment statement.

Operation	Operation keyword (<histop> value)	Parameter	Default
None	**none**	–	–
Piecewise Linear Histogram Equation	**PLHEQ**	**BinWidth**	0.1
Normalise	**Normalise**	**Mean**	0
		StdDev	128
Log Inflection	**LogInfl**	**InflPnt**	128
		Severity	2
Inverse Log Inflection	**InvLogInfl**	**InflPnt**	128
		Severity	2
Linear	**Linear**	**LowClipPercentage**	1
		HighClipPercentage	99

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Legend file syntax

The following table sets out the syntax of legend files using a similar format to the MAPCOMP syntax table in section "Details of MAPCOMP language structure" in MAPCOMP Map Specification Language (R20).

Statement	Description
`Legend Begin`	Legend definition
`Name=<path>`	Path and Name of legend file
`Type=<legendattrib>`	Attribute for assigning to dataset values
`.Level Begin`	Definition of Level assignment

`.Table={`
`@flrt@<number> <attrib>`
`@flrt@<number> <attrib>`
`@flrt@...`
`@flrt@}`
	Table defining the dataset cutoff values and the corresponding attribute values for the data between the cutoff values.

`.HighClip=<attrib>`	Attribute value for dataset values higher than maximum value in **`Table`**
`.LowClip=<attrib>`	Attribute value for dataset values lower than maximum value in **`Table`**
`.Level End`	
`ORRange Begin`	Definition of Range assignment

`-Table={`
`@flrt@<number> <number> <attrib>`
`@flrt@<number> <number> <attrib>`
`@flrt@...`
`@flrt@}`
	Table defining the dataset value ranges and the corresponding attribute values

`-OutOfRange=<attrib>`	Attribute value for dataset values outside the ranges in **`Table`**
`-Range End`	
`ORLookup Begin`	Definition of Lookup assignment

`.Table={`
`@flrt@<number> <attrib>`
`@flrt@<number> <attrib>`
`@flrt@...`
`@flrt@}`
	Table defining the dataset values and the corresponding attribute values

`.OutOfRange=<attrib>`	Attribute value for dataset values not listed in **`Table`**
`.Lookup End`	
`ORHistogram Begin`	Definition of Histogram type legend
`-HistOp=<histop>`	Histogram operation

`-Table={`
`@flrt@<number> <attrib>`
`@flrt@<number> <attrib>`
`@flrt@...`
`@flrt@}`
	Table defining the dataset cutoff values and the corresponding attribute values for the data between the cutoff values.

`-<parameter`
`@flrt@assignment>`
`...`
	Parameter assignments for histogram operation. See Histogram operations.

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Statement	Description
`-HighClip=<attrib>`	Attribute value for dataset values higher than maximum value in **`Table`**
`-LowClip=<attrib>`	Attribute value for dataset values lower than maximum value in **`Table`**
`-Histogram End`	
`Legend End`	

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The bipole line style legend

If you specify bipole line style in a line dataset path plot, you can use the standard bipole legend file supplied with INTREPID to assign Z value levels to perpendicular line lengths. The path of this file is ***install_path*** **/lut/bipole.leg** (where ***install_path*** is the location of your INTREPID installation).

A listing of the standard bipole legend file appears below. The attribute values represent millimetres. This is an example of a dynamic range Level legend, where INTREPID will assign cutoff values at rendering (printing/previewing) time (See Level legends).

```
Legend Begin
##  used for bipole MAPCOMP plots
##   offset from path plot in mm. over dynamic range
Name = bipole
Type = Numeric
Level Begin
Table = {
Null                                8
Null                                7
Null                                6
Null                                5
Null                                4
Null                                3
Null                                2
Null                                1
Null                                .75
Null                                .5
Null                                .25
Null                                0
Null                                -.25
Null                                -.5
Null                                -.75
Null                                -1
Null                                -2
Null                                -3
Null                                -4
Null                                -5
Null                                -6
Null                                -7
Null                                -8
}
HighClip = 0
LowClip = 0
Level End
Legend End
```

See "(Bipole style)" in Including datasets in a map composition (T45b) for more information about the bipole line style.

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