MODSECT Documentation

Version 4.42
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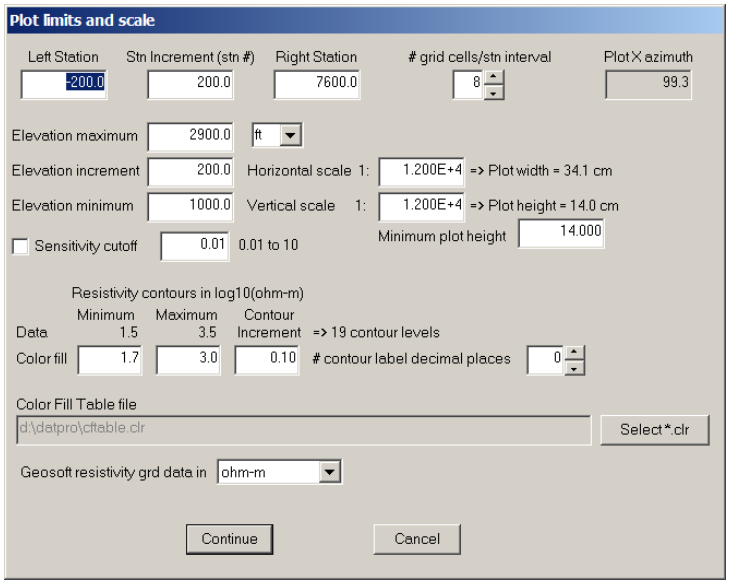
Color-Filled-Contour Plots of Inversion-Model Sections

MODSECT reads Zonge inversion-program model files and creates color-filled contour plots of inversion-model-section resistivity or IP. Modsect can read scsinv m1d (CSAMT), steminv m1d (TEM), ts2dip IPM (resistivity/IP) or scs2d .mtm (far-field CSAMT/AMT) files. Plots may be viewed on screen or exported for hardcopy. Modsect can generate script and data files for use with Surfer v6 or later. It can also export GeoSoft Oasis montaj control and data files which modsect.gx will turn into finished plots. Modsect also exports plots directly to the Windows Printer Manger, windows metafiles (wmf) or portable network graphics (png) raster image files. Output files are given the same filename stem as the source inversion model file, plus a one-letter suffix. Resistivity section plot-file names end with a "r" while IP model-section plot-file names end with a "p".

Typing "modsect mdsdemo" on the command line runs modsect to produce a plot of the sample inversion model held in mdsdemo.* files. If you type “modsect” without a command-line argument, modsect will ask you to choose from a list of model files present in the current directory. Once it has the name of a valid model file, modsect shows a series of interactive dialog boxes to allow plot-parameter editing. (If $auto=yes in the mde file, modsect skips interactive verification of plot attributes, exports the plot to a hardcopy format and then stops.)

The first dialog box displays axis limit, plot scale and contour parameters:

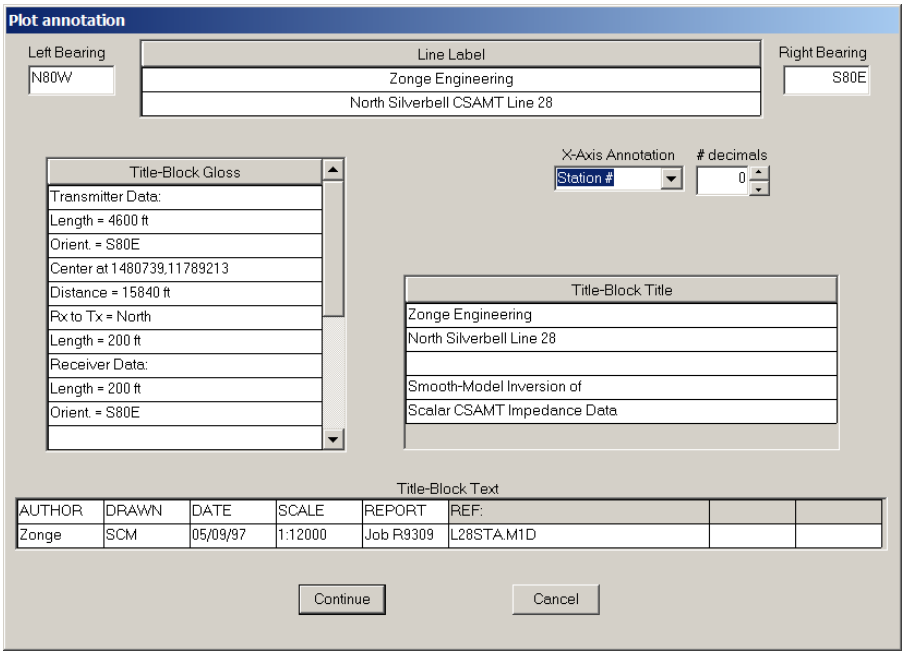


You can move from field to field with the mouse or tab and shift+tab keys to edit plot attributes. If left station < right station then station numbers will increase from left to right across the plot. Conversely, if left station > right station, station numbers will increase from right to left. Plot size is controlled both by station and elevation limits and by plot scale. If necessary, the top and bottom margins are increased to reach the minimum plot height. When the sensitivity cutoff box is checked, the bottom of the model section is trimmed when model-pixel sensitivity drops below the sensitivity-cutoff value. Increasing the sensitivity cutoff trims off more of the model section.

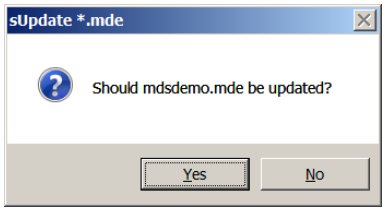
The contour increment and color fill range can be modified by editing a set of fields near the bottom of the Plot limits and scale dialog. Resistivity contours are log-spaced and set in units of log10(ohm-m). IP contours are linear and use units of mrad (for CR) or msec (for TDIP). You can change the default color-fill spectrum by clicking on the Select *.clr button and using the subsequent open-file dialog to select a Surfer format *.clr file (file formats are documented in the appendix).

Pressing ESC or clicking on the Cancel button aborts plot production. Click on the Continue button to save your plot scale changes and to go on to the next dialog.

A second dialog box displays title-block annotation text.

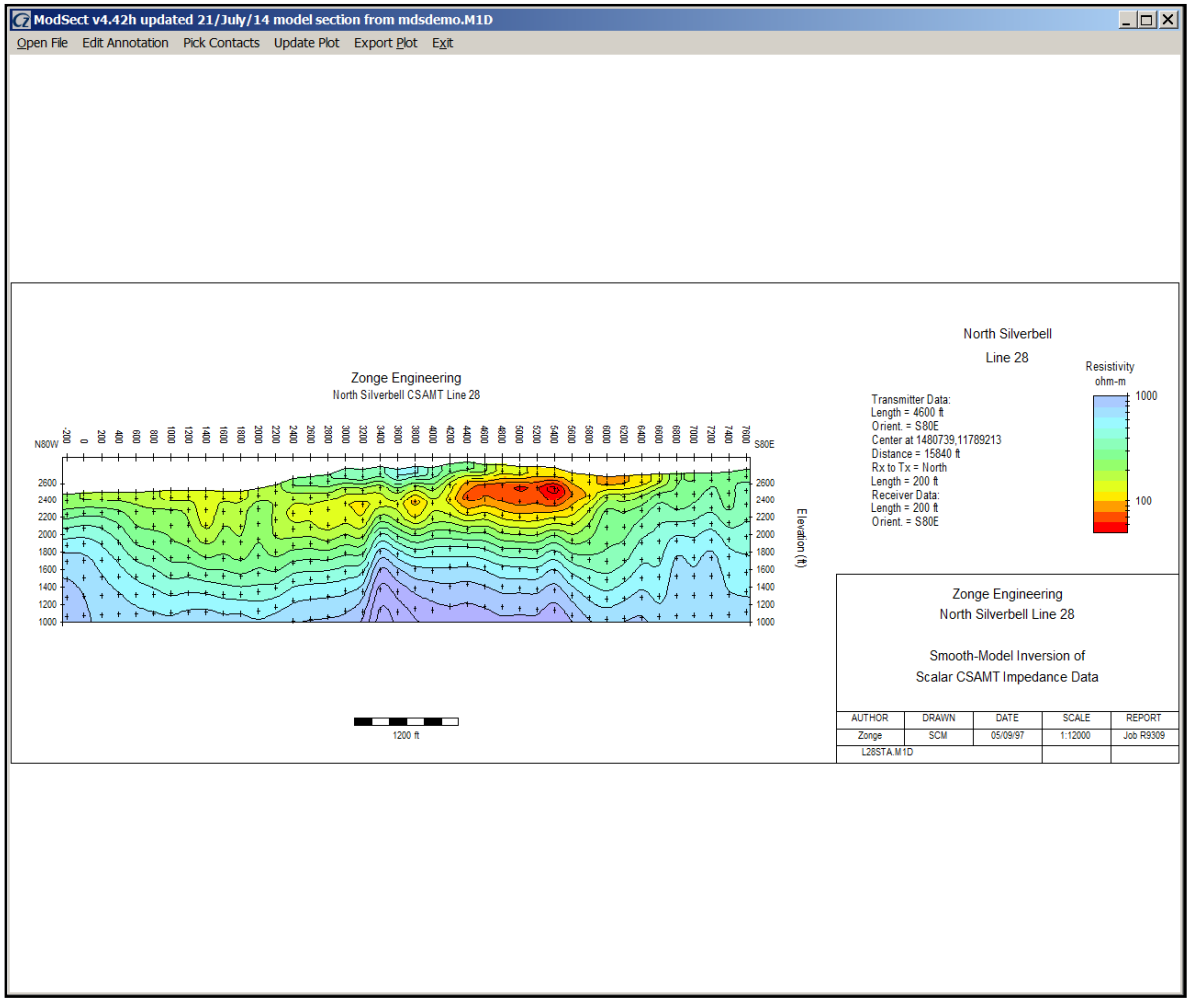


Left and right bearings are plotted at either end of the model-section plot and line-title text is centered above the section. Title block gloss, title and text annotation is plotted to the right of the model section. Default text values are generated from mde file information and from parameters stored in inversion-model files. Arbitrary modsect annotation text may be explicitly specified in mde files. When you click on the Continue button, modsect shows a dialog box allowing the option of updating the mde file.



Plot annotation, axis limit and scale parameters are saved as a block of mde file keywords. With the mde file update option, Modsect either createsa new mde file if one does not already exist or updates an existing mde file. On subsequent runs, modsect will pick up plot scale, axis limit and annotation information from mde file keyword=value record. Saving plot-attribute keywords in mde files is recommended, as it provides an archival record of plot parameters and allows automated plot production from batch files.

After all plot attributes are specified, modsect shows the model section on screen.



Once the model section is shown on screen, a menu along the top of the screen shows a set of options. **Open File** pops up a file select dialog, allowing another pass through the initial dialogs which specify plot attributes. Selecting Open File is useful if you need to go back and reset axis limits, plot scales or contour and color fill attributes. **Edit Annotation** opens the plot annotation dialog described earlier, allowing interactive editing of the plot's annotation text. **Pick Contacts** is an automated way to estimate contact locations on smooth-model sections. It places contacts along the trace of maximum model resistivity or IP gradient. **Update Plot** replots the on screen model section. **Export Plot** has a selection of plot export options; **Printer**,**CSV File**, **WMF File**, **PNG File**, **Surfer Script** or **Geosoft Files**. Selecting CSV File exports pixel-centered ,model section values to a comma-separated-values (csv) file with columns of east, north, elevation, station, line, model resistivity, log10(resistivity) and optionally model IP. Window's metafiles (wmf) can be pasted directly into MS-Word documents. Exporting to portable network graphics (png) files creates raster images suitable for shipping across the Internet. Surfer Script and Geosoft Script generate files for producing high-quality model-section plots, which may then be edited to suit specific needs. Selecting the Exit menu item closes Modsect.

Modsect may be run from batch files for more automated plot production. If "auto=yes" in the mde file, modsect skips interactive verification of plot parameters and does not try to update mde files. If "auto=no" in the mde file or is missing, modsect shows its interactive dialogs to allow interactive plot parameter verification and editing.

To further facilitate batch-file operation, modsect scans its command line for arguments. The first argument should be a model filename, possibly followed by other, optional command-line arguments. Command line arguments may be either upper or lower case. Optional arguments start with a "-" symbol, followed by a keyword, a ":" symbol and then a value. Command line arguments should not have any internal spaces.

Modsect uses the model-file name as a template to search for a matching mde-file name. If a matching mde file is present, opens it to scan for plot-attribute specifications. Modsect then reviews any optional command-line arguments for possible specification updates. For ts2dip resistivity/IP inversion models, "–cntvar=resistivity" or "–cntvar=ip" select between plotting inversion-model resistivity or IP. Modsect also looks for –plot=surfer, -plot=geosoft, -plot=wmf, -plot=printer, or –plot=png on the command line, to select a hardcopy output format.

Given a ts2dip or s2dip model files with the name s2demo.*, running a batch file with the following two lines will produce a Geosoft con, xyz, gxf and zon files for subsequent production of plots within Oasis montaj using modsectgx.gx. Run modsectgx.gx from the montaj GX|Run GX mentu. Then pick s2demoR.con to create a plot of inversion-model resistivity and pick s2demop.con to generate a inversion-model IP plot.

```
call modsect s2demo -cntvar:res –plot=geosoft
call modsect s2demo -cntvar:ip  –plot=geosoft
```

Using –plot=surfer instead of –plot=geosoft, will generate Surfer script and data files named s2demoR.* and s2demoP.*, which may then be used by the Surfer script program, GS_Scripter to generate surfer plots.

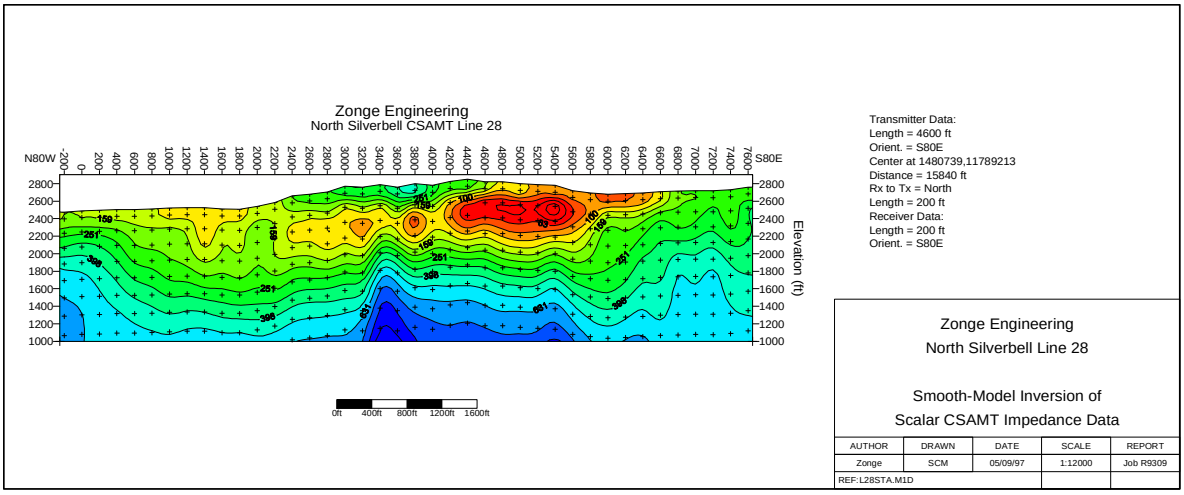


Figure 1: CSAMT model-section produced by running "modsect mdsdemo –plot=surfer" and then using surfer's gs_scripter to generate a surfer plot

MDE File Format (Zonge data-processing-control file)

mde files contain one or more "mode" lines. Program-control mode lines start with a $, optionally followed by a program name and a ":". Next is a keyword followed by an = and then a keyword value. Spaces may be included between elements of the mode line. Putting a ! or " character before the $, inactivates a mode line, turning into an inert comment line which is ignored by modsect. Modsect will read all mode lines that have either no program name or "$ modsect:", "$gsplot:" or "$s2dplot:". It will ignore mode lines which contain other program names.

modsect mde file variables:

CLIENT - company for which survey was run (text).
PROJECT - project name (text).
JOBNUMB - job number.
JOBDATE - date when survey was conducted.
JOBLINE - line number.
BRGLINE - forward line bearing (in direction of increasing station numbers).
BRGBACK - line back bearing (in direction of decreasing station numbers).
LNUNITS - length units (m, km, ft or kft).
AUTO - yes = batch file mode, no = interactive mode in Zonge data processing programs.

$ MODSECT: - identifies keywords intended specifically for modsect.
PlotExport - hardcopy plot type (Printer, WMF, PNG, Surfer or GeoSoft)
LNTITLE? - text centered over top of model section (up to two lines).
BRGLEFT - line bearing annotation for left end of line.
BRGRIGHT - line bearing annotation for right end of line.
TBTITLE? - title block title text (up to five lines).
TBLABEL? - title block subtext labels (five labels).
TBTEXT? - title block subtext (five blocks of subtext).
TBGLOSS?? - survey configuration annotation text (up to 20 lines).
XSCALE - horizontal scale of model-section plot (ground m per plot m).
YSCALE - vertical scale of model-section plot (ground m per plot m).
YSIZE - minimum plot height (cm).
StnLeft - first station on left edge of plot (stations increase from left to right if StnLeft<StnRight and from right to left if StnLeft>StnRight).
StnRight - last station on right edge of plot.
StnInc - posted station interval (stn #).
StnDec - number of decimal places on posted station numbers (0 to 3).
ElvMax - maximum elevation on model section (length units).
ElvMin - minimum elevation on model section (length units).
ElvInc - tick mark increment on model section elevation axis (length units).
TOPO - yes => draw line along topographic surface, no => no line in geosoft plots.
CNTVAR - contour variable (resistivity or IP).

Resistivity color-fill limits and contour attributes.
CRMIN - minimum resistivity contour-color-fill level (log10(ohm-m)).
CRMAX - maximum resistivity contour-color-fill level (log10(ohm-m)).
CRINC - resistivity contour interval (log10(ohm-m)).
CRDEC - number of decimal places on resistivity contour label (0 to 3).
RScutoff - resistivity-sensitivity cutoff (0.01 to 10 percent)

IP color-fill limits and contour attributes.
CPMIN - minimum IP contour-color-fill level (mrad or msec).
CPMAX - maximum IP contour-color-fill level (mrad or msec).
CPINC - IP contour interval (mrad or msec).
CPDEC - number of decimal places on IP contour label (0 to 3).
PScutoff - IP-sensitivity cutoff (0.01 to 10 percent)

Listing of modsect mde-file keywords from mdsdemo.mde:

```
$ CLIENT=Zonge Engineering
$ PROJECT=North Silverbell
$ JOBNUMB= 9309
$ JOBDATE=Nov 93
$ JOBLINE=28
$ BRGLINE=S80E
$ BRGBACK=N80W
$ STNLO =     -2.0
$ STNDELT=     2.0
$ LBLFRST=    -200.0
$ LBLDELT=     200.0
$   TXLEN=4600 ft
$   TXBRG= S80E
$   TXCX=1480739
$   TXCY=11789213
$   TXDIS=15840 ft
$   RX2TX= North
$   RXLEN=200ft
$   RXBRG=S80E
$   UNITS=  FEET
$ AUTO=NO
$ MODSECT: PlotExport = Surfer
$ MODSECT: LNUNITS = ft
$ MODSECT: LNTITLE1 = Zonge Engineering
$ MODSECT: LNTITLE2 = North Silverbell CSAMT Line 28
$ MODSECT: BRGLEFT= N80W
$ MODSECT: BRGRIGHT= S80E
$ MODSECT: TBTITLE1 = Zonge Engineering
$ MODSECT: TBTITLE2 = North Silverbell Line 28
$ MODSECT: TBTITLE3 =
$ MODSECT: TBTITLE4 = Smooth-Model Inversion of
$ MODSECT: TBTITLE5 = Scalar CSAMT Impedance Data
$ MODSECT: TBLABEL1 = AUTHOR
$ MODSECT: TBLABEL2 = DRAWN
$ MODSECT: TBLABEL3 = DATE
$ MODSECT: TBLABEL4 = SCALE
$ MODSECT: TBLABEL5 = REPORT
$ MODSECT: TBLABEL6 = REF:
$ MODSECT: TBTEXT1 = Zonge
$ MODSECT: TBTEXT2 = SCM
$ MODSECT: TBTEXT3 = 05/09/97
$ MODSECT: TBTEXT4 = 1:12000
$ MODSECT: TBTEXT5 = Job R9309
$ MODSECT: TBTEXT6 = L28STA.M1D
$ MODSECT: TBGLOSS01 = Transmitter Data:
$ MODSECT: TBGLOSS02 = Length = 4600 ft
$ MODSECT: TBGLOSS03 = Orient. = S80E
$ MODSECT: TBGLOSS04 = Center at 1480739,11789213
$ MODSECT: TBGLOSS05 = Distance = 15840 ft
$ MODSECT: TBGLOSS06 = Rx to Tx = North
$ MODSECT: TBGLOSS07 = Length = 200 ft
$ MODSECT: TBGLOSS08 = Receiver Data:
$ MODSECT: TBGLOSS09 = Length = 200 ft
$ MODSECT: TBGLOSS10 = Orient. = S80E
$ MODSECT: XSCALE =   1.2000E+4   Horizontal scale  (plot X-axis)
$ MODSECT: YSCALE =   1.2000E+4   Vertical scale    (plot Y-axis)
```

```
$ MODSECT: YSIZE  =       14.00   Min plot height including margins (cm)
$ MODSECT: StnLeft  =     -200.   First station on left edge of plot
$ MODSECT: StnRight =     7600.   Last station on right edge of plot
$ MODSECT: StnDec   =      0      # station-number decimals (0 to 3)
$ MODSECT: StnInc   =    200.00   Station interval (stn #)
$ MODSECT: ElvMin   =   1000.00   Minimum elevation (plot Y-axis)
$ MODSECT: ElvMax   =   2900.00   Maximum elevation (plot Y-axis)
$ MODSECT: ElvInc   =    200.00   Elevation tick interval
$ MODSECT: TOPO   = YES           Draw line along topographic surface?
$ MODSECT: CNTVAR = Resistivity   Contour variable (resistivity or IP)
$ MODSECT: CRMIN  =       1.70    Res contour color minimum (log10(ohm-m))
$ MODSECT: CRMAX  =       3.00    Res contour color maximum (log10(ohm-m))
$ MODSECT: CRINC  =       0.10    Res contour interval (log10(ohm-m))
$ MODSECT: CRDEC  =       0       # res-contour-label decimals (0 to 3)
$ MODSECT: RScutoff =     0.01    Resistivity-sensitivity cutoff (percent)
```

Modsect configuration file (modsect.cfg)

Modsect.cfg is an ASCII file with keywords setting parameters used to configure the modsect program. Every time modsect is run, it looks for modsect.cfg in the current working directory, then the directory holding modsect.exe and finally in operating system -DOS path directories.

Modsect.cfg may contain any number of blank or comment lines, which may be located anywhere in the file. Comment lines begin with a !, /, \ or " character. Modsect ignores all blank and comment lines.

Modsect.cfg contains one or more active "mode" lines with the same structure used in mde files. Mode lines begin with a $ character, followed by a keyword, an = and then a mode value. Spaces may be included between elements of the mode line. Putting a ! character before the $ inactivates a mode line by creating a comment line, which will modsect ignore.

modsect.cfg file variables:

PlotExport - hardcopy type (Printer, WMF, PNG, Surfer or GeoSoft)
SurferVersion - Surfer version number (6 or 7)
PageUnits - Surfer page units (inches, cm)

Listing of modsect.cfg:

```
! Program modsect configuration file, last modified 31/July/01 by SCM
! Blank lines are ignored.
! Comment lines start with ! and are ignored.
! Active mode lines start with $ and are used.

! Default hardcopy plot type, select one of seven.
!$ PlotExport = Printer
!$ PlotExport = WMF
!$ PlotExport = CSV
$ PlotExport = Surfer
!$ PlotExport = GeoSoft

! Surfer version number, select one of two.
!$ SurferVersion=6
$ SurferVersion=7

! Surfer page units, select one of two.
$ PageUnits=inch
!$ PageUnits=cm
```

Modsect color-fill file (cftabel.clr)

CfTable.clr is an ASCII file specifying the color spectrum to use for color fills. The installation version has a blue-to-red rainbow spectrum, but cftable.clr can be customized to suit individual tastes. CfTable.clr uses a Golden Software's Surfer format, so sample Surfer clr files with different color spectrums can be copied from the Surfer\Samples subdirectory.

Listing of cftable.clr:

```
ColorMap 1 1
       0     178     178     255
      25     153     255     255
      50     128     255     128
      75     255     255       0
     100     255       0       0
```

cftable.clr file variables:

S2dplot ignores the header line "`ColorMap 1 1`", but it should be included for compatibility with Surfer.

The remaining numerical records specify range, red, green and blue values for a variable number of anchor points, where
Range = percent between minimum and maximum contoured data (0 to 100),
Red = amount of red color from 0=none to 255=maximum,
Green = amount of green color from 0=none to 255=maximum,
Blue = amount of blue color from 0=none to 255=maximum.

Colors are interpolated between anchor points to get continuous gradation of the color-fill spectrum. Range values should be ordered from low to high with no duplicate values.

Model Section csv format (from menu option Export Plot|CSV File)

model section.csv files hold pixel-centered model-section values in a tabular comma-separated-value format

Partial model section csv file listing:

```
East,North,Elevation,XPixel,Station,Line,ResInv,log10(ResInv),IP_Inv
1472490,11773343,2475,200,-200,28,162.4,2.2106,0
1472490,11773343,2396,399.582,-200,28,162.4,2.2106,0
1472490,11773343,2234,600.151,-200,28,225.6,2.3533,0  .     .     .     .
      .     .     .     .
      .     .     .     .     .     .     .     .
```

*mtm.csv file variables:

Line one holds column labels.

East	- pixel center easting (length units).
North	- pixel center northin (length units).
Elevation	- pixel center elevation (length units).
XPixel	- pixel center distance along line (length units).
Station	- pixel center station number
Line	- line number
ResInv	- inversion model resistivity (ohm-m).
log10(ResInv)	- log10 of inversion model resistivity (log10(ohm-m)).
IP_Inv	- inversion model IP, default = 0 (mrad or msec).

Modsect Installation Notes

Modsect requires a computer running Windows 9?, ME, NT or 2000. It requires “high-color”, “true-color” or 16-bit graphics.

The following files should be distributed with modsect:

Program files:

MODSECT.EXE - core plotting program
MODSECT.CFG - configuration file
MODSECTGX.GX - GX for creating Oasis montaj plots, copy to <GEOSOFT>\gx directory
ZLOGO.CON - GeoSoft mapplot control file for creating Zonge Engineering logo,
Should be stored in the geosoft directory.
CFTABLE.CLR - color table in Surfer color-table file format, read by modsect.

Sample inversion-model files:

MDSDEMO.MDE - sample plot control and annotation file.
MDSDEMO.SCS - sample scsinv survey-configuration and inversion-control file.
MDSDEMO.M1D - sample scsinv inversion-model file.

Modsect program files should be placed in a hard-drive directory on your computer’s operating system path. If you are using Oasis montaj, copy modsectgx.gx to the <geosoft>\gx directory. After unpacking modsect files, edit modsect.cfg and select appropriate default $PlotExport, $SurferVersion and $PageUnits mode lines.