

THERMAL TRANSIENT TEST SET
MODEL 630B SN-25

Volume II
DATA CAPTURE AND ANALYSIS SECTION
INSTALLATION AND OPERATION

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Pasadena Scientific LLC
1418 Gunston Rd
Bel Air, Maryland 21015

THERMAL TRANSIENT CAPTURE AND ANALYSIS SYSTEM

SPECIFICATIONSWaveform Capture

RESOLUTION	12 bits (4096 divisions of full scale)
FULL SCALE RANGES	+/-10mV +/-100mV +/-1V +/-10V
SAMPLE RATE	1MHz (one sample every microsecond)
SAMPLE TIME	100uS TO 100MS
DISPLAY	Complete waveform is displayed on a CRT monitor. A narrow section of the waveform can be displayed and the view can be scrolled forward and back.
DATA STORAGE CAPACITY	40Gb

Analysis Software

DIRECT MEASUREMENT	Maximum Voltage Thermal Time Constant Initial Slope Cold Resistance
CALCULATED VALUES	Temperature Rise Above Ambient Heat Loss Coefficient Heat Capacity
GENERATED TABLES	Statistical Summary Means Standard Deviation
PLOTTED CURVES	Any variable can be plotted against any other.

WARRANTY

Model 620 Data Capture and Analysis System is warranted against defects in materials and workmanship for one year from date of shipment. Our obligation is limited to repairing or replacing parts which prove to be defective during the warranty period. No other warranty is expressed or implied. We are not liable for consequential damages.

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SECTION I

DATA CAPTURE AND ANALYSIS

1.1 Introduction

The use of digital data capture and analysis in thermal transient testing of hot-wire bridge detonators (EED's) for military, aerospace, automotive, and many other commercial applications reduces manhours in testing and reduces the opportunity for error in calculation and recording of data. Commonly employed testing techniques using the Model 610 test sets require that an operator or technician record data manually and then reduce that data by solving the Rosenthal thermal model equations to obtain the required information. The Data Capture System, as included in the Model 630 Test Set, captures the data, displays it on a CRT, calculates the Rosenthal equations, and performs statistical operations on the test population. The system is particularly well-suited for quality assurance, development, engineering design, and aging study applications.

1.2 Host Computer

Data and waveform storage can be done both inside the 630 test set and outside the test set on a host computer. Controlling the test set remotely from the host computer is also an option.

Minimum requirements for the host computer are as follows:

- An X86-based CPU (a 286-based CPU may be used provided it has sufficient memory to run in "Standard" mode.)
- A color graphics monitor with at least VGA resolution.

1.3 Host Computer Operating System and Memory Requirements

- DOS 3.3 or higher or MS Windows 3.1 or higher
- At least 1MB of RAM plus sufficient for operating system

1.4 Related Programs

Commercial spreadsheet programs that can read files in the *.xls or *.csv format may be used as a data logging or storage medium. Some of these are:

- EXCEL by Microsoft Corp.
- LOTUS 123 by Lotus Development Corp., and
- QUATTRO PRO by Borland.

1.5 First Steps

1.5.1 Package Inventory - Package contents include

- Hardware components:
Model 630 Test Set
RB-101 EED simulator,
GPIB circuit board, if used,
Accessories.
- Other:
Two technical manuals, and
Software package on three 3½ inch floppy disks.
Files included are:
630HOST2.EXE
Training demo
README.doc
GPIB drivers

1.5.2 How To Use This Manual - For your first reading it is important to go through this manual sequentially. The information in each section is built on the information presented in previous sections. You may miss something important if you skip around.

When information is presented in steps, use your system to duplicate each step as you read. Giving yourself this "hands-on" experience locks the information into your mind, thus reducing the need to refer to this manual later on.

1.6 Test Concept

The data acquisition circuit board is installed on a passive backplane in the Model 630 test set with a DOS-based computer. The output of the measurement section of the Test Set is connected to the input of the data acquisition circuit board. A normal Thermal Transient test is run and the output of the measurement section is digitized and analyzed. If desired, the data is stored and the waveform itself is stored for later reconstruction. Means and standard deviations of the test population are calculated and stored for possible use in statistical process control.

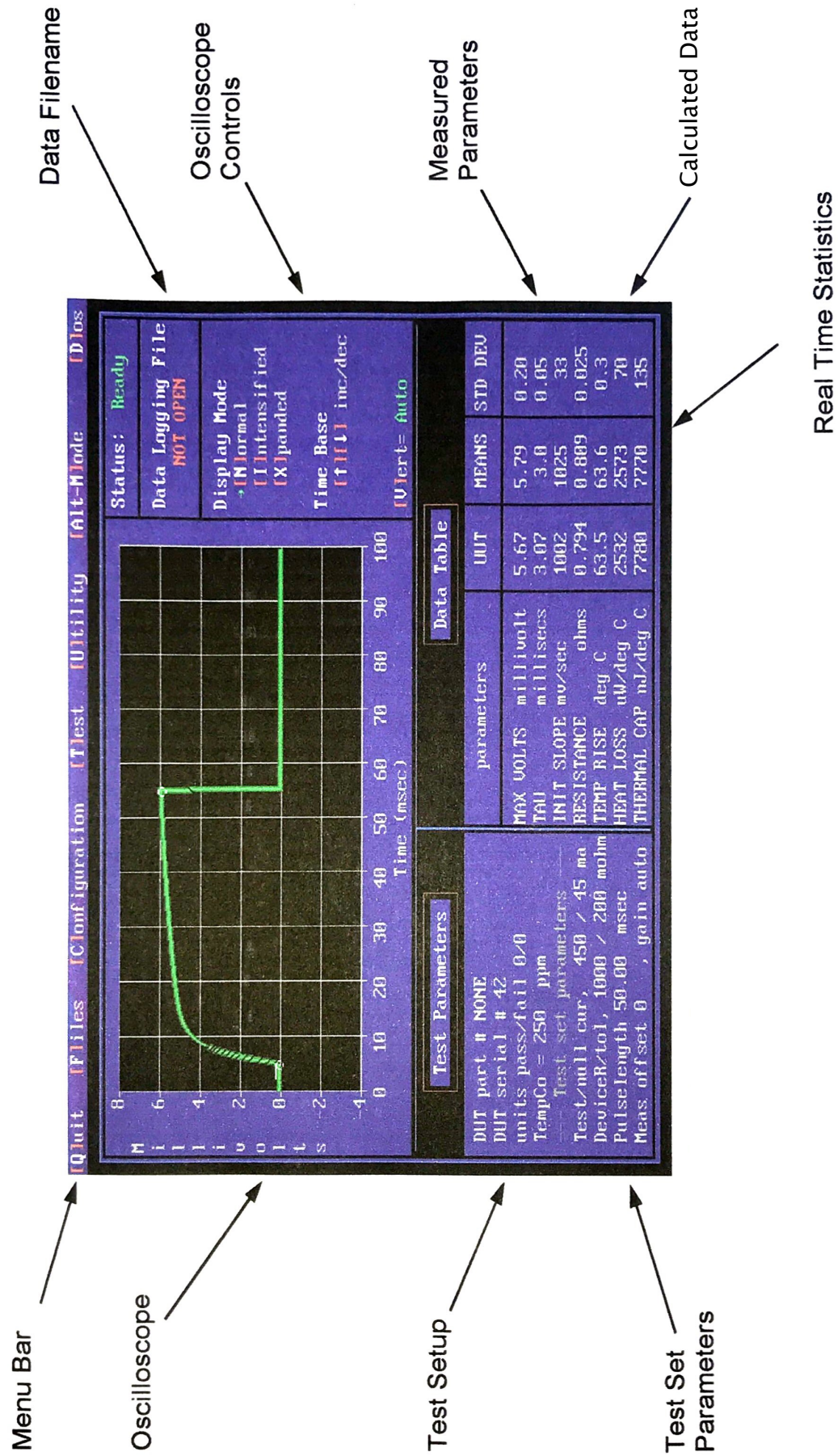
1.7 Test Capabilities

Test and measurement capabilities include:

- (a) 12 bits (4096 divisions of full scale)
- (b) 4 full scale ranges
- (c) 1 sample per microsecond
- (d) 100uS to 100MS sample time
- (e) Computer monitor acts as oscilloscope
- (f) Delay and scrolling of selected part of the waveform
- (g) Direct measurement of Max Voltage, Time Constant, Initial Slope, and Cold Resistance
- (h) Calculation of Temp Rise, Heat Loss Coefficient, and Heat Capacity
- (i) Calculation of Means and Standard Deviations
- (j) Pop-up menus for on-screen control
- (k) Conversion of data to popular spreadsheet formats

1.8 Display

Figure 1-1 is a photograph of the main work screen displaying a thermal response curve and showing the key operating areas.



MAIN WORK SCREEN

1.9 How to Contact PSI

You may send a letter detailing your comments to:

Pasadena Scientific LLC
1418 Gunston Rd
Bel Air, Maryland 21015 USA

Please include a daytime and an evening phone number in case we need to call you for more information.

You may also phone us at 717-227-1220 or FAX us at 717-227-2129. Whichever method you use, you must provide the following information. If you are calling PSI on the phone, please have this information about your host computer on hand before you call:

- Computer make, model, and amount of RAM
- Operating system and version number (enter "VER" at the DOS prompt)
- Graphics card type
- Monitor make and model
- printer make and model
- contents of your CONFIG.SYS and AUTOEXEC.BAT files
- contents of the 630PROC2.LOG file (if one exists) to be found in the same directory as the program executable.
- any RAM-resident programs loaded when the problem occurred (such as SideKick, SuperKey, or a RAM disk)

SECTION II

DESCRIPTION
DATA CAPTURE AND ANALYSIS SYSTEM2.1 General

The Data Capture and Analysis System facilitates thermal transient testing of EED's in a Model 630 Thermal Transient Test Set.

2.2 Description

The system consists of a data acquisition circuit board, a TTL I/O circuit board, and a GPIB circuit board, all installed on a passive backplane with a DOS-based computer. The circuit board consists of an analog preamp, digitizer, and circuitry to process the data and store it in memory. The software controls the operation of the circuit board, analyzes the data and calculates information for output, controls display for operator interface, and provides utilities such as redisplay of stored waveforms, and printing data in a spreadsheet format.

The TTL I/O card provides interface between the internal electronics and the back panel connectors.

The GPIB card provides communication with a host computer. The host computer provides remote control and/or data storage.

2.2.1 Power Requirements - The circuit board receives +5VDC at 150 milliamps and +12VDC at 100 milliamps each from the test set power supply section.

2.2.2 On-Board Power Supplies - The +12V DC is sent to a pair of DC-to-DC converters which provide +15V DC to the front end analog circuits. In addition the +15V DC is sent to a +5V DC regulator to provide a clean reference voltage to the A-to-D converter.

2.3 Jumpers

Two sets of jumpers are on the data acquisition circuit board; one sets the memory address, the other sets the I/O address.

Two sets of jumpers and a set of 8 DIP switches are on the I/O board. One set of jumpers sets the interrupt level of the board. The other, a single jumper, enables the J8 slot of an XT computer. The set of DIP switches sets the base address of the I/O board.

Two sets of jumpers and a set of 5 DIP switches are on the GPIB board. One set of jumpers sets the DMA and a high interrupt level of the board. The other sets a lower level interrupt level. The set of DIP switches sets the base address of the GPIB board.

2.4 Inputs to Data Acquisition System

A 9-pin, subminiature, D-type connector is on the end plate of the data acquisition circuit board. This connector receives signals from the test set main circuit board

2.4.1 Sync Input - The SYNC OUTPUT signal from the main circuit board is connected to the data acquisition circuit board. It is also routed to a BNC connector on the back panel of the test set.

2.4.2 Test Fail Input - The TEST FAIL OUTPUT signal from the main circuit board is connected to the data acquisition circuit board. It is also routed to a BNC connector on the back panel of the test set.

2.4.3 Data Input Connector The EED CHARACTERISTIC OUTPUT signal from the main circuit board is connected to the data acquisition circuit board. It is also routed to a BNC connector on the backpanel of the test set.

SECTION III

INSTALLATION

NOTE: To obtain clean oscilloscope traces particular attention should be given to the setup instructions.

3.1 General

The Data Capture and Analysis System digitizes the system output waveform, analyzes it, solves the Rosenthal thermal equations of the EED under test, and provides for communication to a host computer where these values are stored.

The Data Capture software provides the option for control from a remote host and or data storage via GPIB. Setting up GPIB control involves three basic steps:

1. Installing GPIB hardware and software,
2. Configuring the host to allow GPIB control, and
3. Preparing GPIB host program for controlling the test set.

Sections 3.4.1 through 3.4.3 provide detailed instructions for steps 1 through 3 above. GPIB control function is discussed in section 4.2.4.

3.2 Host Computer Preparation

Prior to installing the GPIB circuit board, check the host computer for other devices that use the I/O bus and system memory. The board is set at the factory for an I/O base address of 2C0 hex, DMA channel 5, and interrupt 7. It is highly probable that these settings will work for you. If not, there are switches on the board with which to change these addresses. (See Figure 3-1).

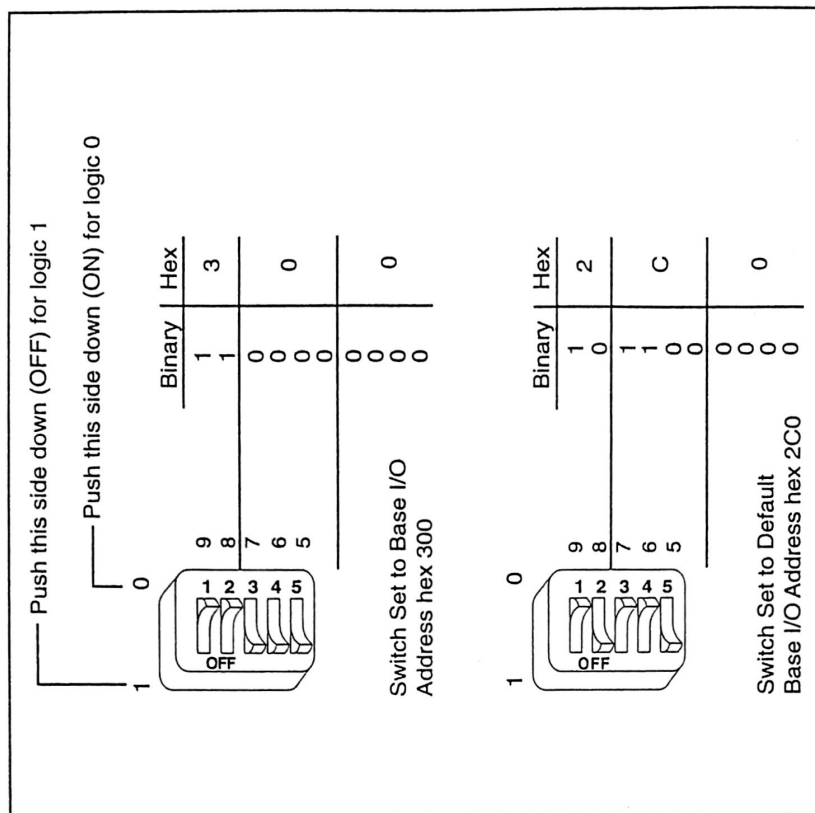
3.3 Host Mechanical Installation

To install the GPIB board in the host computer remove the cover and end plate. Remove an end plate from a spare slot in the back. Install the GPIB circuit board. The factory-preset Base Address range shown in Figure 3-1 is reserved. The address as delivered from Pasadena Scientific Industries is set to 2C0 Hex. The interrupt line is set to 7. These default values will function in most computers without conflict, thereby eliminating any need for address selection and configuration.

Possible Base I/O Address Switch Settings

Switch Setting					Base I/O Address (hex)	I/O Address Space Used (hex)
A9	A8	A7	A6	A5		
0	1	0	0	0	100	100 to 11F
0	1	0	0	1	120	120 to 13F
0	1	0	1	0	140	140 to 15F
0	1	0	1	1	160	160 to 17F
0	1	1	0	0	180	180 to 19F
0	1	1	0	1	1A0	1A0 to 1BF
0	1	1	1	0	1C0	1C0 to 1DF
0	1	1	1	1	1E0	1E0 to 1FF
1	0	0	0	0	200	200 to 21F
1	0	0	0	1	220	220 to 23F
1	0	0	1	0	240	240 to 25F
1	0	0	1	1	260	260 to 27F
1	0	1	0	0	280	280 to 29F
1	0	1	0	1	2A0	2A0 to 2BF
1	0	1	1	0	2C0	2C0 to 2DF
1	0	1	1	1	2E0	2E0 to 2FF
1	1	0	0	0	300	300 to 31F
1	1	0	0	1	320	320 to 33F
1	1	0	1	0	340	340 to 35F
1	1	0	1	1	360	360 to 37F
1	1	1	0	0	380	380 to 39F
1	1	1	0	1	3A0	3A0 to 3BF
1	1	1	1	0	3C0	3C0 to 3DF
1	1	1	1	1	3E0	3E0 to 3FF

Press down on the side marked OFF to select a binary value of 1 for the corresponding address bit. Press down on the ON side of the switch to select a binary value of 0. Refer to Figure 2-4 for an example of the switch settings and corresponding base I/O addresses.



Base I/O Address Switch Settings

Figure 3- / GPIB Base Address Settings

However, if there is a conflict, you will need to change the Base Address and/or the interrupt lines from their present values. You may select one of eleven interrupt levels (IRQ3 to IRQ15, except IRQ8 and IRQ13) from the PC Bus. Interrupt or Base Address changes require setting the jumpers/DIP switches on the GPIB board and modifying software settings. (See Section 3.4.)

Figure 3-2 through Figure 3-6 in Volume I of this manual show external cabling diagrams for local and host operation, and for operation with a PLC.

AS A SAFETY MEASURE WE STRONGLY RECOMMEND THAT TEST ITEMS BE PLACED IN A SUITABLE TEST CHAMBER DURING TESTS.

3.4 Software Installation

A host program for GPIB control called 630HOST2.EXE is provided with the Model 630 Test Set. The host program sends commands to the 630 and receives data back. Communications status and returned data are written to the host screen.

Note: GPIB software should be installed before installing boards into computer.

3.4.1 Software Installation to Host Computer

- Put National Instruments disk for DOS in floppy drive.
- Type A:\ install and Return.
- Perform the full GPIB installation to C:\AT-GPIB (default).
- When asked to modify Config.sys file, type YES.
- Exit install, remove floppy disk, and reboot.

3.4.2 GPIB Hardware Installation

Install GPIB cards into host computer and connect cables.

- Reboot computer

3.4.3 GPIB Run ID, software, and hardware tests

Enter GPIB subdirectory on host computer. (Type "CD:\at-gpib")

- Type "ibconf" and press any key to enter the GPIB configuration screen. Select the appropriate board (typically, GPIB0). If no board is present, select the AT-TNT board type using the arrow keys. Proceed to verify the hardware settings shown on the screen, modifying them if necessary to match jumper settings on the GPIB board. When complete, exit the configuration program by pressing ESC.
- Type "GPIBINFO" and Return (Detects hardware)
- Program output should indicate that software is loaded and should list info such as chip name, I/O address, etc
- Type "ibtest" and Return (Tests hardware)
- Type "ibdiag" and Return (Tests software)
- You will be asked to disconnect the GPIB cable.

For each test GPIB information is displayed. Message at end of each test indicates good or bad software and hardware.

Note: If the results of these diagnostic tests indicate a failure, the board base address or interrupt assignment may be in conflict with other hardware in the computer. Some versions of DOS have diagnostics to check base address and interrupts built into them. Type "MSD" and press Enter. If the diagnostics are available, press "Q" to obtain a listing of interrupts. If the conflict exists, turn the computer off, remove the GPIB board, and set the interrupt assignment to an unused value by moving the jumper on the GPIB board. Reinstall the board and turn the computer on. Rerun the "ibconf" program to change the board settings and then rerun the GPIB diagnostics as described above.

3.5 First Startup

1. Turn on the 630 Test Set.
2. From the C:\620> prompt type:

630PROC2 Press RETURN

Note: Before you can use the control software, it must be configured. This configuration will be saved in a file named "610PROC.CFG". The first time you begin this program is the only time that you will be asked for configuration details.

- The program will prompt you for the parameters needed for the .CFG file. It may be updated at any time, so if you are uncertain about a parameter, just choose the default.
- If you choose to configure the Pass/Fail function at this time, the parameters produced will be saved in a .PFL file.
- During initial configuration, neither Gold Standard nor Waveform Limit functions are available. (A data file must be available to make into a Gold Standard file and a Gold Standard file must be specified to set waveform limits.)
- The program will automatically test and adjust the data acquisition board, and when finished, display the main work screen. The STATUS block in upper right of screen will indicate READY.

3.5.1 Configure Control Interface

1. Press any key to continue.
2. Follow instructions on the screen.
3. Type part number or name of part to be tested.
(Optional)
4. Enter thermal coefficient of resistance of the bridgewire material in parts per million.
(Default = 250)
5. Enter starting serial number. (Default = 1)
(Optional)
6. Do you want automatic serial numbering?
(Default = Y)
7. Select method of determining initial slope.
(Default = T) (Calculated from Tau)
8. Do you want automatic null correction?
(Default = Y)
9. Do you want "fuzzy line" displayed? (Default = Y)

3.5.2 Configure Test Parameters

1. Accept all defaults by pressing "ESC"
2. To change any value, type its number, type new value, and press "Enter".
3. When finished, press "ESC" to continue.

3.5.3 Configure PASS/FAIL Module

1. Do you want to enable Pass/Fail? (Press Y or N)
2. If yes, press "E" to edit limits in the Pass/Fail Parameter dialog box.
3. Move around dialog box using arrow keys.

Note: During initial configuration percentage limits are not available. (A data file must be available to make a Gold Standard file and a Gold Standard file must be loaded to set percentage limits and waveform limits.)

Note: % vs A (% vs Absolute limits) is a toggle function.

Note: The "X to Use" column also is a toggle function.

4. Move cursor to toggled position to be changed and press "Enter".
5. Type values into low or high limit position and press "Enter".
6. When finished press "ESC" to exit Pass/Fail dialog box.

Note: During initial configuration, neither Gold Standard nor Waveform Limit functions are available. (A data file must be available to make into a Gold Standard file and a Gold Standard file must be called to set waveform limits.)

3.5.4 Configure Communications

Select GPIB configuration setting (I). Select "YES" to allow GPIB control. Allowing GPIB control does not disable other control options such as local keyboard trigger or TTL command trigger. When all other configuration options have been set, exit to the main work screen by pressing "ESC".

1. Do you want GPIB communication to record data?
(Default = N)
2. Enter the primary address for the GPIB card. /
(Default = 8)
3. Do you want a GPIB communication error to stop testing
(important in automated assembly line applications)?
(Default = Y)
4. IF yes, do you want to record waveform also?
(Default = N)

3.6 Host First Startup

A host program for GPIB control called 630HOST2.EXE is provided with the Model 630 system. The host program sends commands to the Data Capture System and receives data back from it. Communications status and returned data are written to the host screen.

1. Turn on the host computer.
2. Make new directory "C:\HOST"
3. Copy 630HOST2.EXE file from floppy disk to the C:\HOST directory in the host computer.
4. From the C:\HOST prompt type:
"630HOST2" and press Enter.

Note: Before you use the host software, it must be configured. This configuration will be saved in a file named "610PROC.CFG". The first time you begin this program is the only time that you will be asked for configuration details. Enter the same information for the host program configuration that was entered for the data capture program configuration. Refer to 3.6. Once GPIB communication is established, the configuration data set will be synchronized from then on.

System is fully configured.

3.7 Configuration After First Startup

Start the Data Capture software by typing 630PROC2 and RETURN from the c:\620 directory. If a configuration file already exists, the main work screen will appear. Type "C" to display the Configuration screen. If a configuration file does not already exist the software will prompt the user to enter configuration information

The software will attempt to initialize the GPIB card. If GPIB error messages appear, go to paragraphs 3.5.5.3 and 3.5.6.3 and perform the diagnostic checks on the GPIB hardware and software.

3.8 System Turn-On After First Startup

To avoid communication errors, turn on test set first. Then turn on host computer and start "630HOST2" program. The test set will recognize the host computer as soon as information starts to flow over the GPIB line.

SECTION IV

OPERATING INSTRUCTIONS

4.1 General

Instructions contained in this Section assume that the user is unfamiliar with the Model 630 Test Set and its test procedures. As the user becomes familiar with the various controls and their relationship to the test, it will become apparent that some procedure details, as outlined, may be modified or omitted.

For indoctrination purposes Reference Bridgewire RB101 is used as the device under test in the examples to follow. The RB101 is a thermally responsive resistor network whose electrothermal behavior is comparable to typical EED's. A full description of the RB101 will be found in Appendix AN 1.

4.2 Operating Procedure

The operating procedure consists of five parts: display, configuration, data storage and analysis, communications, utilities, and other features.

4.2.1 Display - Oscilloscope Controls

1. Set up the 630 Test Set using an RB101 squib simulator.
2. Make a measurement by pressing "T" to simulate trigger to 630 test set.

Note: "ESC" (escape key) always returns to previous screen.

NOTE: The waveform that appears on the monitor is similar to the waveform that appears on an oscilloscope display. The system is set up to give the look and feel of an analog oscilloscope. However, the data is stored digitally in the computer and can be manipulated after the waveform is generated. This is in contrast to the analog oscilloscope where everything had to be set up prior to taking data. If a different look at the data was required, the oscilloscope had to be re-adjusted and new data taken.

The display is adjusted just like an oscilloscope, except that an oscilloscope is set up using its front panel controls, whereas the display of the Data Capture System is controlled from the computer keyboard.

3. The vertical scale is controlled by pressing "v" on the computer keyboard. A pop-up menu will appear presenting vertical scale options of 0.5 to 8 mv/div, or Auto. In Auto the system will auto-range the display giving the maximum resolution of the displayed waveform.

NOTE: The Num Lock function on the computer keyboard must be off (light out) if you are using the arrows on the number keypad.

4. The horizontal scale (timebase) is controlled by the arrow keys. The up/down arrows control the timebase in the 1, 2, 5 sequence. The left/right arrows scan the scale by changing its starting point.
5. There are three horizontal or timebase modes - normal, intensified, and expanded. These work just like the conventional analog oscilloscope in that the intensified spot is used to position the display for the expanded mode and to determine exactly where a particular spot is. (The left/right arrows work only in the INTENSIFIED and EXPANDED mode.)
6. In the Data Capture System the "intensified" spot is not intensified (it would be too hard to see). It is actually a small yellow circle approximately the size of the expanded timebase and large enough to be easily visible on the screen.
7. With a characteristic waveform on the display, switch to the intensified mode by pressing "i". Drive the spot around with the left/right arrow keys.
8. Position the yellow circle around some particular event and switch to the expanded mode by pressing "x". Note that the background color changes to remind you that you are in the expanded mode.
9. Continue using the arrow keys until you develop a good feel for their use. Return to the normal mode at any time by pressing "n".
10. The white circles near the start and end of the waveform indicate the start and end points for the analysis routine.

Note: The analysis routine attempts to calculate the true start of the characteristic waveform. It extrapolates back down the curve to a point, in time, that would have been the start of the waveform if there had been no inductive spike. It places a white circle on the waveform to mark this point.

It also determines a starting level from which to calculate amplitude. It plots a small white line on the graph to indicate the amplitude of the starting level. If the 630 test set produced a perfect null, this small white line would lie on the baseline. In other words, The analysis routine can correct for small errors in null.

The system will base its analysis on the position of these points. If you feel that they are in error, you may turn off this feature (Config Menu).

The white circle near the end of the waveform is the point where the system measures the maximum amplitude. It's position is set by value of Pulse Length (Config Menu) which should be adjusted to where you feel that valid, reliable indications may be obtained.

4.2.2 Configuration

4.2.2.1 Test Parameter Setup

Letters A through D allow test parameter setup.

1. Press "C" for Config.
2. Press the letter of the parameter you wish to change.
3. Default values for each parameter are already in the system and are shown in brackets - [DEFAULT]. You may choose the default value by pressing ENTER or you may input a new value and then press ENTER.
4. When you press ENTER the value is changed and the screen returns to the parameter menu.

A PART NUMBER: [NONE]

Enter the part number of the device you will be testing (11 characters max).

B BRIDGEWIRE CO'FF = 250

Enter the temperature coefficient of resistance (in parts per million per degree C) of the bridgewire material you will be testing. If unknown, enter "0". (Note that calculated values will not be generated if coefficient of resistance is not known.)

C SERIAL NUMBER = 1

Enter the starting serial number for the device you will be testing.

D TEST SET PARAMETERS

To change the test set input parameters, enter the number of the item you wish to change. Press ENTER to accept the default or current value. Press <ESC> to return to previous menu.

- 1 Test current (ma): [450]
- 2 Null current (ma): [45]
- 3 Nominal device resistance (milli-ohms) [1000]
- 4 Resistance tolerance (milli-ohms) [200]
- 5 Pulse length [50]
Enter the pulse width in milliseconds (10 to 100).
- 6 Offset constant [0]
Offset range is from -10,000 to +10,000
- 7 Gain step (0-7, or 8 for Auto gain of 100) [8]

4.2.2.2 Test Option Setup

Letters E through H allow test option setup.

1. Press "C" for Config.
2. Press the letter of the option you wish to change.
3. Default values for each option are already in the system and are shown in brackets - [DEFAULT]. You may choose the default value by pressing ENTER or you may input a new value and then press ENTER.
4. When you press ENTER the value is changed and the screen returns to the parameter menu. /

E AUTO SERIAL NUMBER INCREMENT - ON

Do you want Auto Serial Numbering (Y/N) [Y]

If you desire, the test set will automatically update the serial number of the device you are testing. Otherwise you will be prompted to enter it's serial number.

F INITIAL SLOPE - Tau

Select the method for determining the initial slope (Measured/Tau)

The heat capacity of your device is calculated from the initial slope of it's thermal transient. This is measured directly by the test set, but it's measurement is difficult and may have significant error under certain conditions. The initial slope may also be calculated from Tau - the thermal time constant.

G OFFSET CORRECTION - ON

Do you want this feature (Y/N) [Y]

The test set may not be able to generate a perfect null. This analysis package calculates the amount or offset (based upon the measured or calculated slope), and adds/subtracts it from the measured values for extra precision. You may turn this feature ON or OFF.

H PLOT FUZZY LINE - ON

Do you want this feature (Y/N) [Y]

The screen plotter generates a "fuzzy" line to make a display that looks more like an oscilloscope display. When this feature is turned off the waveform display is one-pixel wide line. You may turn this feature ON or OFF.

4.2.2.3 PASS/FAIL Setup

Letter I allows pass/fail parameter setup

1. Press "C" for Config.
2. Press "I" enable Pass/Fail module.
3. Press "Y" to enter Pass/Fail edit screen.
4. Press "E" to enter Edit function.

Note: Percent "%" sign vs Absolute "A" is a toggle function. Press Enter to toggle, Press arrow key to move without toggling.

Note: Use arrow keys to move around screen. Type new values where desired.

5. Press "ESC" to leave edit function.
6. Choose "G" to select Gold Standard.
Choose "W" to go to waveform limits screen.
Choose "ESC" to return to work screen.

4.2.2.3.1 Edit Waveform Limits

4.2.2.3.1.1 Set Start and End Times of Limit Lines

1. To set start and end times for upper and lower waveform limit lines, press "T" or use arrow keys to move cursor to "TIME" button and press "Enter".
2. Use arrow keys and type values in dialog box for start and end times of waveform limit lines.
3. Use arrow keys and type "X" or ENTER to select the waveform limit for use in the pass/fail analysis.
4. When finished, press "ESC".

4.2.2.3.1.2 Move Limit Lines Up or Down

1. To move limit lines up or down, press "SHIFT-U" or use arrow keys to move cursor to "SHIFT Up" button and press "Enter".
2. Use Up or Down arrow to move whole upper limit line.
3. When finished, press "ESC".
4. Press "SHIFT-L" or arrow to "SHIFT Lo" button and press "Enter".
5. Use Up or Down arrow to move whole lower limit line.
6. When finished, press "ESC".

4.2.2.3.1.3 Adjust Shape of Limit Line

1. To adjust shape of limit lines pixel by pixel, press lower case "u" or use arrow keys to move cursor to "Mod u" button and press "Enter".
2. Use left and right arrows to position circle on upper waveform.
3. Use Up or Down arrows to change shape of waveform at that point.
4. Repeat steps 2 and 3 to achieve desired waveshape.
5. When finished, press "ESC".
6. Press lower case "l" or arrow to "Mod Lo".
7. Repeat steps 2 through 5 to modify shape of lower limit line.

4.2.2.3.1.4 Reset to Default Limits

1. To return to the default limits, press lower case "d" or use arrow keys to move cursor to Default button and press "Enter".
2. Press "Y" in response to the question "Do you wish to continue". Limits will be reset to their default values.

4.2.2.3.2 Return to Config Screen

1. WHEN FINISHED setting up and editing waveform limits, press "ESC" to return to Pass/Fail edit screen.
2. Press "ESC" to return to Config screen.
3. Press "ESC" to return to Work screen.

4.2.2.4 Configure Communications

Press "C" to enter Config screen.

Letter J allows communications setup.

Select GPIB configuration setting (J). Select "YES" to allow GPIB control. Allowing GPIB control does not disable other control options such as local keyboard trigger or TTL command trigger. When all other configuration options have been set, exit to the main work screen by pressing "ESC".

1. Do you want GPIB communication to record data?
(Default = N)
2. If yes, enter the GPIB card primary address.
(Default = 8)
3. Do you want a GPIB communication error to stop testing (important in automated assembly line applications)?
(Default = Y)
4. Do you want to record waveform also?
(Default = N)

4.2.3 Storage and Analysis

While the display makes viewing the characteristic waveform much easier than ever before, the automatic analysis and logging makes device evaluation much easier, also. The system analyzes the waveform, directly measuring final pulse voltage, initial slope, thermal time constant, and cold resistance. Using these measured data, it calculates temperature rise of the bridewire, heat loss, and heat capacitance. It then updates the statistical database, and stores the data. Inputs to the system are the test parameters, temperature coefficient of resistance of the device to be tested and test current (each entered once via the Config Menu at the start of testing). It also calculates a running mean and standard deviation of the sample lot tested so far. This data may then be saved to the data logging file.

To minimize the chance of losing data due to power line interruption, etc., the system opens the logging file, appends the new data to it, and then quickly closes the file. This allows the minimum time that the file is vulnerable to damage by computer hardware problems.

The system provides for rapid testing, limited only by the time it takes to connect a device and view the waveform. The system will tolerate a small amount of null error by calculating the true null point from the waveform itself and compensating for it in it's calculations.

A feature in the calculation of the thermal equations is the use of either the exponential thermal time constant, TAU, of the waveform (calculated by the half-point method) or the Initial Slope measured by two points early in the waveform. One technique produces more accurate results on some devices while the other technique produces more accurate results on others. Either method may be selected from the Config Menu under Options.

4.2.3.1 Record Test Data

1. From main work screen, press "F" for "File".
2. Press "P" to set path. Type the name of the file path in which you would like these files to reside - e.g. C:\YOURDIRNAME on the host computer. (Data can be stored locally, in the 630 test set, only on the "D" drive - e.g. D:\YOURDIRNAME.)
3. Type "N" for filename. Type new filename or accept default to append new data to an existing file. Type "Enter".
4. Press "O" to open file. If file already exists, press "O" again when prompted.

4.2.3.2 Take Data

1. Press "T" desired number of times to generate data. Each "T" will generate one line of data and record it in the file.
2. Continue to add as many lines of data as desired.
3. When finished, press "F".
4. Press "C" to close file.
5. Press escape key "ESC" to return to work screen.

Note: Data file is now available for viewing or converting to .csv format for printing. (See paragraphs 4.2.5.1 and 4.2.5.2.)

4.2.3.4 Local Data Storage Capacity

There is approximately 78Gb of file space available in the 630 test set. Each test will result in one line of data.

TYPE OF FILE	FILE NAME	OVER- HEAD	PER LINE	TOTAL (bytes)
Numerical	*.DAT	38	34	
Waveform	*.WVF	2	1620	
Gold Std	*.GLD			1656
Gold Limits	*.GLM			3295
Excel	*.CSV	104	113	

These file size numbers will vary depending upon your particular configuration. However, they are close enough for planning. We suggest that you check sizes of the files for your configuration.

4.2.4 Communications

4.2.4.1 GPIB Host Program - Operating functions

GPIB communication between the host and local computers consists of command strings followed, in some cases, by additional data. The following paragraphs describe the communication messages. Description of configuration data sent over the GPIB line is provided in Figure 4-1 and description of test data sent over the GPIB line is provided in Figure 4-2.

CONFIGURATION DATA DESCRIPTION	DATA TYPE	# OF BYTES	UNITS	NOTES
*****	*****	*****	*****	*****
Temperature Coefficient of Resistance	floating point	4	parts/million/degree C	
Test Current	floating point	4	amperes	
Pulse Length	long integer	4	milliseconds	
Serial number	long integer	4		
Auto Serial Numbering Flag	integer	2		Auto=Y, Manual=N
Slope Calculation Flag	integer	2		Measured=M, Tau=T
GPIB Communication Flag	integer	2		Enabled=1, Disabled=0
Digital I/O Communications Flag	integer	2		Enabled=1, Disabled=0
Include Waveform Over GPIB Flag	integer	2		Enabled=1, Disabled=0
GPIB Primary Address	integer	2		
Stop Testing on GPIB Error	integer	2		Yes=1, No=0
Length of Part Number String	integer	2		
Part Number	char	1*string length		
Offset Correction Flag	integer	2		Enabled=1, Disabled=0
Null Current	integer	2		
Device Resistance	integer	2	milli-amperes	
Resistance Tolerance	integer	2	milli-ohms	
Offset Constant	integer	2	milli-ohms	
Gain Step	integer	2		
Pass/Fail Flag	integer	2		1-7, 8=Auto
Gold Standard Filename String Length	integer	2		Enabled=1, Disabled=0
Gold Standard Filename	char	1*string length		
Pass/Fail Low Limits	floating point	4*7		
Pass/Fail Low Limits Absolute Limit Flag	char/BYTE	1*7		See notes 1,3
Pass/Fail High Limits	floating point	4*7		See notes 2,3
Pass/Fail High Limits Absolute Limit Flag	char/BYTE	1*7		See notes 1,3
Pass/Fail Limit Use Flag	char/BYTE	1*7		See notes 2,3
Pass/Fail Waveform Time Limits	floating point	4*4		See notes 2,3
Pass/Fail Waveform Use Flag	char/BYTE	1*2		See notes 3,4, and 8
Pass/Fail Waveform Upper Limit	floating point	4*400		See notes 3,5, and 8
Pass/Fail Waveform Lower Limit	floating point	4*400		See notes 3,6, and 8
Pass/Fail Gold Standard File Contents	long integer	4		See notes 3,6, and 8
Message Checksum				

Figure 4-1a. Description of Configuration Data Message Sent Over GPIB

1. Low and high limits are 7 element float arrays. The data in the array is ordered as follows:

Array Element	Data	Units
0	Max Volts	millivolts
1	Tau	milliseconds
2	Initial Slope	millivolts/second
3	Resistance	ohms
4	Temp Rise	Degree C
5	Heat Loss	microWatts/Degree C
6	Heat Capacitance	NanoJoules/Degree C

2. Low and high limits absolute limit flags are 7 element byte arrays. If value is 1, then use absolute limits. If value is 0, then use % limits. Pass/Fail limits use flag is a 7-element byte array. If value is 1, then use the limit for pass/fail evaluation. If value is 0, then do not use the limit. The data is ordered as indicated in note 1.

3. Data included in message only if pass/fail flag is 1.

4. Pass/fail waveform time limits is a 4-element float array. The data in the array is ordered as follows:

Array Element	Data	Units
0	Lower Trace Start Time	milliseconds
1	Lower Trace Stop Time	milliseconds
2	Upper trace Start Time	milliseconds
3	Upper Trace Stop Time	milliseconds

5. Pass/fail waveform use flag is a 2-element byte array. The data is ordered in the array as follows:

Array Element	Data	Units
0	Lower Trace	0=Do not use, 1=Use
1	Upper Trace	0=Do not use, 1=Use

6. Pass/fail waveform upper and lower limits are 400-element float arrays. The units of the array values are millivolts.

7. The entire Gold Standard file is included in the message. The file length is not known but is typically approximately 1700 bytes.

8. Data is included in message only if the Gold standard file name has been defined. (If the filename string length is greater than 0 characters)

Figure 4-1b. Notes for Figure 4-1a

TEST DATA DESCRIPTION	DATA TYPE	# OF BYTES	NOTES
Serial Number	long integer	4	
Resistance	floating point	4	Ohms
Max Voltage	floating point	4	Millivolts
Tau	floating point	4	Milliseconds
Slope	floating point	4	Millivolts/second
Temp Rise	floating point	4	Degree C
Heat Loss	floating point	4	Microwatts/Degree C
Heat Capacitance	floating point	4	Nanojoules/Degree C
Pass/Fail	integer	2	0=Fail, 1=Pass, 99=Not evaluated
Time Interval Between Points in Waveform Array	Long integer	4	microseconds/100
Pulse Start Time	Long integer	4	microseconds
Pulse End Time	Long integer	4	microseconds
Pulse Amplitude Offset	Long integer	4	millivolts/64
800 Element waveform Array	integer	800*2=1600	millivolts/64
Message Checksum	Long integer	4	
			Waveform Data

Figure 4-2. Description of Test Data Message Sent Over GPIB

The Data Capture System will recognize and respond to five command strings:

- Request for identification
- Command trigger
- Request for system gain
- Request for system parameters
- Request for configuration
- Request for mode change
- Request for current mode
- Configuration download

These command strings are sent via the GPIB line to the 630 Test Set.

Request for identification - ?I

When the Data Capture System receives the "?I" string, it responds with a null terminated character string identifying itself. This function is necessary for identifying devices on networks of more than one device.

Command Trigger - *T

When the Data Capture System receives a "*T" string it immediately responds with a "!T" string to acknowledge that the trigger was received. The Data Capture System then begins the test by relaying the COMMAND TRIGGER signal to the measurement section. If the system is in the process mode, it responds with a "-T" string to indicate that the trigger was not processed.

After a test is complete and the results are available, the Data Capture System asserts a service request over the GPIB interface. It then writes the data string to the local GPIB card which passes it across the GPIB interface, regardless of how the test was initiated (GPIB, TTL Command Trigger, or Keyboard). The data string and waveform information is sent via the GPIB line from the local PC to the host in a binary stream in the format described in Figure 4-2.

Request for System Gain - ?G

When the Data Capture System receives a "?G" string, it responds with system gain in the form of a 3-digit integer as follows: "*G,XXX".

Request for System Parameters - ?P

When the Data Capture System receives the "*P" string, it responds with EED resistance and system gain in the form of a comma delimited string consisting of a 5-digit floating point number for resistance and a 3-digit integer for system gain as follows: "*P,xx.xxx,xxx".

Request for configuration - ?C

When the Data Capture System receives the "?C" string, it responds with configuration parameters in the form of a binary stream in the format described in Figure 4-1 and Figure 4-2.

If the system is in the process mode, it responds with a "-C" string to indicate that the configuration request was not processed.

Configuration data download - "*C"

System configuration will be updated when it receives the "*C" string command followed by the configuration data. The test set expects the data to be in a binary stream in the same format as shown above. When the data has been successfully downloaded, the test set responds with a "!C" string to acknowledge that the data was received. If the test set is in the process mode, it responds with a "-C" to indicate that the download request was not processed.

Mode change - *M

When the test set receives the "*M" string, it changes the mode from local to process or vice versa and responds with a "!M" string to acknowledge that the mode was successfully changed. If the mode was changed manually at the test set, the test set sends a "*M" string to indicate that the mode was changed.

Request for current mode - ?M

When the test set receives the "?M" string, it responds with a string indicating the current mode of operation:

Process mode - "*MP"
Local mode - "*ML"

4.2.5 Utilities

There are three utilities used within the Data Capture System software. VIEW utility allows you to view device characteristics stored in the data logging file including the stored waveform. CONVERT utility converts a logging file to a *.csv file that can be read directly by most popular spreadsheet programs. And a GOLD STANDARD utility which converts a current data file to a gold standard file (filename.gld)

To reach these utilities press "u". The utility menu will pop up. Select which of the utilities you wish to use. The program will branch to that utility, and return to 630PROC2 when done. The current data logging file and path, as defined by the "f" menu, will be used automatically.

4.2.5.1 VIEW UTILITY (VIEW stored waveform and data)

1. Make desired data file current. It may be open or closed.
2. Press "U" for Utility.
3. Press "V" to view file just created or appended to.

Note log file information in lower left of work screen.

4. Press "K" or "L" to move up and down through file.
5. Press "ESC" to leave view function.

4.2.5.2 CONVERT UTILITY (CONVERT data file to Excel format)

1. Make desired data file current. (File may be open or closed.)
2. Press "C" to convert file.
3. File has been converted to "yourfilename.csv". (*.csv is a comma delimited file which can be read by Excel. The file is stored in the same directory as the original data file.
4. Exit 630PROC2 and launch Excel to view, edit, or print file.

4.2.5.3 GOLD STANDARD UTILITY (Convert data file to Gold Standard file)

1. Set up and open log file.
2. Press "T" as many times as desired to simulate taking data from a number of EED's.
3. Close log file.
4. Press "U" for Utility.
5. Press "G" to convert file to a Gold Standard file. File is saved and user is returned to work screen.

4.2.6 Other Features

1. The fuzzy line option in the configuration menu is designed to present a more pleasing waveform display. It's purpose is to display a line that looks more like the waveform on an analog oscilloscope. The trace is made up of several lines. these lines are blended together with the outer edges filtered to reduce the jagged nature of digital graphics. You may turn off this feature to get a single thin line.
2. MODE control provides control of keyboard accessibility
 - a. Local - Allows keyboard control at test set, as well as remote control via GPIB or serial lines.
 - b. Process - Locks out keyboard control at test set, while allowing remote control via GPIB or serial lines.

SECTION V

MAINTENANCE

5.1 System Serial Number

A serial number is shown on the title page of this manual. This serial number is also the serial number of the equipment for which the manual was prepared.

5.2 Replacement of Components

There are no components replaceable by the user.

5.4 Circuit Board Offset Adjustment

Screwdriver adjustable control R11 (on the PC printed circuit board) removes any voltage offset in the circuit board preamp. It is a factory adjustment.

5.5 Circuit Board Gain Adjustment

Screwdriver adjustable control R4 (on the PC printed circuit board) sets voltage gain of circuit board preamp. It is a factory adjustment.

!!! WARNING !!!

OBSERVE APPROPRIATE SAFETY PRACTICES
WHILE PERFORMING THESE TESTS