



Genrakode™ Test Unit

User's Manual

Features • Functionality • Operation
P2160TU, Rev. Sept/2002



Genrakode™ Test Unit

User's Manual

© 2002 ALSTOM Signaling Inc.

Features • Functionality • Operation

P2160TU, Rev. Sept/2002

REVISION LOG

Date Mo/Year	Description	TP&T Rep.	Project Manager Name	Date	Project Engineer Name	Date
August 2001	Initial Release		RIH	08/10/01	HWM	08/10/01
July 2002	Reflects Hardware/Software Changes	JR	RIH	07/01/02	HWM	07/01/02
September 2002	Various Clarifications		RIH		HWM	

TABLE OF CONTENTS

SECTION 1 INTRODUCTION.....	2
PURPOSE.....	2
SYSTEM OVERVIEW.....	2
<i>Figure 1-1. Genrakode Test Unit.....</i>	<i>2</i>
SECTION 2 TEST UNIT FEATURES.....	3
<i>Figure 2-1. Layout of Test Unit Console.....</i>	<i>3</i>
SECTION 3 GENERAL FUNCTIONALITY.....	4
SECTION 4 USING THE TEST UNIT.....	5
SETUP.....	5
POWER-UP SEQUENCE.....	5
SERIAL INTERFACE.....	6
<i>Figure 4-1. Serial Cable Pinout.....</i>	<i>6</i>
<i>Figure 4-2. Startup Diagnostic Messages and GTU Prompt.....</i>	<i>7</i>
TRANSMITTING AND RECEIVING CODES.....	8
DC TRANSIT VS NORMAL MODE.....	9
CODE T.....	9
DISCONNECTING.....	12
APPENDIX A FLASH UPGRADING.....	13
<i>Figure A-1. Entering Monitor Mode to Prepare for Download.....</i>	<i>13</i>
<i>Figure A-2. Choosing Option to Enter Test Unit Mode.....</i>	<i>14</i>
<i>Figure A-3. Dloadwin in Test Unit mode, Choosing File to Download.....</i>	<i>14</i>
<i>Figure A-4. Downloading Hex File.....</i>	<i>15</i>

SECTION 1 INTRODUCTION

PURPOSE

The purpose of this document is to identify the functionality and use of the Genrakode Test Unit (“the test unit”). This document explains what the test unit is and how to use it.

SYSTEM OVERVIEW

As its name implies, the purpose of the test unit is to provide a device with which to test Genrakode (or Genrakode-compatible) systems. The test unit is compatible with conventional, programmable (PGK), and electrified Genrakode systems, as well as Harmon Industries Electrocode systems. Additionally, the test unit fully supports the PGK Code T implementation. The test unit is upgradable via flash memory and thus can support future enhancements or changes that may be made to the Genrakode specification as well as features that may be added to the test unit system software.



Figure 1-1. Genrakode Test Unit

SECTION 2 TEST UNIT FEATURES

The following are the test unit's most significant features:

- Rugged design – housed in a protective case and operates from –20 to +70 Celsius
- Portable – lightweight and easy to transport
- Ease of use – user-friendly, intuitive console
- Wide power voltage range (9-16 VDC)
- RS232 communications port for connection to terminal or computer
- Flash Upgradability of system software
- Configuration settings are stored in non-volatile memory

The following diagram depicts the console of the test unit, showing all switches, LED displays, and connections.

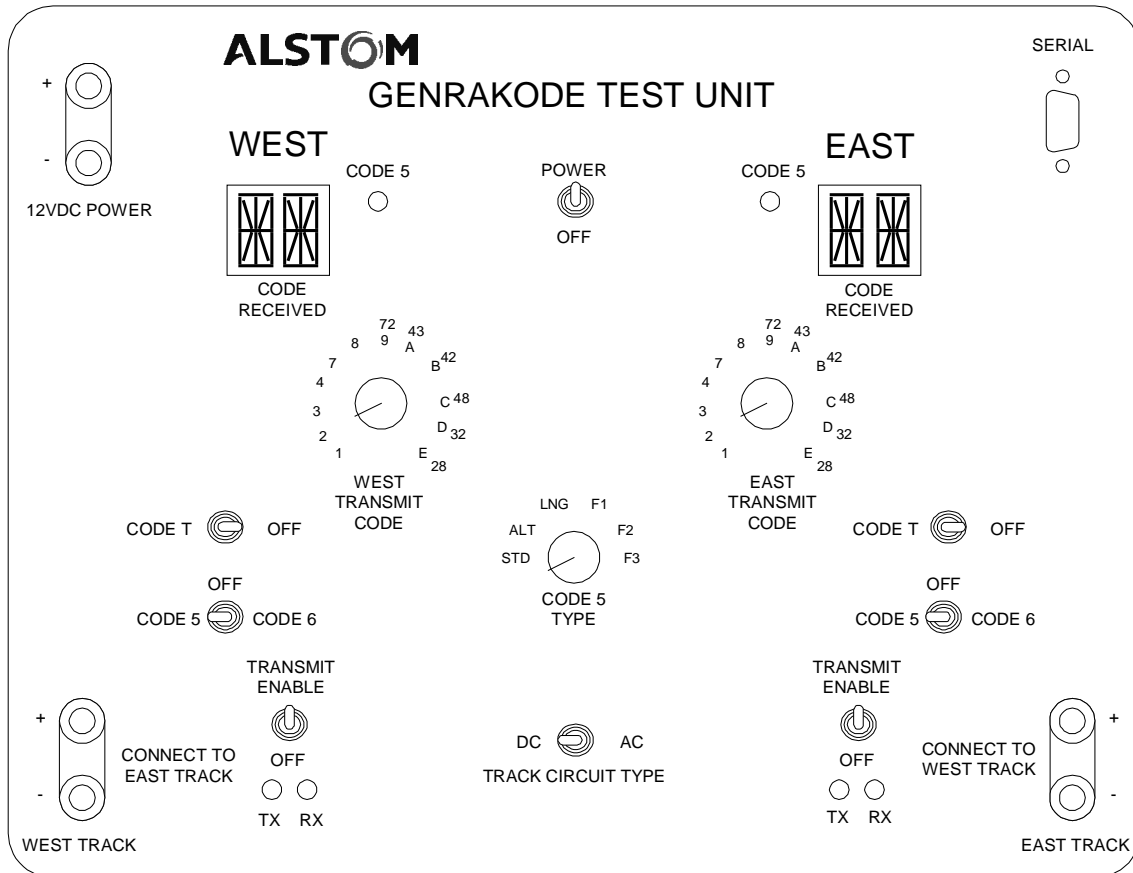


Figure 2-1. Layout of Test Unit Console

SECTION 3

GENERAL FUNCTIONALITY

The Genrakode Test Unit was engineered with three primary design goals in mind: portability, functionality, and upgradability.

The test unit is compatible with all existing Genrakode and Genrakode-compatible systems to date, including various competitors' products. The unit is capable of receiving DC track codes 1 through 9 and also features support for possible future codes. AC codes 1 through 8, 72, 43, 42, 48, 32, and 28 are also supported.

The test unit features two simultaneously operating channels: East and West. While both channels are independent from each other, certain settings must remain the same between the two channels. Specifically, the AC/DC mode selection, the Code 5 type, and the DC Normal vs. Transit selection must be the same for both transmit and receive on both channels.

As can be seen from Figure 2-1, the right side of the control panel is essentially a mirror of the left. Both sides feature a two digit 14-segment display and Code 5 LED that indicate the code currently being received, if any. Additionally, both sides contain a code select rotary switch, a Code T transmit enable switch, a Code 5/6 transmit switch, and a transmit enable switch. See the "Transmitting and Receiving Codes" section for descriptions of how to use these switches.

The test unit features over-voltage, current, and thermal protection. For example, accidental connection of the track leads to a 16 Volt DC battery source will not damage the device. Connecting the power connection or track leads backwards (i.e. negative to positive and vice versa) will also not result in damage to the unit. While the device contains numerous such protections, the maximum voltage that may be applied to any part of the device without causing damage is 16 VDC.

SECTION 4 USING THE TEST UNIT

SETUP

The first step to begin using the test unit is to connect the power leads to a 9 to 16 Volt DC power source. The nominal input voltage is 12 VDC. The power source must be able to supply 3A of DC current. If the test unit is to be used in AC mode and a separate power supply is being used to power the test unit from the one powering the module under test, the ground connections from the two power supplies must be connected.

The next step is to connect the track leads to the Genrakode module under test. First, disconnect any track connections to the Genrakode module, including any connections to Track Interface modules. It should be noted that if only one track of the module under test is to be tested, both sets of track leads need not be connected to the module.

If the module to be tested is operating in AC (“electrified Genrakode”) mode, the West track leads of the test unit *must* be connected to the East track posts of the Genrakode module and the East track leads of the test unit *must* be connected to the West track posts of the Genrakode module. This necessity is due to slight variations in the synchronization methods for the West and East tracks in AC mode.

If the module to be tested uses a Line Driver Converter/Receiver board to interface to line wire, it may be necessary to move the transmit tap settings on the Line Driver board to the 3.0V or 4.0V taps for the test unit to receive properly. The test unit will not be damaged at any tap setting, but proper reception of codes may require reducing the transmit voltage. Remember to take note of the tap settings before adjusting them so that they can be returned to the correct position after testing.

POWER-UP SEQUENCE

Once the track and power leads are connected, power up the test unit and the module under test (if not already powered up). If the test unit is operating properly, all segments of the 14-segment displays should immediately illuminate for a brief period to test the displays. Following this test, while the unit is initializing, the unit should display “P-UP” and illuminate both Code-5 LED’s. This entire process should take no more than seven seconds.

Then the 14-segment LEDs will show the test unit’s configuration settings. For each display (West and East), the first character displays the DC Normal vs. Transit mode for that track, and the second character displays if code T is enabled for that track. So, “Nd” means Normal mode and code T disabled, “NT” means Normal mode and code T enabled, and “T-” means Transit mode and code T is not applicable. Note that in AC mode, neither of these settings will be used

but are displayed. Upon completion of power-up, the 14-segment LEDs will show a single dash in each direction (“-”). To change modes, see the sections entitled “DC Transit vs. Normal Mode” and “Code T” later in this manual.

In the event of a failure with the system software on the test unit, the test unit will remain in a reset loop, with “P-UP” displayed on the 14-segment LEDs. The system software may be reprogrammed via the test unit’s serial connection. The PGK Dloadwin downloading software and a system software image file are required and are available from ALSTOM Signaling, Inc. See below (“Flash Upgrading”) for full details on the reprogramming procedure.

After the unit has successfully completed its power-up sequence, it will immediately begin to synchronize both tracks with the module under test. After synchronization occurs, the test unit will automatically transmit and decode signals based on the current switch settings. If the AC/DC switch is not yet in its proper setting, place it in its proper position now. The AC/DC switch position – and any other switch position on the test unit – may be changed at any time without needing to reboot or power cycle the device.

SERIAL INTERFACE

The Genrakode Test Unit features a serial interface that can be used for a multitude of purposes, including upgrading the system software, running advanced diagnostics, and changing several nonvolatile configuration settings. The test unit is configured to be used with a laptop or personal computer connected via a DB-9 null modem serial cable (or a straight-through cable with a null modem adapter). See Figure 4-1 below for the pinout. (This is the same cable used to connect a computer to the Programmable Genrakode CPU board.)

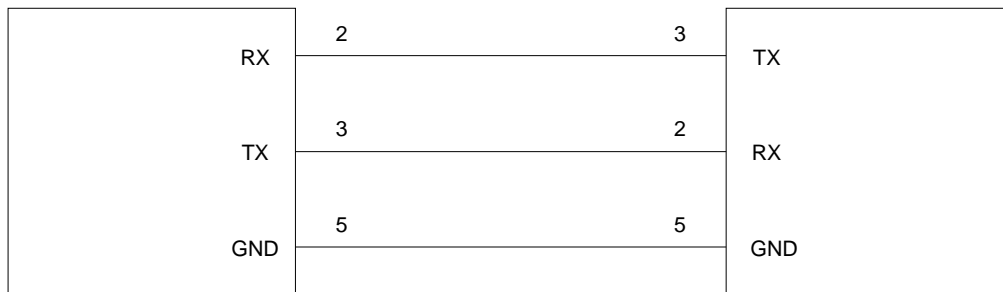


Figure 4-1. Serial Cable Pinout

Like PGK, the connection speed is 1200 bits per second (baud), and the connection parameters are 8 data bits, no parity, 1 stop bit, and no flow control.

Upon powering up the test unit, a message will be displayed from the boot loader as it performs a quick RAM check and some other power-up self-tests. Any problems are reported via the serial interface. Assuming all tests pass, the unit will then prompt the user to press “Enter” to go into

the bootloader monitor or wait a few seconds to enter the test unit's serial interface. The bootloader monitor is used in the flash upgrade process (see Appendix A).

After entering the serial interface, a GTU> prompt will be displayed (see Figure 4-2 below). The user interface is similar to that of PGK. The following commands are available (type ?):

```
(Enter ? for Command Summary)
GTU> ?

GTU Command Summary

DCM - Display/Modify DC Mode (Normal or Transit)
TOL - Display/Modify Tolerance Mode (Minimum, Nominal, or Maximum)
TID - Display/Modify Code T Location ID
MTS - Display/Modify Code T Enable Settings
TCD - Display/Modify Code T to be Transmitted
TPL - Display/Modify Code T Number of Parameters per Location
CHK - Display the Checksum and CRC of the System Flash
```

Figure 4-2 also shows an example of the startup messages that, in addition to the 14-segment LEDs, display the DC Normal vs. Transit setting and the Code T enable settings.

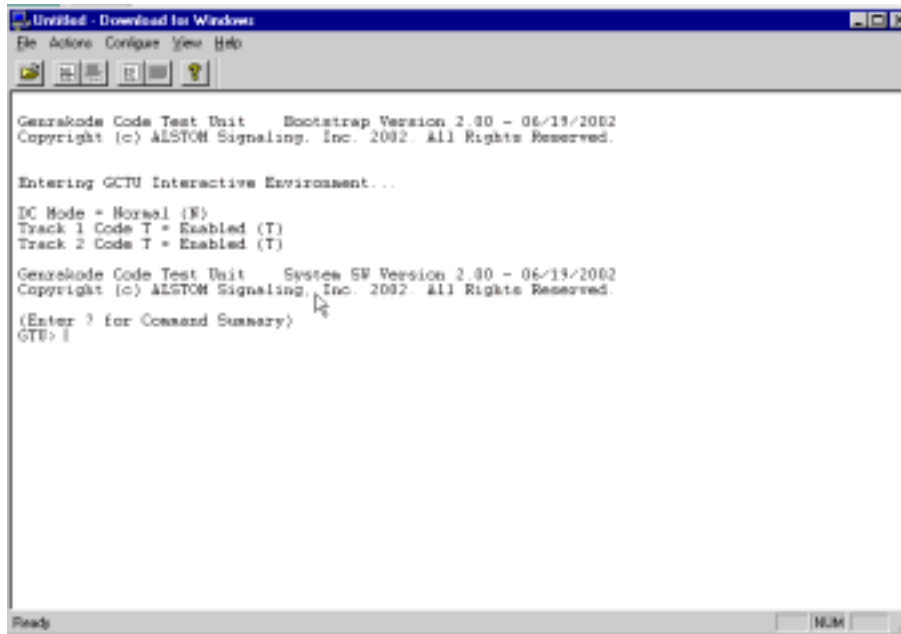


Figure 4-2. Startup Diagnostic Messages and GTU Prompt

TRANSMITTING AND RECEIVING CODES

After the test unit has powered up, codes successfully received from each set of track leads will automatically appear on the corresponding two-digit 14-segment display. If Code 5 is received, the appropriate Code-5 LED (located next to the two-digit display) will illuminate.

The test unit determines what code(s) to transmit based on the switch settings as well as the configuration of certain settings stored in nonvolatile memory and changed via the serial interface (see below). The various switches that control the codes transmitted are as follows:

- Code Select – selects the code to be transmitted. DC codes are marked in blue while AC codes are marked in red. At the time of this printing, valid DC codes are Code 1 through Code 9 while valid AC codes are Code 1 through Code 28. The test unit will ignore code selections as the switch is being turned, unless there is a long enough pause on an intermediary selection.
- Code T – toggles transmission of the trouble code. This switch is *only* effective if Code T mode is enabled via the serial interface (see section “Code T” below). If enabled, when this switch is turned on, Code T will be transmitted using the location ID and trouble code as set via the serial interface. When the switch is then turned off, the test unit will complete the active Code T transmission and then stop. So to send only one Code T, flip the switch on and then off again.
- Code 5/6 – this switch is a three-position switch that toggles transmission of Code 5 or Code 6. As these codes are mutually exclusive, both can not be transmitted simultaneously. Per the Genrakode specification, when Code 6 is selected, only one Code 6 pulse will be sent followed by Code 1. The current Code 5 setting will be held over for about one cycle when the switch is flipped to Code 6, so a quick flip to Code 6 and then back to Code 5 will ensure that one Code 6 pulse is sent without disturbing the Code 5 transmission.
- Transmit Enable – as its name implies, this switch enables transmissions from the test unit. Because this switch is interfaced directly to the analog transmitter circuitry within the unit, the transmit LED will continue to blink when the unit would normally transmit. However, the unit will not actually transmit a signal. This switch is especially useful to simulate a loss of signal to the Genrakode Module due to track shunting. Note that the test unit will continue to receive codes regardless of the position of the Transmit Enable switch.

A serial configuration setting, TOL, allows for specifying the length of the codes transmitted by the test unit. Available lengths are MINIMUM, NOMINAL, AND MAXIMUM. This command enables testing of receive tolerances of the module under test. For example, the nominal pulse width of a Code 1 in Normal DC mode (see below for a discussion of Normal vs. Transit DC modes) is 112ms. The minimum specified pulse width is 64ms and the maximum is 160ms. See the ALSTOM Genrakode, Genrakode II, and AC Genrakode Manuals for more details on the pulse width and pulse spacing tolerance specifications. Below is an example of using this serial command.

```
(Enter ? for Command Summary)
GTU> tol

East Track Tolerance Mode: NOMINAL
West Track Tolerance Mode: NOMINAL

<< Modify Tolerance Mode Settings >>

Enter 0 for MINIMUM, 1 for NOMINAL, and 2 for MAXIMUM

East Track Tolerance Mode> 0

West Track Tolerance Mode> 2
```

DC TRANSIT VS NORMAL MODE

The Genrakode specification allows for two different DC modes – Transit and Normal. In order to enable changing of this mode without requiring the use of the serial interface, a special method of toggling between normal and transit mode was established.

To toggle the DC mode, turn the unit off, set the Code 5 type switch to the “F1” position, and turn the unit back on. The DC mode will be toggled. Once the unit has powered up, the Code 5 type switch should be returned to its desired position.

It should be noted that the DC mode can also be changed via the serial interface’s DCM command if desired.

```
(Enter ? for Command Summary)
GTU> dcm

DC Mode: NORMAL

<< Modify DC Mode Settings >>

Enter 0 for NORMAL, 1 for TRANSIT

Enter DC Mode> 1
```

CODE T

The Code T specification allows for transmission of a trouble code and location ID to simulate a problem at a given Genrakode location. The test unit fully supports transmission and receiving of all possible Code T location IDs (1 through 27) and trouble codes (1 through 8 *).

* Note: As a default, the number of Code T parameters per location is set to 8, but to change this to 4 to match an earlier PGK application, see instructions on the TPL command below.

In order to receive or transmit Code T signals, Code T must first be enabled via the serial interface. The Code T enable setting is a per-track setting; that is, Code T can be in one direction and disabled in the other.

The command to enable or disable Code T is MTS.

```
(Enter ? for Command Summary)
GTU> mts

Code T East Track Operation: DISABLED
Code T West Track Operation: DISABLED

<< Modify Code T Settings >>

Enter 0 to DISABLE, 1 to ENABLE

Code T East Track Enable> 1

Code T West Track Enable> 1
```

Code T can also be enabled or disabled without requiring the use of the serial interface. To do this, turn the unit off, set the Code 5 type switch to the “F2” position, set the Code T switches to the “Code T” selection to enable Code T for that track or to the “OFF” selection to disable it, and turn the unit back on. Once the unit has powered up, the switches may be put back to their desired positions. For example, setting the West Code T switch to “Code T” and the East Code T switch to “OFF” in the above procedure will enable West Code T and disable East Code T.

Setting the trouble code and location ID to be transmitted is done via the serial interface using the TCD and TID commands.

```
(Enter ? for Command Summary)
GTU> tcd

East Transmit Code T = 1
West Transmit Code T = 1

<< Modify Code T Transmit Codes >>

Enter number between 1 and 8

Enter East Transmit Code (between 1 and 8) > 3

Enter West Transmit Code (between 1 and 8) > 2

(Enter ? for Command Summary)
GTU> tid

East Code T Location ID = 1
West Code T Location ID = 1

<< Modify Code T Location IDs >>

Enter number between 1 and 27

Enter East Code T Location ID (between 1 and 27) > 4

Enter West Code T Location ID (between 1 and 27) > 2
```

As noted previously, the default number of Code T parameters per location for the test unit is set to 8. This can be changed to 4 to support interfacing with older PGK applications. To do so, use the TPL command. Be aware that since this affects the formatting of the Code T message, the test unit should be reset to begin any Code T transmissions again.

```
(Enter ? for Command Summary)
GTU> tpl

Number of Code T Parameters Per Location: 8

<< Modify Number of Parameters Per Location >>

Enter 4 for 4 Parameters, and 8 for 8 Parameters

Number of Parameters> 4
*** Reset Test Unit To Ensure Proper Code T Operation ***
```

DISCONNECTING

When testing with the test unit is complete, simply disconnect the track and power leads from the Genrakode module under test. Then the Genrakode module can be reconnected to any tracks or Track Interface modules that were disconnected prior to testing.

APPENDIX A FLASH UPGRADING

Flash upgrading the test unit system software is a quick and easy procedure. Before proceeding, ensure that you have all the necessary hardware and software:

- Dloadwin.exe – the Windows PGK Download program. The PGK Dloadwin program (as of version 2.0) has an option to download to the test unit. See instructions below.
- GCTUSYSP.HEX – the system software file. The size of this file should be 276,527 bytes.
- A laptop or personal computer running Microsoft Windows.
- A null modem serial cable (or a straight through cable with null modem adapter) with a DB-9 connector.

To begin the flash upgrade process, connect the serial cable from the test unit to the computer and run the Dloadwin application. To do so from Windows, navigate to the application using Windows Explorer and double click on the application. If the serial port being used on the computer is not com 1, go to Configure > Com Port and choose the correct port being used.

Go to Actions > Terminal Mode (or click on the toolbar button) to enter the terminal view. Then power up the test unit, being ready to press <Enter> when prompted to enter the bootloader monitor. See Figure A-1 below. If the MON> prompt does not appear, power cycle the test unit and try again. Once at the MON> prompt, go to Actions > File Mode to leave the terminal mode.

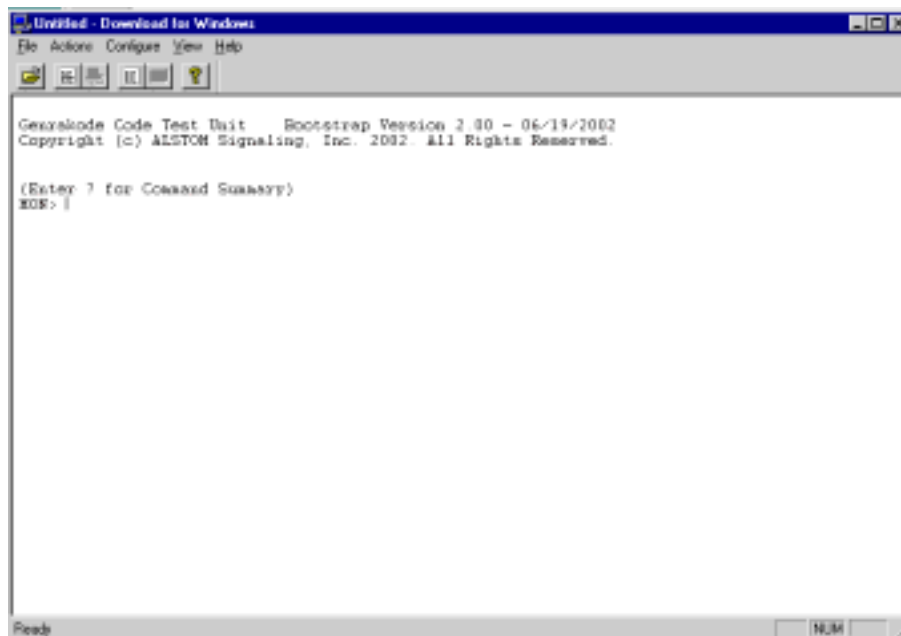


Figure A-1. Entering Monitor Mode to Prepare for Download

Since this download application is normally used for downloading software to a PGK module, go to Configure > Options > Test Unit to change to Test Unit Mode. See Figure A-2 below.

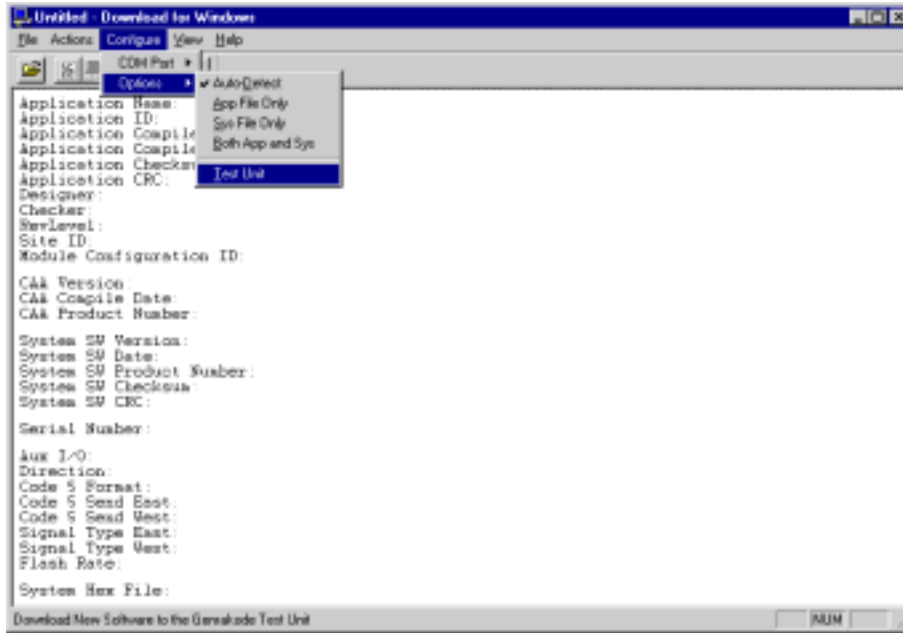


Figure A-2. Choosing Option to Enter Test Unit Mode

Once in Test Unit Mode, the File view will display test unit specific information. Go to File > Open to select the system software hex file. Browse for the gctusysp.hex file. See Figure A-3.

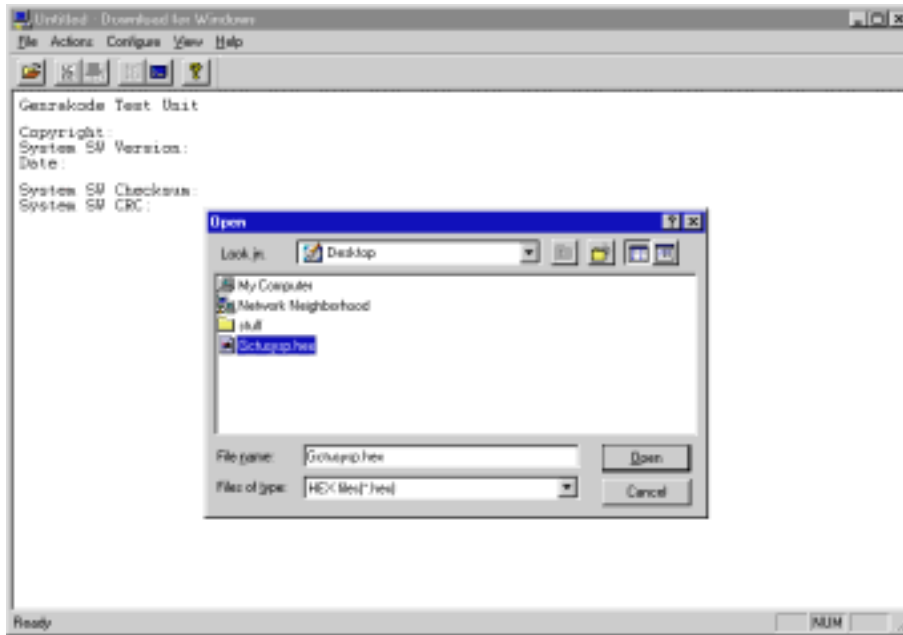


Figure A-3. Dloadwin in Test Unit mode, Choosing File to Download

Finally, to begin the download process, go to Actions > Download. The download process will take a few minutes to complete. Status information will be displayed in the download application throughout the process. See Figure A-4 below.

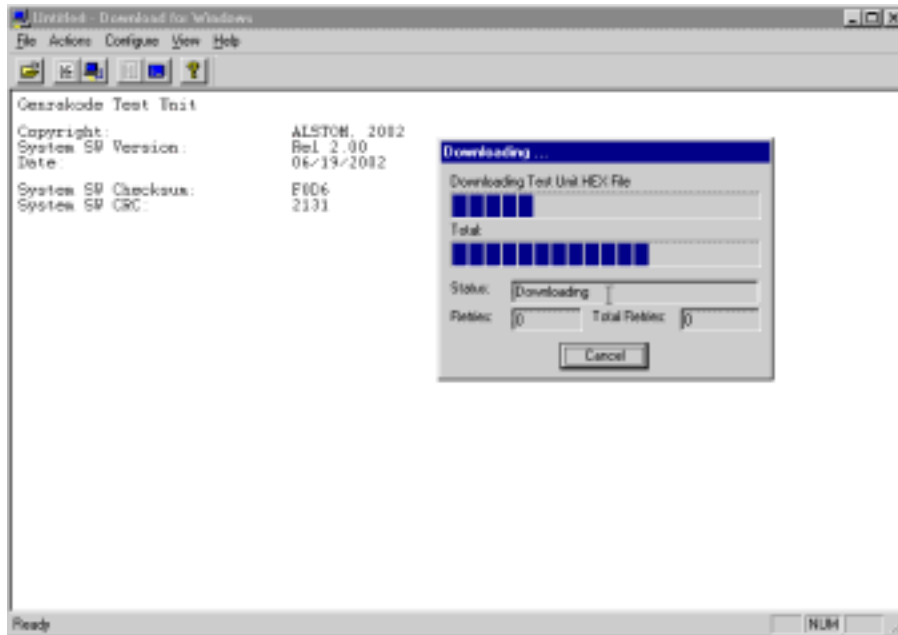


Figure A-4. Downloading Hex File

If you would like to confirm that the new software has been successfully programmed, reenter the download application's terminal view (by going to Actions > Terminal Mode) and power cycle the test unit. You should see a new version number reflected in the system software (the bootloader version number will remain the same).

Once the process is complete, exit from the download application and power cycle the test unit.