

Chapter 7 - TABLET Reference

What is TABLET?

TABLET is a digitizing program which supports the creation of analytic element input data files (.DAT files) read by GFLOW1. The program creates a users environment which allows the user's digitizer to be used as a logical extension of his keyboard, adding the coordinates of points on the tablet to the user's data file. Coordinate conversion from meters to feet and relative to a local coordinate origin is provided "on-the-fly". A facility is provided for converting latitude-longitude coordinates into "locally Cartesian" UTM coordinates.

Comparison of TABLET and GAEP

TABLET is intended as a tool for manual creation of input data files for GFLOW. It is anticipated that it will be used by students and other modelers who have rather simple modeling tasks. GAEP is a comprehensive preprocessor program which allows the user to manage digital hydrographic data sets and automates the process of creating GFLOW data sets on the computer screen. GAEP is anticipated as a tool for large modeling projects and for consultants who can benefit from the availability of prepackaged hydrographic data. GAEP users may resort to TABLET to create small support files which do not require the sophistication of GAEP.

Installation of TABLET

TABLET installation was performed as part of the install procedure for GFLOW. A default TABLET configuration based upon no digitizer being connected to the system was installed. If you have not yet configured your digitizer, refer to the installation information in the GFLOW Installation Guide (Chapter 1).

This manual presumes that you have already installed TABLET on your system.

Configuring TABLET

The TABDVR digitizing tablet driver (developed by the author) must be configured for the particular digitizer and computer system used. The configuration of the TABDVR tablet protocol drivers is documented in the TABDVR Configuration Guide (Appendix A). TABDVR is used by GAEP as well, so if you have successfully installed and configured GAEP, you are ready to run TABLET.

Coordinate Systems and Data Units

GFLOW works in any consistent system of units selected by the user. Before beginning a project, you should determine which unit of length to use. Some common selections are feet and meters for length and days or seconds for time. Once a set of units has been decided upon, the modeler must maintain it throughout the project. Although any units system may be used, the *preferred units* are meters and days or feet and days.

World Coordinates

TABLET requires that data be entered in a set of world coordinates selected by the user. If you are working from a USGS topographic map, a convenient system is the UTM coordinate system. If you are working from a plat for a site or from a simple map layout, the units might be shown on your figures. TABLET allows you to work in either system. If you are digitizing in georeferenced coordinates (UTM or State Plane, for example), you can set up your digitizer with the appropriate world coordinates and TABLET can translate the world coordinates into a local coordinate system, shifting the origin and converting units.

Conversion of Latitude-Longitude to UTM Coordinates

Groundwater models require that the units used to define locations be Cartesian (that is, the x - and y - dimensions must have the same length). Often, the user will have maps which have world coordinates marked as latitude and longitude. A problem with the direct use of latitude-longitude coordinates is that they are not Cartesian (a degree of latitude is usually not the same length as a degree of longitude). One standard way to achieve a Cartesian system is to use the UTM (Universal Transverse Mercator) coordinate system.

The UTM system breaks the globe into "zones", each of which has a central meridian. Within each zone, a set of coordinates is assigned to each point, measured (in meters) relative to the central meridian (UTM X value at the meridian is 500000) and to the equator (UTM Y value at the equator is 0). Over a relatively small geographic area, the coordinates can be considered to be Cartesian, with only a small amount of error. This provides a simple X-Y coordinate system in data units for modeling work.

TABLET does not contain a facility for performing the latitude-longitude to UTM conversion, but there is a facility in GAEP (See Chapter 5). For users' convenience, a facility is included in GAEP for converting between UTM coordinates and latitude-longitude coordinates, given the number of the UTM zone. This feature simplifies the process of locating digitizer origin points (see below). Users who are unfamiliar with the UTM coordinate system may wish to investigate this topic further.

Coordinate Origins

The TABLET user is required to set two different types of coordinate origins when creating a groundwater model with TABLET. The first, the "Model Origin" is consistent throughout all modeling operations and should be set at the beginning of the project. The second, the "Digitizer Origin" is set whenever a map is mounted on the digitizing tablet. It is important that the modeler not confuse the meanings of these two terms.

Model Origin

As discussed above, GFLOW works in a dimensionless coordinate space. TABLET allows the user to set any world coordinates he chooses. A conversion may be performed by TABLET to change the X-Y coordinates from meters-to-feet or feet-to-meters, if the modeler desires.

The numeric values of UTM coordinates are so large (particularly in the Y direction) that numerical errors can occur in GFLOW if the geographic coordinates are simply used directly from TABLET. To prevent this, TABLET allows the user to enter a "Model Origin" in UTM coordinates that will be the "zero point" for GFLOW's computations. The model origin should be maintained throughout a particular modeling project. To select a Model Origin, simply choose a point near the model study region and record its UTM coordinates. It is particularly convenient to mark and label this point on your maps as well. TABLET allows you to enter a model origin by use of a keystroke command (see below). If a model origin is specified, TABLET will report coordinates in the output data file relative to the specified model origin. If a coordinate conversion is specified, TABLET will perform this computation relative to the local origin.

Digitizer Origin

Whenever a map is mounted on the digitizer, the TABLET user must tell TABLET how to convert digitizer coordinates (typically measured in inches or millimeters internally) to "real-world" coordinates. This task is performed by the use of origin points, which are points marked on the map for which the world coordinates are known. TABLET requires that the user locate these points with the digitizer and then enter the world coordinates from the keyboard.

A pair of digitizer origin points are required each time a map is mounted on the digitizer and must fit on the digitizer surface (of course). This means that for a small digitizer, several sets of origin points may be required on each topographic map. A convenient way to enter these is by the use of the UTM conversion utility (see above), converting the latitude-longitude points on the edges of the map, and writing the corresponding UTM coordinates in the map margin.

Data Preparation for Digitizing with TABLET

Before beginning a digitizing session, it is useful to determine which features are to be included in your model and to lay out analytic elements (linesinks for stream reaches, wells, etc.). A good way to define your elements is to lay out your topographic map and overlay it with either a clear piece of acetate or vellum. Sketch your elements on the overlay sheet using markers on acetate (or pencil on vellum), marking the elevation or discharge of each element near the element. Remember to mark at least two points on the overlay sheet for the digitizer origins and mark them with the world coordinates of the origin points.

Once all of your elements are marked on the overlay sheet, you can begin to digitize the elements directly from the overlay. If changes need to be made, you will need to

re-mount the overlay sheet on the map, erase and re-mark the new elements. You may also use a new overlay sheet to redo your element layout.

Use of TABLET

TABLET is designed to be a logical extension of the user's keyboard. When you are using TABLET, everything you type is directly entered into your output data file, as if you are using a typewriter. Corrections can be made only on the current line, using the <BACK-SPACE> key. A function key is provided which allows the user to enter a text editor of his choice for advanced file editing. When the editing session is complete, control returns to TABLET.

Starting TABLET

A TABLET session is started by invoking the TABLET program, providing the data file name as part of the command:

```
C:\> TABLET <FILE.DAT>
```

If the file file.dat does not exist, it is created. If it already exists, TABLET prompts:

FILE.DAT ALREADY EXISTS. (A)PPEND (R)EPLACE OR (Q)UIT?

Press the A key to continue the TABLET session, adding all data entered to the end of the current file. Press the R key to overwrite the existing file (all previous data will be lost). Press the Q key to abort the program.

Commands to TABLET are invoked using the function keys (<F2>-<F10>) on the keyboard.

TABLET Menu

TABLET beta version 2.0	File:
TEST.DAT	F2 Set Origin
V.A.Kelson, 5/7/94	F3 Round
0.1	F4 Model X
0	Y
0 [New File test.dat]	F5 Unit Conv
M->Ft	F6 Show
Coordinates	F7 Editor
	F8 Review File
	F10 Exit

Figure 7.1 - TABLET Menu

As the user types text, it is displayed on the screen (in white) and also sent to the desired output file. Function keys displayed in the upper right corner of the screen are always available.

Digitizer Input

Once a digitizer origin has been set (<F2> command), the digitizer is enabled for data input:

- The first tablet button transmits the scaled coordinates (according to the current tablet settings and model origin), as if they had been typed by the user.
- The second tablet button has the same effect as the <CR> key.

Commands

- Set Origin <F2> Defines origin points for the digitizer.
- Round <F3> Sets a rounding value for digitizer inputs.
- Model Origin <F4> Sets the model origin (zero point for digitizer scaling).
- Unit Conv <F5> Sets the distance unit conversion mode for the digitizer.
- Show Coord <F6> Continuously transmits coordinates from the digitizer until a key is pressed.

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- Editor <F7> Invokes an editor (default \DOS\EDIT.COM) on the output file.
- Review <F8> Reviews the current file, displaying it from the beginning.
- Quit <F10> Exits TABLET, saves the output file.

<F2> Set Origin**Command Description**

Sets up the conversion between digitizer coordinates and world coordinates on your map. TABLET will request that the user input one of the origin points marked on the map (see above). Place the digitizer puck on the first point and press the first button on the puck. TABLET will prompt for the world coordinates of the first point. Next, TABLET will repeat the process for the second origin point. Once the digitizer origin is set, it is possible to digitize hydrologic and background map features. During selection of origin points with the digitizer puck, the coordinates of the puck on the digitizer surface (in inches) are displayed in the upper right corner of the screen.

Example

- The user has two origin points marked on his map at (450000,4280000 UTM) and (460000,4280000 UTM). The mapping of digitizer - to - world coordinates is established by selecting the Origin command:

<F2>

SELECT FIRST ORIGIN POINT WITH PUCK

{The user places the puck at the first origin point and presses the first puck button}

ENTER UTM COORDINATES: 450000 4280000

SELECT SECOND ORIGIN POINT WITH PUCK

{The user places the puck at the second origin point and presses the first puck button}

ENTER UTM COORDINATES: 460000 4280000

The origin is now set. If the user presses the first tablet button, the world coordinates (scaled by the Model Origin and Unit Conversion mode specified) will be entered as if the user had typed them.

<F3> Round Off

Command Description

Sets a round off value for tablet input. When the user presses the first tablet button, the world coordinates are computed, and then scaled by the unit conversion mode and relative to the current Model Origin. Once the scaled location is computed, it is rounded off to the number of decimal digits specified by this command.

Example

- To round off all tablet input locations to the nearest foot, use the Round Off command:

<F3>

ENTER ROUND OFF VALUE: 1 <CR>

The current round off setting is shown in the function key menu.

<F4> Model Origin

Command Description

Sets the model origin for digitizer coordinate scaling. The model origin is the base point for the user's modeling work (in world coordinates). When the user presses the first tablet button, the world coordinates are computed, and then scaled by the unit conversion mode and relative to the current Model Origin.

Example

- To place the local origin at 500000, 4280000 in UTM, use the Model Origin command:

<F4>

ENTER MODEL ORIGIN: 500000 4280000 <CR>

<F5> Unit Conversion

Command Description

Sets the unit conversion mode for digitizer coordinate scaling. When the user presses the first tablet button, the world coordinates are computed, and then scaled according to the unit conversion mode and relative to the current Model Origin.

Available unit conversion modes are feet-to-meters, no conversion and meters-to-feet. Each press of the <F5> key cycles through the possible conversion modes. The current mode is displayed on the function key menu.

<F6> Show Coordinates

Command Description

Causes TABLET to continuously display the cursor coordinates on the computer screen. The continuous display continues until the user presses any key. This feature is useful for examining locations on your map or measuring distances. It is not directly useful for creating analytic elements.

<F7> Editor

Command Description

Invokes an editor (the default is `EDIT.COM`) for editing the current file. When the user exits the editor, control is returned to TABLET, and the user is placed at the end of the input file to continue data entry.

Note

To specify an editor other than the default editor, use the `TABEDIT` environmental variable. Place the line `SET TABEDIT=[EDITOR NAME]` in the `AUTOEXEC.BAT` file. For example, to use the Norton Editor (`NE` command), place the line

```
SET TABEDIT=NE
```

In the file `AUTOEXEC.BAT`.

<F8> Review File

Command Description

Prints the entire contents of the output file on the user's screen. This command is useful often once a number of other commands have "cluttered" the user's screen.

TABLET Menu

<F10> Quit

Command Description

Exits TABLET and returns to DOS. All current TABLET settings will be saved to the file TABLET.INI in the current directory for use by future TABLET runs.