

MAPINFO GRID ENGINE

MapBasic calls to the MIGRID.DLL

Compiled and edited by Jacques Paris

August 2001

I have been as careful as I could in compiling and editing this document, but I cannot not be held responsible for erroneous bits of information that would create some problems in your work. In such circumstances, only the original MapInfo documents can be regarded as the official source and if there are discrepancies between this document and the "source", or if the translation to MB standards is incorrect, I would expect that you will get in touch with me in order to give me a chance to include the necessary corrections.

jacques@paris-pc-gis.com

Based on the following documents:

GridEngine.doc, version 3, april 13, 1999 (in GridEn30.exe)

Sample code offered in the message

From: Andrew_Dressel@mapinfo.com on 06/08/2000 04:14 PM AST

Subject: MI Re: Grid Engine API sample MapBasic Application

Various code files contained in the GridHand30.exe file.

and direct e-mail contacts with Andrew Dressel.

Table of contents

Define constants and variable types (structures)

Constants:	GE_GRIDINFO_MAGIC_NUMBER	1
	GE_GRIDINFO_INVALID	
	GE_GRIDTYPE_CONTINUOUS	
	GE_GRIDTYPE_CLASSIFIED	
	GE_MAX_INFLECTIONS	
Types:	FORMAT_INFO	
	GE_COLORINFLECTIONS	2
	GE_GRID_INFO	

Grid Engine Functions for Reading

	GE_OpenGrid	3
	GE_CloseGrid	
	GE_SetInflections	
	GE_GetInflections	
	GE_GetCoordSysInfo	
	GE_GetDimensions	4
	GE_GetContinuousMinMax	
	GE_SetNullColor	
	GE_SetNullTransparent	
	GE_GetNullColor	
+3	GE_GetGridType	5
+3	GE_StartRead	
+3	GE_EndRead	
	GE_GetContinuousValue	

Grid Engine Functions for HillShading

+3	GE_OpenToAddHillshade	6
+3	GE_CloseForHillshade	
+3	GE_SetHillshade	
+3	GE_ContainHillshade	
+3	GE_DisplayHillshade	

Grid Engine Functions for Writing

-3	GE_GetDefaultContinuousWriteHandler	7
+3	GE_GetDefaultWriteHandler	
+3	GE_CountWriteHandlers	
+3	GE_FindWriteHandlers	
+3	GE_GetHandlerInfo	
+3	GE_GetDefaultFileExtension	
~3	GE_CreateContinuousGrid	8
	GE_WriteContinuousValue	
	GE_WriteNull	
+3	GE_CloseContinuousGrid	

-3 (removed in v 3) ~3 (modified in v 3) +3 (added in v 3)

"The grid toolkits are referred to as version 2 or 3. Version 3 is the latest version and is used with MIPro 5.5 and later. Version 2 is used with MIPro 5.0"

"Classified grids are not currently (*MIPro 6.5*) supported even though the header files refer to them. If/when classified support is added, a new grid toolkit would be created."¹

Changes between versions 2 and 3 are identified in the table of contents

Define constants

```
Define GE_GRIDINFO_MAGIC_NUMBER      13124 '0x3344
Define GE_GRIDINFO_INVALID           43690 '0xaaaa
Define GE_GRIDTYPE_CONTINUOUS        1
Define GE_GRIDTYPE_CLASSIFIED        2
Define GE_MAX_INFLECTIONS            255
```

Note: GE_GRIDINFO_MAGIC_NUMBER and GE_GRIDINFO_INVALID should not be changed. "They are set in the grid engine and are used to validate the GE_GRID_INFO structure."²

Define variable types (structures)

required for : findwritehandlers, gethandlerinfo

Version 1

```
Type FORMAT_INFO
    shortsSpecLevel as Smallint    'level of supported handler spec: always 1
    pszDllName as string           'name of DLL
    pszDescription as string        'description of DLL
    sNumExtensions as Smallint      'number of extensions in list: maxi 4
    pszExtensionList as string      'list of supported extensions(each 9 ch.+ null)
End Type
```

version 2 (recommended)

```
Type FORMAT_INFO
    sSpecLevel as smallint          'level of supported handler spec:
                                     ' 1 for grid handler ver.2, 2 for ver.3
    pszDllName as string            'name of DLL
    pszDescription as string         'description of DLL
    sNumExtensions as Smallint      'number of extensions in list: maxi 10
    szExtensionList as string        'list of supported extensions(each 3 ch.+ null)
End Type
```

Note: "There are 2 versions of the FORMAT_INFO structure that only differ in the way the file extensions are handled. Version 1 supports 4 extensions, each 9 characters (plus null) in length. Version

¹ From Andrew Dressel e-mail of July 31, 2001

² id

2 supports 10 extensions, each 3 characters (plus null) in length. Version 2 is the default, Either FORMAT_INFO is valid. I don't believe that long extensions work correctly, therefore it is best to use version 2 type with sSpecLevel set at 2.³

required for : getinflections, setinflections, createcontinuousgrid

```
Type GE_COLORINFLECTIONS      '(from gridtypes.h)
  sNumInflections As SmallInt  'number of inflections
  alignmentfiller(3) As SmallInt 'filler
  adValue(GE_MAX_INFLECTIONS) As Float 'z-value at which there is an inflection
  aColor(GE_MAX_INFLECTIONS) As Integer 'RGB code for corresponding adValue
End Type
```

Note: As we are in the GE_GRIDTYPE_CONTINUOUS situation only, one variable float variable planned for CLASSIFIED is not used here and a filler “forces MapBasic to expect the Float to be where the compiled and linked C code puts it: on an 8-byte boundary. Each SmallInt is 2 bytes. The one in sNumInflections plus the 3 in alignmentfiller make 8 bytes.”⁴

Note: Grid cell values that fall between 2 inflection points have a color value computed using an even color distribution between the two bounding inflection points. If cell value is greater than the maximum inflection, it will be drawn in the color at the max inflection. Similiar behavior for values less than the mininum inflection value. Inflections should be listed in increasing, sequential order.”⁵.

required for : createcontinuousgrid

```
Type GE_GRID_INFO      '(from gridtypes.h)
  lMagic As Integer     ' to check validity
  lWidth As Integer     ' number of columns in grid
  lLength As Integer    ' number of rows in grid
  ptchCoordSys As String ' coordsys description
  dMinXVal As Float     ' min X coord
  dMaxXVal As Float     ' max X coord
  dMinYVal As Float     ' min Y coord
  dMaxYVal As Float     ' max Y coord
End Type
```

³ id

⁴ From Andrew Dressel e-mail of Aug 8, 2001

⁵ From Andrew Dressel e-mail of Aug 9, 2001

Grid Engine Functions for Reading

GE_OpenGrid opens a grid file for reading

The hGrid handle that is returned from this function is passed to many of the other grid functions and is used to specify a particular grid image.

```
Declare Function GE_OpenGrid Lib "Migrid.dll" (  
    ByVal lpszFilename As String, 'name of the file to be opened  
    ByVal lCacheSize As Integer,  'amount of cache (in bytes) for this file  
    hGrid As Integer              'grid handle  
    ) As Logical                  'FALSE if no grid handler supports the file  
                                'TRUE if a grid handler can open this file
```

GE_CloseGrid closes an open grid file

```
Declare Function GE_CloseGrid Lib "Migrid.dll" (  
    hGrid As Integer              'grid handle  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_SetInflections modifies color inflections during display

```
Declare Function SetInflections Lib "Migrid.dll" (  
    hGrid As Integer,             'grid handle  
    pInflections As GE_COLORINFLECTIONS 'modified color inflections for display  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_GetInflections fills out the color inflection table currently associated with the grid

```
Declare Function GetInflections Lib "Migrid.dll" (  
    hGrid As Integer,             'grid handle  
    pInflections As GE_COLORINFLECTIONS 'color inflections for table associated  
                                        'with grid  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_GetCoordSysInfo returns the coordinate system information associated with the grid

The ptchCoordSys string will be in MapBasic CoordSys clause format.

```
Declare Function GE_GetCoordSysInfo Lib "Migrid.dll" (  
    ByVal hGrid As Integer,        'grid handle  
    ptchCoordSys As String,        'MapInfo coordinate system string  
    pdMinXVal As Float,            'bounds of the grid file in real world units  
    pdMinYVal As Float,            '  
    pdMaxXVal As Float,            '  
    pdMaxYVal As Float            '  
    ) As Logical                  'FALSE if there is an error, TRUE on success
```

GE_GetDimensions returns the number of columns and rows that comprise the grid

```
Declare Function GE_GetDimensions Lib "Migrid.dll" (  
    ByVal hGrid As Integer,                'grid handle  
    plWidth As Integer,                    'number of columns  
    plHeight As Integer                    'number of rows  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```

GE_GetContinuousMinMax returns the mini and maxi cell (zed) values in the grid file

```
Declare Function GE_GetContinuousMinMax Lib "Migrid.dll" (  
    ByVal hGrid As Integer,                'grid handle  
    pdMinZVal As Float,                    'minimum cell value (zed values)  
    pdMaxZVal As Float                    'maximum cell value (zed values)  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```

GE_SetNullColor modifies the display characteristics of null cells

```
Declare Function GE_SetNullColor Lib "Migrid.dll" (  
    hGrid As Integer,                      'grid handle  
    clrNull As Integer                      'color to be used to display null cells  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```

GE_SetNullTransparent displays null cells as transparent

```
Declare Function GE_SetNullTransparent Lib "Migrid.dll" (  
    hGrid As Integer                        'grid handle  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```

GE_GetNullColor returns the display settings for the null cells

```
Declare Function GE_GetNullColor Lib "Migrid.dll" (  
    ByVal hGrid As Integer,                'grid handle  
    puchIsNullTransparent as Smallint,    '=1 null cells transparent;  
                                           '=0 non transparent with color pclrNull  
    pclrNull as Integer                    'colour of non transparent null cells  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```


GE_GetGridType returns a flag specifying if this is a continuous or classified grid

```
Declare Function GE_GetGridType Lib "Migrid.dll" (  
    ByVal hGrid As Integer,      'grid handle  
    GridType as Smallint         'GE_GRIDTYPE_CONTINUOUS only supported yet  
    ) As Logical                'FALSE if there is an error  
                                'TRUE on success
```

GE_GetContinuousValue retrieves individual cell values from a grid

```
Declare Function GE_GetContinuousValue Lib "Migrid.dll" (  
    ByVal hGrid As Integer,      'grid handle  
    ByVal lCol As Integer,       'x position of cell in grid  
    ByVal lRow As Integer,       'y position of cell in grid  
    pdValue As Float,           'cell value  
    puchIsNull As SmallInt       '1 if null cell, 0 otherwise  
    ) As Logical                'FALSE if there is an error  
                                'TRUE on success
```

GE_StartRead allows the grid handler to prepare for reading

GE_StartRead needs to be called before GE_GetContinuousValue is called.

```
Declare Function GE_StartRead Lib "Migrid.dll" (  
    ByVal hGrid As Integer,      'grid handle  
    ) As Logical                'FALSE if there is an error  
                                'TRUE on success
```

GE_EndRead allows the grid handler to cleanup

When done reading, GE_EndRead needs to be called.

```
Declare Function GE_EndRead Lib "Migrid.dll" (  
    ByVal hGrid As Integer      'grid handle  
    ) As Logical                'FALSE if there is an error  
                                'TRUE on success
```

Grid Engine Functions for HillShading

GE_OpenToAddHillshade opens the grid file in read-write mode to add hillshade data

```
Declare Function GE_OpenToAddHillshade Lib "Migrid.dll" (  
    ByVal pszFilename As String, 'name of the file to be opened  
    ByVal CacheSize As Integer,   'amount of cache (in bytes) for this file  
    PhGrid As Integer             'grid handle  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_CloseForHillshade closes a grid file that had been opened using
GE_OpenToAddHillshade()

```
Declare Function GE_CloseForHillshade Lib "Migrid.dll" (  
    phGrid As Integer             'grid handle  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_SetHillshade sets hillshade values for each non-null grid cell

```
Declare Function GE_SetHillshade Lib "Migrid.dll" (  
    hGrid As Integer,             'grid handle  
    lColumn as Integer,           'x position of cell in grid  
    lRow as Integer,              'y position of cell in grid  
    SHSValue as Smallint          'value to give the cell  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_ContainHillshade whether grid file contains any hillshade information

```
Declare Function GE_ContainHillshade Lib "Migrid.dll" (  
    hGrid As Integer,             'grid handle  
    pbHasHillshadeData as Logical 'TRUE if grid contains HillShade  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

GE_DisplayHillshade affects the display of grid files

```
Declare Function GE_DisplayHillshade Lib "Migrid.dll" (  
    hGrid As Integer,             'grid handle  
    bDisplayUsingHillshade        'TRUE is image displayed with HS  
    ) As Logical                  'FALSE if there is an error  
                                'TRUE on success
```

Grid Engine Functions for Writing

GE_GetDefaultWriteHandler returns information about the default writeable grid handler

```
Declare Function GE_GetDefaultWriteHandler Lib "Migrid.dll" (  
    ByVal sGridType As SmallInt,            'GE_GRIDTYPE_CONTINUOUS only supported yet  
    ptchHandlerName As String            'Name of handler returned  
    ) As Logical                            'FALSE if there is an error  
                                           'TRUE on success
```

GE_CountWriteHandlers returns the number of writeable grid handlers found

```
Declare Function GE_CountWriteHandlers Lib "Migrid.dll" (  
    sGridType as Smallint,                'GE_GRIDTYPE_CONTINUOUS only supported  
    psNumHandlers as Smallint            '# of writeable grid handlers found  
    ) As Logical                          'FALSE if there is an error  
                                           'TRUE on success
```

GE_FindWriteHandlers returns information about the writeable grid handlers

```
Declare Function GE_FindWriteHandlers Lib "Migrid.dll" (  
    sGridType as Smallint,                'GE_GRIDTYPE_CONTINUOUS only supported  
    ppFormatInfo as FORMAT_INFO,        'information for each handler  
    sMaxFormatInfo as Smallint            '# of handlers  
    ) As Logical                          'FALSE if there is an error  
                                           'TRUE on success
```

GE_GetHandlerInfo returns information about a single grid handler

```
Declare Function GE_GetHandlerInfo Lib "Migrid.dll" (  
    sGridType as Smallint,                'GE_GRIDTYPE_CONTINUOUS only supported  
    ptchHandlerFilename as string,       'name of grid handler  
    pFormatInfo as FORMAT_INFO           'handler information  
    ) As Logical                          'FALSE if there is an error  
                                           'TRUE on success
```

GE_GetDefaultFileExtension returns the default file extension for a grid handler

```
Declare Function GE_GetDefaultFileExtension Lib "Migrid.dll" (  
    sGridType as Smallint,                'GE_GRIDTYPE_CONTINUOUS only supported  
    ptchHandlerFilename as string,       'name of grid handler  
    ptchExt as string                    'default file extension  
    ) As Logical                          'FALSE if there is an error  
                                           'TRUE on success
```

GE_CreateContinuousGrid create a new continuous grid file

```
Declare Function GE_CreateContinuousGrid Lib "Migrid.dll" (  
    ptchHandlerName As String,                    'grid handler to be used to write  
                                                 'grid file  
    ptchFilename As String,                      'name of the grid file being  
                                                 'created  
    pInflections As GE_COLORINFLECTIONS,        'default color inflection table for  
                                                 'this file  
    ByVal uchIsNullTransparent As SmallInt,     'display characteristics of null  
                                                 'cells; transparent null  
                                                 'cells, set to 1  
    clrNull As Integer,                          'color of non transparent non null cells  
                                                 'if uchIsNullTransparent set to 0  
    pGridInfo As GE_GRID_INFO,                  'additional information about the grid  
    ByVal dMinVal As Float,                     'minimum of range of cell zed values  
    ByVal dMaxVal As FLoat,                    'maximum of range of cell zed values  
    phGrid As Integer                           'grid handle returned if grid opened  
                                                 'FALSE if there is an error  
                                                 'TRUE on success  
    ) As Logical
```

GE_WriteContinuousValue writes a cell value to a grid

```
Declare Function GE_WriteContinuousValue Lib "Migrid.dll" (  
    ByVal hGrid As Integer,                      'grid handle  
    ByVal lCol As Integer,                       'column number  
    ByVal lRow As Integer,                      'row number  
    ByVal dValue As Float                       'z value  
                                                 'FALSE if there is an error  
                                                 'TRUE on success  
    ) As Logical
```

GE_WriteNull writes a null cell at the specified location

```
Declare Function GE_WriteNull Lib "Migrid.dll" (  
    hGrid as As Integer,                        'grid handle  
    lCol as Integer,                            'column number  
    lRow as Integer                             'row number  
                                                 'FALSE if there is an error  
                                                 'TRUE on success  
    ) As Logical
```

GE_CloseContinuousGrid closes the file that had been opened for writing

```
Declare Function GE_CloseContinuousGrid Lib "Migrid.dll" (  
    phGrid As As Integer                        'grid handle  
                                                 'FALSE if there is an error  
                                                 'TRUE on success  
    ) As Logical
```