

Appendix C - Tablet Configuration Guide

This appendix contains a description of the digitizing tablet driver provided as part of GAEP and TABLET and details about configuration. A description of the program TABTEST, a tool for testing digitizer installation is included.

A number of digitizers have been tested with GAEP and TABLET. The configurations for those tablets are also included here.

Acknowledgments

This document describes the operation of the GAEP program with a number of different hardware configuration systems. The GAEP program was developed by Vic Kelson at the SPEA Groundwater Modeling Laboratory, Indiana University. The author acknowledges Phil DiLavore for his work on the initial design of GAEP. Thanks also to Jack Wittman of IU and Dr. Stephen R. Kraemer of the USEPA for assistance and guidance with this work.

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Introduction

This document describes the configuration procedure for the program GAEP (as implemented for the GFLOW product). It also describes the configuration of the digitizer driver, the devices supported, and gives setup instructions for several digitizers. It is intended that this manual will be expanded as additional digitizers are tested with GAEP.

Installation of GAEP

GAEP installation was performed as part of the install procedure for the GFLOW product. A default GAEP configuration based upon no digitizer being connected to the system was installed. If you have not yet installed GAEP, refer to the installation information in the Gflow documentation. This manual presumes that you have already installed GAEP on your system.

Digitizer Configuration

The tablet driver included as part of the GFLOW product supports four common digitizing tablet protocols:

- Formatted ASCII protocol (digitizer writes digitizer inches)
- SummaGraphics MM ASCII protocol
- SummaGraphics MM Binary protocol
- SummaGraphics Bit Pad Plus protocol

It is expected that one or more of these protocols will work with nearly any digitizer on the market. Both binary mode and ASCII mode protocols are available, and a support program, TABTEST, is provided to assist with digitizer configuration and testing. It is easy to configure GAEP for any of the protocols by modifying the \GFLOW\TABSETUP.BAT file. Protocol selection for GAEP is done by setting the environment variable TABLET and appropriately setting the port parameters in the \GFLOW\TABSETUP.BAT batch file, for example:

```
SET TABLET=ASCII COM1 12 12 4  
MODE COM1:9600,E,7,2
```

Will select a formatted ASCII mode tablet connected to port COM1 at 9600 bps, even parity, 7 data bits and 2 stop bits. The tablet is 12" x 12" and has a 4-button puck. TABTEST will modify the file TABSETUP.BAT once digitizer configuration is complete. The following several pages document the available protocols.

How Do I Configure My Digitizer for GAEP and TABLET?

General

Digitizer configuration can be a difficult and frustrating process. GAEP and TABLET use the same digitizer driver, which was written particularly for their use. As part of the digitizer driver, a support program (TABTEST) is provided which may be used to ensure that the digitizer and the software are communicating properly.

This section outlines the basic steps which the user needs to execute to configure the GAEP and TABLET digitizer driver for a particular digitizer.

Note

If your system does not have a digitizer, you may wish to configure GAEP and TABLET to use a Microsoft (or compatible) mouse or to request direct keyboard entry of coordinates. The digitizer driver supports these also; no hardware testing is required. See the appropriate protocol discussion in the "Digitizer Protocols" section of this appendix. TABTEST does not support these protocols.

Step-By-Step

To configure and test your digitizer with the GAEP and TABLET digitizer driver, the following step-by-step process should be performed. Detailed discussions of the options are to be found in the "Digitizer Protocols", "Program TABTEST" and "Tested Configurations" sections of this appendix.

- If necessary, unpack and install your digitizer and cable it to your computer. Place the digitizer puck on the active digitizing surface.
- Locate your digitizer's reference manual and have it handy before beginning the configuration process.
- Examine your digitizer manual and the "Digitizer Protocols" section of this appendix. Select a protocol to be used. Our experience has shown that the ASCII protocols are easier to test, because the tablet transmits readable characters. In some cases, however, only binary protocols are available. If you have a Summa-Graphics Bit Pad Plus, only the Bit Pad Plus protocol may be used.
- Select a transmission baud rate, parity and character format for serial communications. Recommended settings are:
ASCII Protocols: 9600 bps, even parity, 7 data bits, 2 stop bits
Binary Protocols: 9600 bps, no parity, 8 data bits, 1 stop bit
- Configure your digitizer for the desired protocol. This will require that you follow the instructions in your digitizer manual carefully. This may include setting of hardware switches in your digitizer or running a DOS-based configuration program, or both.

Note: Software-based digitizer configuration

Depending on your digitizer model, may need to run a program from DOS to set up the digitizer protocol. Be aware that many applications which use your digitizer may transmit configuration information prior to their execution. If a DOS command is needed to configure your digitizer, you will need to manually modify the file TABSETUP.BAT in the GFLOW installation directory to execute the proper configuration command, once the digitizer communications have been tested.

Note: Tested Digitizers

Some digitizers have already been fully tested with GAEP and TABLET. Check the "Tested Configurations" section of this appendix to see if your digitizer has been previously tested.

- Once the digitizer has been configured, run the program TABTEST to test the communications with the digitizer. Set the TABTEST driver, port (COM1 or COM2) and the communications settings (baud rate, etc.), then use the <F2> "CommTest" command (see the "Program TABTEST" section of this appendix for details).
- Once the communications test is successful, use TABTEST's <F3> "DriverTest" command to ensure that the digitizer driver is working and that puck coordinates are being read in inches from the lower left corner of the digitizer (see the "Program TABTEST" section of this appendix for details).
- Once all of the tests are complete, use the <ESC> command to leave TABTEST, and tell TABTEST to write the current settings to TABSETUP.BAT in the GFLOW installation directory.
- If your digitizer required the execution of a DOS program to set up the digitizer configuration, you will now need to modify the TABSETUP.BAT file in your GFLOW installation directory to include the command(s) required to configure the digitizer. Place the configuration commands at the beginning of TABSETUP.BAT. The TABSETUP.BAT file is run automatically prior to each execution of GAEP and TABLET.

Digitizer Protocols

The following section of this appendix contains a technical description of the protocols supported by GAEP and TABLET. Four digitizer protocols, plus the use of a Microsoft (or compatible) mouse or direct keyboard entry are supported.

Digitizer Protocols

Formatted ASCII Protocol

This is the favored protocol, when possible. The digitizer transmits the puck coordinates directly as a formatted string, in inches from the lower left corner of the tablet. This protocol is the easiest to debug in most cases. (CalComp digitizers usually refer to this protocol as mode 8.)

To configure the formatted ASCII driver, the TABLET environmental variable should be set as follows:

```
SET TABLET=ASCII <PORT> <X IN> <Y IN> <# BUTTONS>
```

Where:

- <PORT> Is the serial port used. Only COM1 and COM2 are supported.
- <X IN> Is the size of the digitizer in the X direction, in inches.
- <Y IN> Is the size of the digitizer in the Y direction, in inches.
- <# BUTTONS> Is the number of buttons on the puck.

The configuration used is described in CalComp 2500 Series User's Manual as follows:

- Mode Run - the tablet transmits continuously
- Commands Enabled (optional - the driver doesn't use commands)
- Transmit rate 50 points per second. Can be set as you like; this setting works well with the 2500 and a 80386 or 80486 system.
- Line feed Disable (required)
- Out of proximity Enable (optional)
- Margin data Disable (optional)
- Resolution 1000 lpi (optional - may be set as desired)
- ASCII Format 8 Required. This format transmits "XXXX.X YYYY.Y CC T0 <CR>", Where XXXXX is the X position in inches, YYYY.Y is the Y position in inches, CC is a two-character code for the puck button currently pressed, T0 is the digitizer status setting (ignored) and CR is a carriage return. NOTE: The number of significant digits transmitted is dependent on

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the digitizer resolution; check your digitizer manual for details.

- Baud rate (optional)
- Data bits 7 (required)
- Stop bits (optional)
- Parity (optional)
- Echo Disabled
- Handshake Enabled
- Cursor buttons Set according to your hardware
- Beeper Disabled (GAEP beeps when points are entered)

SummaGraphics MM Binary Protocol

To configure the SummaGraphics MM Binary driver, the TABLET environmental variable should be set as follows:

```
SET TABLET=MMBINARY <PORT> <X IN> <Y IN> <#BUTTONS> <LPI>
```

Where:

- <PORT> Is the serial port used. Only COM1 and COM2 are supported.
- <X IN> Is the size of the digitizer in the X direction, in inches.
- <Y IN> Is the size of the digitizer in the Y direction, in inches.
- <# BUTTONS> Is the number of buttons on the puck.
- <LPI> Is the number of lines per inch on the digitizer.

The configuration used is described in the SummaGraphics MM1812 Technical Reference as follows (all settings are selected by switches on the tablet, except as noted):

- Mode Stream - the tablet transmits continuously. Driver sends the "@" command to select this mode.
- Transmit rate 110 points per second. This setting works well with the MM1812 and a 80386 or 80486 system.
- Report format Binary
- Resolution 500 lpi
- Baud rate 9600
- Data bits 8 (required)
- Stop bits 1 (required)
- Parity Odd

Digitizer Protocols

SummaGraphics MM ASCII Protocol

To configure the SummaGraphics MM ASCII driver, the TABLET environmental variable should be set as follows:

```
SET TABLET=MMASCII <PORT> <X IN> <Y IN> <# BUTTONS> <LPI>
```

Where:

- <PORT> Is the serial port used. Only COM1 and COM2 are supported.
- <X INCHES> Is the size of the digitizer in the X direction, in inches.
- <Y INCHES> Is the size of the digitizer in the Y direction, in inches.
- <# BUTTONS> Is the number of buttons on the puck.
- <LPI> Is the number of lines per inch on the digitizer.

The configuration used is described in the SummaGraphics MM1812 Technical Reference as follows (all settings are selected by switches on the tablet, except as noted):

- Mode Stream - the tablet transmits continuously. Driver sends the "@" command to select this mode.
- Transmit rate 110 points per second. This setting works well with the MM1812 and a 80386 or 80486 system.
- Report format Binary
- Resolution 500 lpi
- Baud rate 9600
- Data bits 7
- Stop bits 2
- Parity Odd (by default)

SummaGraphics Bit Pad Plus Protocol

The Bit Pad Plus uses a different protocol than other SummaGraphics digitizers. It is not configurable so simply setting the TABLET environmental variable is sufficient:

```
SET TABLET=BITPAD <PORT> <X IN> <Y IN> <# BUTTONS> <LPI>
```

Where:

- <PORT> Is the serial port used. Only COM1 and COM2 are supported.
- <X IN> Is the size of the digitizer in the X direction, in inches.
- <Y IN> Is the size of the digitizer in the Y direction, in inches.
- <# BUTTONS> Is the number of buttons on the puck
- <LPI> Is the number of lines per inch (200 on the Bit Pad Plus)

The configuration used is described in the SummaGraphics Bit Pad Plus Technical Reference. No tablet settings are required.

- Baud rate 9600
- Data bits 8 (required)
- Stop bits 1 (required)
- Parity Odd (required)

Digitizer Protocols

Microsoft Mouse

GAEP supports the use of the mouse for digitizing in two manners. First is the "Mouse Markup" mode, which allows the user to add features to an existing map. This mode is available regardless of the TABLET setting and is selected by commands in GAEP. An alternative use of the mouse is to use the absolute mouse cursor position as a digitizer, so that the position of the mouse on the screen can be scaled as you desire. It is anticipated that this has little use in the context of GAEP and its application is discouraged.

The use of the mouse as a "digitizer" is supported in the digitizer drivers and is documented here only for completeness.

To use the absolute mouse position for digitizing, the TABLET environmental variable should be set as follows:

```
SET TABLET=MOUSE
```

- No options are required.

Note

You will need to set the digitizer origin in GAEP, just as if you had a digitizer (see GAEP manual).

Digitizer Protocols

Keyboard Data Entry (For Systems Without Digitizers)

GAEP supports digital map data entry without the use of a digitizer by making the user's keyboard into a "digitizer". The user can use a quadruled sheet (8 squares to the inch vellum works quite well), and trace the features to be digitized onto the sheet, along with georeferenced origin locations. When GAEP requests data from the "digitizer", the message

```
[KEYBOARD DIGITIZER; F1 - BUTTON 1, F2 - BUTTON 2]
```

appears onscreen.

To "digitize", you simply press the F1 key for "tablet button 1" or the F2 key for "tablet button 2". The digitizer driver will then ask for the coordinates of the point to be entered from your grid sheet. The default is to enter the data in inches, but you may use any grid coordinates you wish.

To use the keyboard data entry method for digitizing, the TABLET environmental variable should be set as follows:

```
SET TABLET=KEYBOARD <MAXIMUM X> <MAXIMUM Y>
```

Where:

- <x inches> Is the size of the digitizer in the X direction, in inches.
- <y inches> Is the size of the digitizer in the Y direction, in inches.

Note

If the X and Y maximum values, the driver defaults to a 20" (X direction) by 24" (Y direction) space, calibrated in inches. You are not restricted to any particular grid coordinate system for data entry; for example, you might have a grid sheet calibrated in grids that was 500 grids on the X axis by 400 on the Y axis. To tell the driver this, you can set the TABLET environmental variable as follows:

```
SET TABLET=KEYBOARD 500 400
```

and GAEP will work properly, showing the grid sheet extent while performing data entry.

Note

You will need to set the digitizer origin in GAEP, just as if you had a digitizer (see GAEP manual).

Program TABTEST

```
F1-Help      F2-CommTest  F3-DriverTest
F6-Tablet    F7-Port      F8-Baud, etc.

Tablet:      Formatted ASCII      { +x.xxx,+y.yyy,bb,s }
Port:        COM2
Baud:        9600      Parity:     EVEN      Data bits: 7      Stop bits: 2

Current setup lines for TABSETUP.BAT:

MODE COM2:9600,E,7,2
SET TABLET=ASCII COM2 12 12 4

TABTEST v0.2 - Graphics Tablet Setup/Test Program
Copyright (c) 1994 V.A.Kelson
```

Figure C.1 - TABTEST Menu

Testing serial communications devices such as digitizers can be time consuming and frustrating due to a lack of standards and because digitizers usually make no directly visible signals. TABTEST is designed to facilitate this process by allowing you to experiment with parameter settings and instantly monitor the effect. The configuration process with TABTEST is subdivided into three steps:

1. Configure the driver for the communications port (COM1 or COM2), baud rate, parity, and number of data and stop bits ("Port" and "Baud, Etc." commands).
2. Establish basic communications with the digitizer ("CommTest" command).
3. Test proper functioning of the digitizer driver ("DriverTest" command).

Commands

Help **<F1>**

- Displays a help screen

CommTest **<F2>**

- Tests low-level communications, displaying results one byte at a time.
- For ASCII mode drivers (ASCII and MMASCII)

The tablet response as discussed in the driver reference (see above) will be printed on the screen, with continuous update. The user should be able to easily read the puck coordinates and button status. When test is complete, press <ESC> to return to the TABTEST menu.

- For binary mode drivers (MMBINARY and BITPAD)

The tablet response will be displayed as 5 2-digit hexadecimal numbers, continuously updated. Since it is not easy to read these numbers to ensure they are correct, the user can only look to ensure that they remain constant when the puck is motionless on the tablet and that they change in a regular pattern when the puck is moved. When test is complete, press <ESC> to return to the TABTEST menu.

- During the communications test you may need to experiment with different drivers and the various communications parameters.

Note: Common Blunders

The author has typically made two major blunders at this step in testing, both of which seem trivial. First, make sure that you select the correct communications port (COM1 or COM2), and second, make sure that the digitizer puck is on the active digitizing surface. The driver uses "RUN" mode to read coordinates, and points are only transmitted by most digitizers when the puck is on the digitizer.

DriverTest **<F3>**

- Tests the tablet driver. Prints puck location in inches from the lower left corner of the tablet.

The results of this test are the same for all tablet drivers. The current puck coordinates will be printed and continuously updated. The values printed should be the *x*- and *y*- coordinates of the puck in inches from the lower left corner of the tablet.

- During the use of the driver test, you may need to experiment with the selected protocol selection and the number of lines per inch (LPI) setting. A common problem is that the test looks fine, but the number of inches is off by some factor. This usually indicates that the LPI setting is wrong.
- Again, be aware of the "Common Blunders" mentioned above.

Tablet **<F6>**

- Selects the tablet driver. A menu is displayed, showing the digitizer driver choices.

Note

After the tablet driver choice is made, it is usually necessary to set the port parameters (see below).

Port **<F7>**

- Chooses the serial port (COM1 or COM2) where the tablet is connected. A menu of choices is printed; choose the appropriate port, depending upon your cabling.

Note

After the port choice is made, it is usually necessary to set the port parameters (see below).

Baud, etc. **<F8>**

- Sets up the COM port parameters for serial communications with the digitizer. The choices are:
- Baud rate: 300, 600, 1200, 2400, 4800, 9600 bps
- Parity: Odd, Even or None
- Data Bits: 7 or 8
- Stop Bits: 1 or 2

Notes

- Binary mode tablet drivers (MMBINARY and BITPAD) MUST use 8 data bits. ASCII mode drivers (ASCII and MMASCII) usually use 7 data bits.
- It is usually best to use the default communication parameters for your tablet; check your tablet's reference manual for details.
- Many digitizer models require the execution of a DOS program which sends command to the tablet, initializing the protocol, baud rate, etc. prior to use. It is most critical that the user check the digitizer manual THOROUGHLY and perform any necessary tasks prior to attempting to use TABTEST.

Quit **<ESC>**

- Exits TABTEST. The user is prompted whether or not to update TABSETUP.BAT. If the user wishes, the updated settings for the TABLET environmental variable and a DOS MODE command will be placed in \GFLOW\TABSETUP.BAT for execution at startup for future GAEP and TABLET runs.

Note

TABTEST does not retain any of the settings internally after termination. Each TABTEST run starts "from scratch". In most cases, the user will only run TABTEST once when installing GFLOW, and the tablet will work thereafter.

Tested Configurations for Various Digitizers

During the development of GAEP, several digitizers have been tested, and their known configurations are shown here. This information is provided as an example of the way one might use the system.

Note

If you have a digitizer not shown here and you are successful in using the device with one of the supported protocols, it would be much appreciated if you would record the tablet and software configuration information and send it to the author:

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CalComp 2500 (12"x12")

Soft switch settings:

- Bank 1: 0 0 0 0 0 0 0 1
- Bank 2: 1 0 1 1 0 0 0 1
- Bank 3: 0 1 1 0 1 0 0 0
- Bank 4: 0 0 1 0 0 0 0 1
- Bank 5: 0 1 1 1 0 0 1 0

Environmental variable settings:

SET TABLET=ASCII COM1 12 12 4 for COM1: connection
MODE COM1:9600,N,8,1

SET TABLET=ASCII COM2 12 12 4 for COM2: connection
MODE COM2:9600,N,8,1

CalComp DrawingBoard II (48"x36")

Soft switch settings (18 switches per bank, 2 banks):

- Bank A: 1 1 0 0 0 1 0 1 1 1 0 0 1 0 0 0 0 0
- Bank B: 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0

Environmental variable settings:

SET TABLET=ASCII COM1 48 36 4 for COM1: connection
MODE COM1:9600,N,8,1

SET TABLET=ASCII COM2 48 36 4 for COM2: connection
MODE COM2:9600,N,8,1

It is expected that other DrawingBoard II (and possibly the Estimat line as well) models will use the same soft switch settings.

SummaGraphics SummaSketch Professional (18"x12")

DIP Switch Settings (0=off, 1=on):

- Bank 1: 1 1 1 0 0 0 0 0
- Bank 2: 0 0 0 0 0 0 0 0
- Bank 3: 0 0 0 0 0 0 0 0

Environmental variable settings:

SET TABLET=MMBINARY COM1 12 12 4 500 for COM1: connection
MODE COM1:9600,N,8,1

SET TABLET=MMBINARY COM2 12 12 4 500 for COM2: connection
MODE COM2:9600,N,8,1

SummaGraphics Bit Pad Plus (12"x12")

No switch settings required.

Environmental variable settings:

SET TABLET=BITPAD COM1 12 12 4 200 for COM1: connection
MODE COM1:9600,N,8,1 (REQUIRED)

SET TABLET=BITPAD COM2 12 12 4 200 for COM2: connection
MODE COM2:9600,N,8,1 (REQUIRED)

Summagraphics SummaGrid IV (24"x36")

(Model CEM2436). Dip switch settings (0=off, 1=on):

- Bank A: 1 0 0 1 1 1 0 0
- Bank B: 1 0 0 0 0 1 0 0
- Bank C: 0 0 0 0 0 0 1 0

Environmental variable settings:

SET TABLET=MMBINARY COM1 24 36 4 500 for COM1: connection
MODE COM1:9600,N,8,1

SET TABLET=MMBINARY COM2 24 36 4 500 for COM2: connection
MODE COM2:9600,N,8,1

It is expected that these settings will be the same for other SummaGrid models.

Note

Before using the SummaGrid, the DOS program supplied with the digitizer must be run to set the appropriate tablet protocols. Check the tablet manual prior to testing.

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