

# 3 User Settings

Various settings allow the user to configure the software to function to his/her preference. It is important to review all the settings prior to using the software to ensure they are set to produce the desired results.

## 3.1 Units

Unit settings affect input interpretation and representation.

### Angle Unit

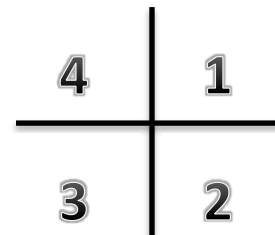
The angle unit may be set to 360<sup>000</sup> (DMS), 360° dec (DEG) or 400 gon (GRD). Angular and directional input and output will honour this setting for all functions.



### Direction Reference

Direction reference may be set to North Azimuth (AZ), South Azimuth (SA), or Quadrant Bearings (QB).

- North azimuths are defined by declaring north to be 0° (or 0g) while south azimuths are defined by declaring south to be 0° (or 0g), and then measuring the full circle in a clockwise direction. Azimuth input and output are subject to both angle unit and direction reference settings.
- Quadrant bearings split the circle into NE, SE, SW, and NW quadrants, always measuring angles from north or south towards east or west. Quadrants are numbered 1-4 to facilitate fast input of quadrant bearings. For example, to enter a bearing of N36°43'15"W; the user would enter *436.4315* because the NW quadrant = quadrant 4.



## Primary Distance Unit

The primary distance unit may be set to metres or feet for display and conversion purposes.

The primary distance unit setting DOES NOT AFFECT JOB COORDINATES. The primary distance unit is for input/output display only. The setting changes what happens when a unit conversion is performed and affects geodetic<>grid input/output. To change a job from metric to imperial or vice versa it is required that you scale all points. This behaviour is consistent with how a CAD drawing operates. The coordinates are essentially unit-less and this setting determines how the coordinates will be handled for input and output.

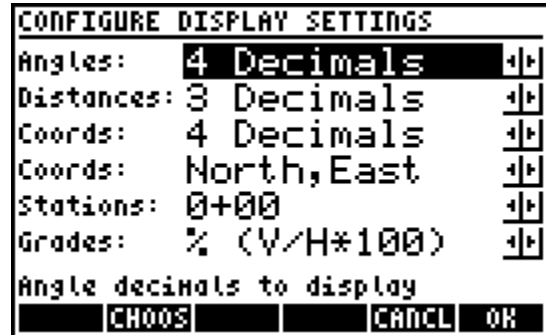
## Foot Definition

The foot definition setting may be set to US Survey Foot or International Foot for use with all conversions between metric and imperial.

- The definition of a US Survey Foot is exactly  $1200/3937$  metres, approximately 0.304800609601 metres.
- The definition of the International Foot is exactly 0.3048 metres.

## 3.2 Display

Display settings change the displayed precision of numbers, the order of coordinates and the formats of stations and grades.



### Angle Decimals

Angle decimals may be set to display between 4 and 7 decimals. A DMS example of 4 decimals is 0°00'00" and of 7 decimals is 0°00'00.000". Modify the precision of angle decimals from the main menu by using the key followed by the or key.

### Distance Decimals

Distance decimals may be set to display between 1 and 7 decimals. Modify the precision of distance decimals from the main menu by using the or keys. This setting also applies to stations and grades.

### Coordinate Decimals

Coordinate decimals may be set to display between 1 and 7 decimals. Modify the precision of distance decimals from the main menu by using key followed by the or key.

### Coordinate Display

The coordinate display format may be set to display coordinates in the order of (Northing, Easting), (Easting, Northing) or (X,Y). This setting changes the order and labels for most cases where coordinates are input and/or displayed.

### Stationing Display

The stationing display format may be set to display stations in the format 0+00, 0+000 or without any formatting.

### Grade Display

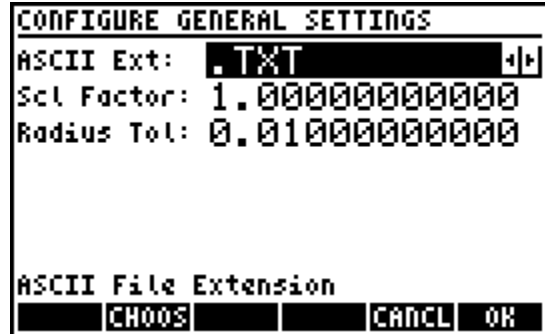
The grade display format may be set to display grades as percentage grades (V/H\*100), ratio V:H, or ratio H:V. This setting applies to input and output of grades.

### 3.3 General

General settings control the default ASCII file extension, allow the user to enter a user-defined scale factor and define a radius tolerance distance for curves.

#### ASCII File Extension

Choose the file extension to use when exporting ASCII files to the SD card.



#### Scale Factor

Various applications support a user-defined scale factor. Softkeys labelled **xUSF** or **/USF** allow distance input to be multiplied or divided by this scale factor.

#### Radius Tolerance

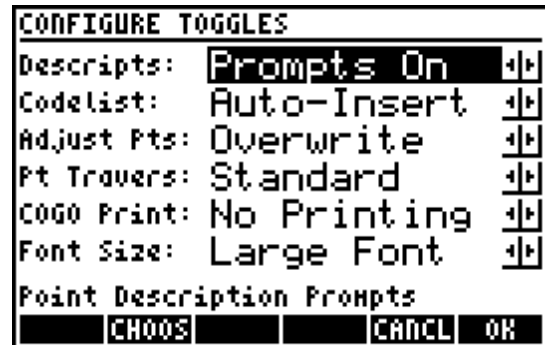
Enter a value to set the radius tolerance between 0 and 0.1 units, used primarily by **Inverse Curve** and **Area by Points**. The distance from the BC point to the Radius point and the distance from the EC point to the Radius point cannot differ by more than this value, otherwise the points will not define a valid curve. The average of the two values  $((BC..CC+EC..CC)/2)$  is always used as the radius for a curve.

### 3.4 Toggles

Toggles are used to turn on/off certain features, including point description prompts, codelist translation, adjusted points numbering and **Point Traverse** mode selection

#### Description Prompts

Point description prompts are optional. This setting controls the presence of point description prompts when storing point coordinates.



#### Codelist Translation

Version 3.59 introduced an updated codelist system that allows the user to create a list of codes with associated description attributes. This toggle controls whether the program will automatically translate a code to its description. For example, with the toggle ON, a user could enter the code 19 as a point

description and the program would automatically insert the description for that code. With the toggle OFF, the description input is left as entered.

### **Adjusted Points**

Adjusted points are points that have been somehow manipulated (scale, rotate, mirror, compass rule, shift, transformed, etc.). This toggle controls whether the adjusted coordinates will overwrite the original coordinates, or if new re-numbered points with an additive number are stored. For example, consider a case where you wish to scale a point with coordinates 1000,1000 by a factor of 2 from the origin, and let us assume that the point number is 1. When the setting is set to “overwrite”, the coordinates of point 1 will be overwritten with 2000,2000. When the setting is set to “re-number” and an additive number of 100 is provided, a new point 101 is created with coordinates 2000,2000.

### **Point Traverse Mode**

**Point Traverse** features a *Standard* and a *Sideshot* operating mode. This setting controls how the **Point Traverse** program will operate when you run it. See the [Point Traverse](#) section for more details.

### **COGO Print**

Toggle automatic printing to an infrared printer when using the **Point Traverse**, **Inverse**, **Intersections** and **Area by Points** programs. When set to *Auto Print*, the calculator will send print commands to the printer when completing calculations. This toggle should only be set when using a printer.

### **Font Size**

Sets the font size of input screen prompts and choose box items. The large font is the same font size as the main menu items, while the small font is the system mini font.


### 3.5 Geodetic

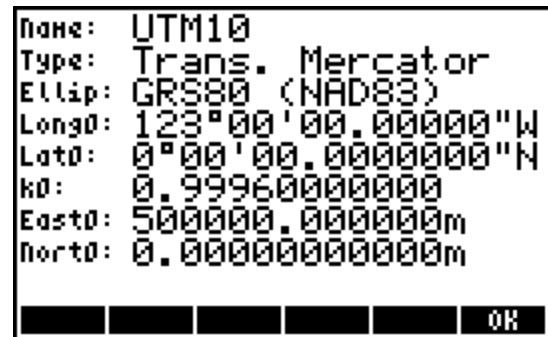
Geodetic settings allow the selection of a coordinate system with pre-defined projection parameters for grid<>geodetic conversions, geodesic ellipsoid calculations and KML file export. Coordinate systems are grouped by region and projection type. Available reference ellipsoids vary depending on the coordinate system selected.

#### Coordinate Groups

The available coordinate groups include:

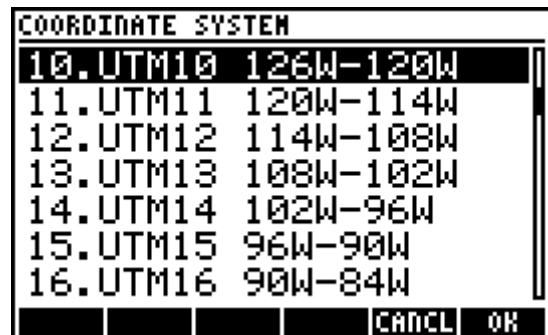
1. UTM
2. US State Plane
3. Other US
4. Canadian
5. European
6. Australia, New Zealand
7. South American
8. Central American
9. African
10. Middle East
11. Gauss-Krüger 3° Zones
12. Gauss-Krüger 6° Zones
13. [Custom Projections](#)

Note the  **Cur?** softkey. This option displays the projection parameters of the currently selected coordinate system.



#### Coordinate Systems

The projection parameters for each coordinate system available within each group are completely pre-defined. Most of the coordinate systems are based on the widely used Transverse Mercator and Lambert Conformal Conic projections.



## Reference Ellipsoid

Reference ellipsoids in use for many regions of the world have undergone revisions over time for numerous reasons. The available reference ellipsoids include:

1. Clarke 1866 (NAD27)
2. GRS80 (NAD83)
3. WGS84
4. International 1924 (Hayford)
5. Clarke 1880 (ARC)
6. Clarke 1880 (IGN)
7. Clarke 1880 (RGS)
8. Airy 1830
9. Australian National Spheroid
10. Krassovsky 1940
11. Bessel 1841
12. Parametry Zemli 1990 (PZ-90)
13. [UserDef Ellipsoid](#)



Choosing the appropriate reference ellipsoid is very important. Some coordinate systems limit the available reference ellipsoid selections to ensure a correct selection. **WHEN WORKING WITH CUSTOM PROJECTIONS IT IS ALSO POSSIBLE TO CREATE A USER-DEFINED ELLIPSOID.** [Appendix A](#) LISTS THE ELLIPSOID PARAMETERS.

## Mean Earth Radius

Choose or enter the mean earth radius to use for elevation factor calculations. Options include:

- 6372000m – Commonly used mean earth radius.

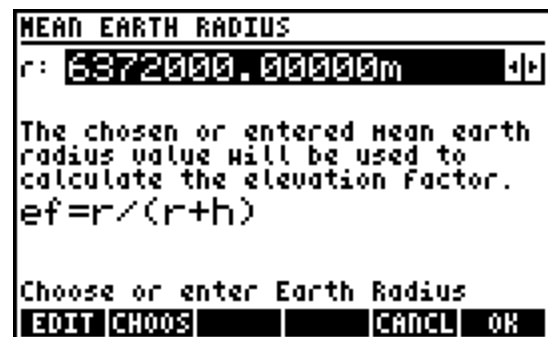
**THIS SHOULD BE CONSIDERED THE DEFAULT VALUE.**

- Geometric Mean – Calculate the geometrical mean earth radius for each point, using the

formula: 
$$r = \frac{a \times \sqrt{1 - e^2}}{1 - e^2 \times (\sin \theta)^2}$$
 where a = semi-major axis (radius at equator)

$e^2$  = eccentricity squared and  $\theta$  = geodetic latitude.

- Enter a mean earth radius. **SOME REGIONS HAVE ADOPTED A MEAN EARTH RADIUS THAT BEST FITS THEIR REGION.**



## Custom Projections

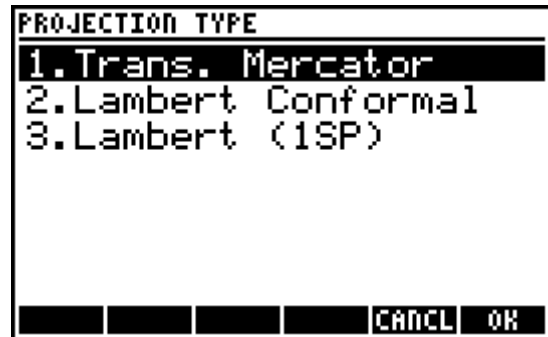
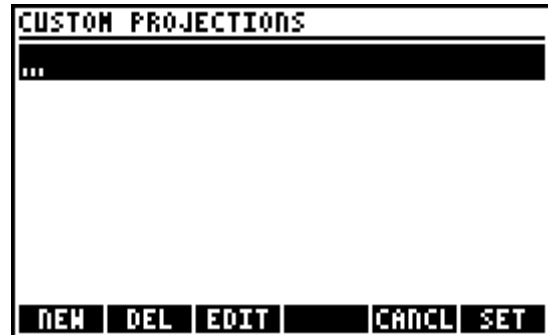
Define your own custom projections for your local area by entering the projection zone parameters and choosing or defining the appropriate ellipsoid. **SINCE THERE ARE MANY WAYS OF INCORRECTLY DEFINING A CUSTOM PROJECTION, IT IS HIGHLY RECOMMENDED TO CROSS-REFERENCE CONVERSION RESULTS WITH PUBLISHED DATA OR WITH ANOTHER TRUSTED SOURCE TO ENSURE ALL REQUIRED PARAMETERS HAVE BEEN ENTERED CORRECTLY.**

Multiple custom projections and user-defined ellipsoids may be created. From the COORDINATE GROUP choose box select *13. Custom Projections* to open the main CUSTOM PROJECTIONS screen where you can add, delete, edit or set a custom projection.

### Add a New Projection

Press **F1** **NEW** to create a new custom projection.

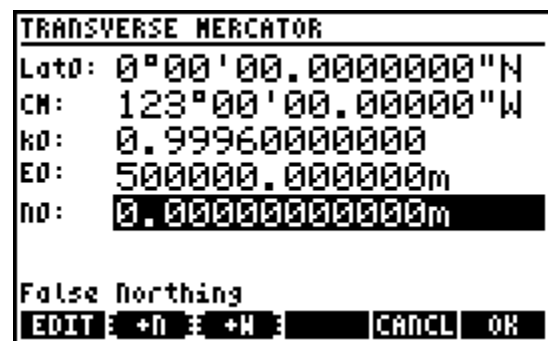
Creating a new projection consists of choosing the projection type, entering the parameters, and naming the projection. The three possible types of projections are Transverse Mercator, Lambert Conformal Conic (2SP), and Lambert Conformal Conic (1SP). **ALL CUSTOM PROJECTIONS ARE SAVED WITH A \*.CPP EXTENSION.**



### Transverse Mercator

The required parameters for a Transverse Mercator projection are:

- Origin Latitude
- Central Meridian
- Scale Factor along Central Meridian
- False Easting
- False Northing



The screen capture shows the parameters entered for UTM zone 10, North Hemisphere.



## Lambert Conformal Conic (2SP)

This is a common projection type used in many US State Plane zones and elsewhere around the world. The required parameters for this projection are:

- Origin Latitude
- Central Meridian
- Standard Parallel South
- Standard Parallel North
- False Easting
- False Northing

```
LAMBERT CONFORMAL CONIC
Lat0: 39°20'00.000000"N
CM: 122°00'00.000000"W
SP S: 40°00'00.000000"N
SP N: 41°40'00.000000"N
EO: 500000.000000m
NO: 2000000.000000m
Origin Latitude
EDIT +N +W CANCL OK
```

The screen capture shows the parameters entered for State Plane zone 0401.California 1.

## Lambert Conformal Conic (1SP)

This is not a very common projection type. The required parameters are:

- Origin Latitude
- Central Meridian
- Scale Factor
- False Easting
- False Northing

```
LAMBERT CONFORMAL CONIC (1SP)
Lat0: 18°00'00.000000"N
CM: 77°00'00.000000"W
k0: 1.000000000000
EO: 750000.000000m
NO: 650000.000000m
Origin Latitude
EDIT +N +W CANCL OK
```

The screen capture shows the parameters entered for the JAD2001 Jamaica National Grid.

## Delete a Projection

Press **F2** **DEL** to delete the selected projection. It is possible to delete a custom projection that is currently set; in such a case, the parameters remain current until changed to a different projection.

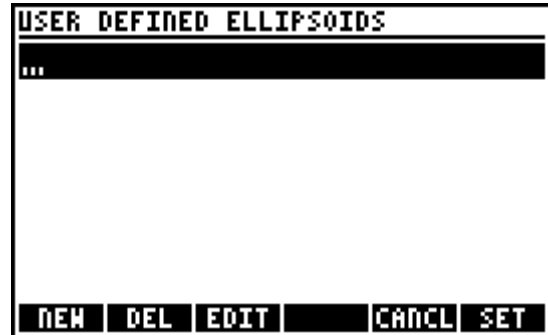
## Edit a Projection

Press **F3** **EDIT** to edit the selected projection. The same input form opens as when defining a new projection, and any of the parameters can be changed. **AFTER EDITING A PROJECTION IT IS REQUIRED TO SET THE PROJECTION FOR THE CHANGES TO TAKE EFFECT. EDITING ALONE WILL NOT CHANGE THE CURRENT GEODETIC SETTINGS.**

## Set a Projection

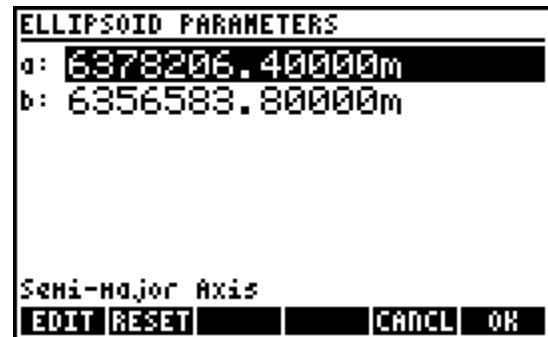
Press **F6** **SET** or **ENTER** to set the selected projection. The entire process needs to complete for any new settings to take effect. You may be prompted to choose the Hemisphere, North or South.

From the REFERENCE ELLIPSOIDS choose box select one of the pre-defined ellipsoids to use, or select *13.UserDef Ellipsoid* to open the main USER DEFINED ELLIPSOIDS screen where you can add, delete, edit or set a user-defined ellipsoid. **SELECTING AN EXISTING ELLIPSOID FROM THE REFERENCE ELLIPSOIDS CHOOSE BOX COMPLETES THE PROCESS OF SETTING A CUSTOM PROJECTION ACTIVE.**



## Add a New User-defined Ellipsoid

Press **F1** **NEW** to define a new ellipsoid. The required parameters are the semi-major axis and semi-minor axis of the ellipsoid, and a name for the ellipsoid. **IT MAY BE NECESSARY TO CALCULATE THE SEMI-MINOR AXIS FROM ANOTHER PARAMETER, SEE [Appendix A](#) FOR APPLICABLE EQUATIONS. ALL USER-DEFINED ELLIPSOIDS ARE SAVED WITH A \*.CPE EXTENSION.**



## Delete a User-defined Ellipsoid

Press **F2** **DEL** to delete the selected ellipsoid. As with a custom projection, it is possible to delete a user-defined ellipsoid that is currently set. The parameters will remain current until changed.

## Edit a User-defined Ellipsoid

Press **F3** **EDIT** to edit the selected ellipsoid. The same input form opens as when defining a new ellipsoid, and the parameters can be changed. **AFTER EDITING AN ELLIPSOID, IT IS REQUIRED TO SET THE ELLIPSOID FOR THE CHANGES TO TAKE EFFECT. EDITING ALONE WILL NOT CHANGE THE CURRENT GEODETIC SETTINGS.**

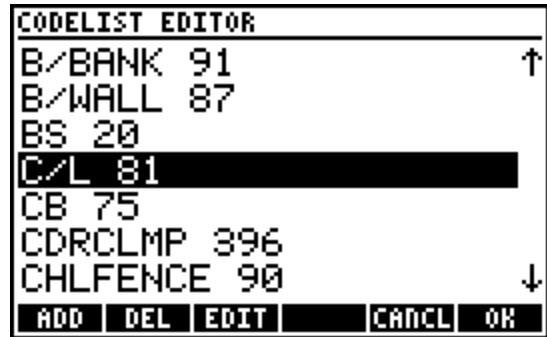
## Set a User-defined Ellipsoid

Press **F6** **SET** or **ENTER** to set the selected ellipsoid.

When the custom projection has been set, the main menu screen will display the name of the custom projection (up to 8 characters) and the name of the reference ellipsoid (up to 5 characters).

### 3.6 Codelist

The codelist is a list of codes with associated descriptions. The codelist editor displays the codelist sorted by description. Use **ALPHA** followed by an alpha character to jump to the first description starting with that character. It is possible to enter a code in any point description input and have the description automatically inserted when the [codelist translation](#) toggle is enabled.



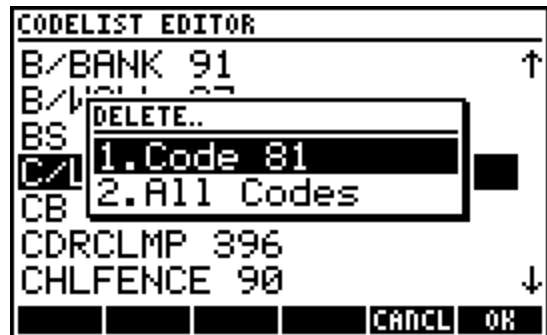
#### Add a Code

Press **F1** **ADD** to enter a new code and description. It is possible to have multiple codes with the same description, but each code can only exist once. New codes are sorted by description and added to the Codelist.



#### Delete a Code

Press **F2** **DEL** to delete the selected code or to delete all codes. A choose box prompts the user to select the operation.

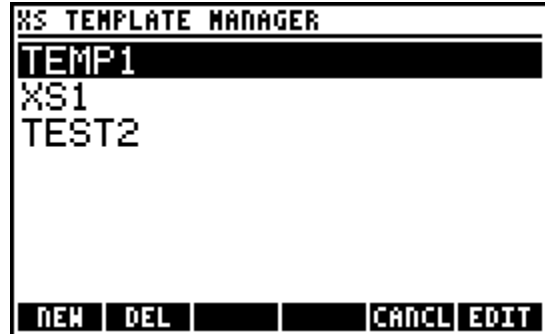


#### Edit a Code

Press **F3** **EDIT** to edit the selected code and/or description. If necessary, the modified code is re-sorted within the codelist after editing.

### 3.7 Cross Section Templates

Cross section templates are used to define cross sections of alignments and can be re-used unlimited times once created. The cross section template manager lists all the templates created. New templates can be created and existing templates can be deleted or edited. The menu provides access to the operations described below.



#### Create a new Template

Press **F1** **NEW** to create a new template. Select either *1.Hz Width + Slope* to define the cross section by entering horizontal widths and slopes of each segment away from the centerline, or select *2.Hz Width + Vt Chnge* to define the cross section by entering the horizontal widths and the vertical elevation changes of each segment. Next, enter a name for the template to create a new blank template, which added to the list of templates in the Template Manager.



#### Delete a Template

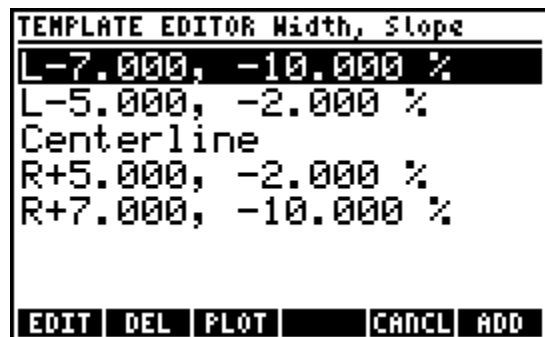
Press **F2** **DEL** to delete the selected template. It is not possible to delete a template currently assigned to an alignment.

#### Exit the Template Manager

Press **F5** **CANCL** or **ON** to exit the template manager and return to the main program interface.

#### Edit a Template

Press **F6** **EDIT** or **ENTER** to edit the selected template. A new screen appears listing all the components of the template from Left to Right. A new blank template contains only the Centerline entry. The options available for the template editor are described on the following page.



### Edit a Segment

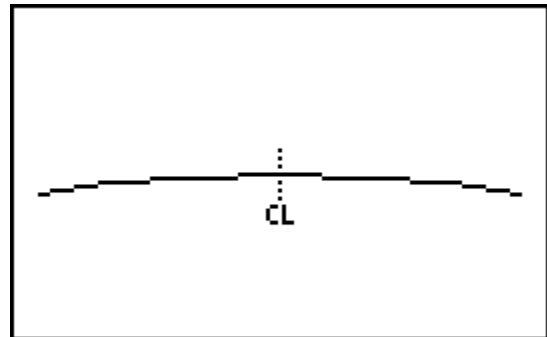
Press **F1** **EDIT** to edit the selected template segment. It is possible to change the width and slope/elevation change of a segment.

### Delete a Segment

Press **F2** **DEL** to delete the selected segment from the template. It is only possible to delete segments starting from the outer edges and going in towards the centerline.

### Plot the Template

Press **F3** **PLOT** to plot the cross section template on the screen for a visual confirmation of the entered segments. The vertical components of the cross section are exaggerated somewhat to aid in the illustration of the direction of the slopes.



### Exit the Template Editor

Press **F5** **CANCL** or **ON** to exit the template editor and return to the template manager screen.

### Add a Segment

Press **F6** **ADD** or **ENTER** to add a new segment to the template. Specify if the new segment is an offset to the left or to the right of the centerline, then enter the width and slope (or vertical elevation change) of the segment. Each segment added will be going “outwards” from the centerline, and the slope is always away from the centerline, therefore negative and positive sign of the slope (or vertical elevation change) is important to enter correctly. A negative slope goes downward from the centerline, while a positive slope goes upward from the centerline.

