HUNTRON TRACKER 5100DS

USER'S MANUAL

Part Number 21-1145
August, 1988
REV 3, 4/91

Congratulations on your purchase of the Tracker 5100DS analog signature analysis (ASA) troubleshooting system. This user's manual will not cover detailed theory, but will familiarize you with the system and testing boards as quickly as possible.

GPIB CHANGE INFORMATION

ISSUE NO: 2 **P/N 21-1196**

This change contains information necessary to ensure the accuracy of the following manual:

Title:	**HUNTRON TRACKER 5100DS USER'S MANUAL**
Print Date:	**April 7, 1998**
Revision:	**3**
Revision Date:	**4/91**

CHANGE: 1

On page 2-2:

CHANGE: Item #5

ADD: Add the following two (2) sentences to the end of item #5.
The GPIB board comes properly configured for 5100DS operation. Do not change any jumpers or DIP settings.

CHANGE: 2

On Page 2-2:

Delete Item #6. It is no longer valid.

CHANGE:3

On Page 2-3:

Delete Figure 2-1. It is no longer valid.

CHANGE: 4

EFFECTIVITY: 1/98

ON PAGE before the Table of Contents change the CONTACTING HUNTRON information to:

To obtain information about service, accessories and other products, contact:

Huntron Instruments , Inc.
15720 Mill Creek Blvd.
Mill Creek, WA 98012
USA

In North America, call 800-426-9265 or 425-743-3171.

Huntron is also accessible by:

- FAX: 425-743-1360
- Internet E-mail: huntron@huntron.com
- Internet home page: http://www.huntron.com

New Software Release Information Supplement.

Information for Tracker 5100DS software version 5.00 users.

The following pages briefly describe the major changes and new additions in software version 6.00.

Version 6.00 has incorporated many of the features requested by Tracker 5100DS users and in order to obtain maximum benefit, please look over these pages.

If you don't read anything else, at least read this supplement.

Additional new features information may be found in this new revision of the User's Manual and on your set of floppy disks in the README.DOC file.

Contact Huntron Technical Support for any questions or comments you may have about this new release.

P/N 21-1145
REV. 3, 4/91

SUMMARY OF CHANGES FROM VERSION 5.00 TO VERSION 6.00:

BUILD/REPEAT
NUMBER OF BOARDS
NUMBER OF SECTIONS
NUMBER OF COMPONENTS
COMPONENT INSTRUCTIONS FIELD SIZE
COMPONENT INSTRUCTIONS DISPLAY
DRIVE
MOVE/COPY
DISK SPACE NEEDED WINDOW
SELECT A FUNCTION AT MAIN MENU
QUICK CHANGE OF TEST RANGES & TOLERANCE OF A COMPONENT
COMPARE SIGNATURE RESOLUTION
MAINTENANCE UTILITY
TROUBLESHEET
VIEW SIGNATURES
VIEW SIGNATURE ZOOM
SIGNATURE STYLE
BACKUP/RESTORE
FREE DISK SPACE DISPLAY
STARTUP/TEMPORARY FILES PATHS
HELP FOR ALT KEYS
SORT COMPONENT BY NAMES
EDIT COMPONENT NAME
AUTOMATIC TEST RANGE SELECTION
NAME, RANGE, FILTER, COMMON PINS AND TOLERANCE PER PIN
SHORTED PINS CHECK

EXPLANATION OF SOFTWARE CHANGES:

BUILD / REPEAT:

The BUILD and REPEAT functions of the EDIT mode use the data of the current item instead of the last item edited.

NUMBER OF BOARDS:

The number of boards has been increased from 22 per disk drive to 110 per path.

NUMBER OF SECTIONS:

The number of sections has been increased from 22 per board to 110 per board.

NUMBER OF COMPONENTS:

The number of components has been increased from 99 per section to 330 per section.

COMPONENT INSTRUCTIONS FIELD SIZE:

The component instructions field was increased in size from 3 lines of 30 characters (90 total) to 6 lines of 30 characters (180 total).

COMPONENT INSTRUCTIONS DISPLAY:

The component instructions are no longer displayed with component information. They are displayed in a pop-up window before LEARN/TEST. This feature can be turned on/off in SETUP. They can also be displayed with a single key stroke (F2 key).

DRIVE:

Instead of just changing to another disk drive, the Log feature has been renamed to DRIVE and put on the menu and allows changing to another disk drive and/or DOS path.

MOVE/COPY:

The MOVE and COPY features have been moved under the TRANSFER mode (See also BACKUP/RESTORE).

DISK SPACE NEEDED WINDOW:

This feature shows the amount of disk space required when merging LEARNS for an entire section. The display of the required component space has been moved to the component information box. Press Alt+N to display the section space needed window.

SELECT A FUNCTION AT MAIN MENU:

Activate each item on the Main menu by pressing the key of the highlighted letter.

QUICK CHANGE OF TEST RANGES & TOLERANCE OF A COMPONENT:

Press Alt+Q at the component level of TEST to temporarily change the test ranges and tolerance.

COMPARE SIGNATURE RESOLUTION:

The user can select comparison of 20 (Ver. 5.00) or 100 points. The 100 point comparison allows the 5100DS to "see" subtle variations in the signature missed by the 20 point comparison. In Area mode the areas will be larger, and in Peak mode the deviations may be greater.

MAINTENANCE UTILITY:

Without exiting the program, access complete hardware maintenance routines from Main menu (MAINT). The Cal Check feature is now under Maint.

TROUBLESHEET:

The TROUBLESHEET is different for the three levels of the TREE. The user can activate the TROUBLESHEET in the TEST mode by pressing the 'T' if at least one component has been tested. At the component level (T-Test Results) the component results window is displayed. At the section level a choice of viewing, printing or storing a trouble sheet for the components of the current section is allowed. These same options are available at the board level for all the components of the current board.

The display of the component results window for the component level TEST RESULTS shows the status of each component that has been tested in the current test session. If the component tested "DIFFERENT", viewing of the signatures or removing of the component from the TROUBLESHEET are allowed.

Viewing of the TROUBLESHEET at the section and board level shows a list of the components that failed in DIFFERENCE ORDER. Each of the components are selectable. The current component can be removed from the TROUBLESHEET. The detailed pin difference information for the current component can be viewed in a pop-up window. The signatures for the current component can be viewed. Other components with signature differences can be viewed by choosing the next, previous, first or last component options. A summary displaying the number of DIFFERENT, REMOVED and EQUIVALENT components is available.

Printing the TROUBLESHEET at the section and board levels allows the choice of either a SIMPLE or DETAILED report. The SIMPLE report lists the components with differences in order from the most to the least different. Each component's pins are also listed in difference order. The DETAILED report is similar but also lists the RANGE, TOLERANCE, DIFFERENCE and AREA of each different pin.

Storing the TROUBLESHEET at the section and board levels allows the choice of either a SIMPLE or DETAILED report. An ASCII text file of the corresponding printed report is saved to the specified path. There is also a selection for an ASCII DELIMITED REPORT for uploading into "off the shelf" database programs.

VIEW SIGNATURES

The 5100DS CRT is now enabled in VIEW signature ZOOM (except view stored signatures) for real time signature analysis.

VIEW SIGNATURE ZOOM

In addition to using the 'Z' key to zoom and then the 'N' key to get to the signature of the next pin, the Alt+1 through Alt+8 keys will zoom on the corresponding signature position. Alt+1 is the same as "Z".

SIGNATURE STYLE

When viewing signatures, style changes using Alt+S were temporary and reset upon exit. Now the style changes are maintained until the user modifies it again or exits out of the software.

BACKUP/RESTORE:

BACKUP can perform compression on data. The amount of compression is user selectable. BACKUP can accept sections with up to 330 components (maximum number). BACKUP and RESTORE do not remove data from the source. BACKUP can also break up the data to fill up floppy disks completely. After selecting BACKUP, a board of the current drive/path is selected from the board selection screen. RESTORE adds the board to the end of the currently selected drive/path board list.

FREE DISK SPACE DISPLAY:

Displays at the top right portion of the screen the amount of free disk space still available on the current drive.

STARTUP/TEMPORARY FILES PATH:

You can set the default drive/path for tree/signature info in SETUP. This path is used when the software is started. You can change the tree/signature info path to another path after the software is started by using the DRIVE feature. The temporary files path can only be changed in SETUP. These files contain the TROUBLESHEET data that is generated after testing. Setting this path to a RAM disk allows for faster system operation.

HELP FOR ALT KEYS:

On-line help for all Alt key shortcuts and commands is available by pressing Alt+F1.

SORT COMPONENT BY NAMES:

Components of the current section will be sorted alphanumerically by pressing Alt+O at the component level of EDIT.

Example:

CURRENT	SORTED
U2	C02
U5	C1
U3	C12
C12	C2
C2	U2
C1	U3
C02	U5

EDIT COMPONENT NAME:

Allows changing the name of a component without losing any signature data.

AUTOMATIC TEST RANGE SELECTION:

The user selects "?" for the LEARN/TEST ranges and the software will determine the best range to test each pin. In LEARN, (first time for each component) the 5100DS will scan the LOW, MED1, and MED2 ranges and the software will determine which range is best for each pin. The successive TESTs will use the range found with the first learn.

NAME, RANGE, FILTER, COMMON PINS AND TOLERANCE PER PIN:

Pressing the 'P' key at the component level of EDIT allows the user to enter a NAME, SINGLE RANGE, FILTER, COMMON PINS and TOLERANCE for each pin of the current component. Select different pins using the PgUp and PgDn keys.

SHORTED PINS CHECK:

Selectable in SETUP, looks for shorts between adjacent pins of a component. Similar to version 5.00 opens check.

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CHAPTER 1
GENERAL INFORMATION

1-1. THE README FILE

Before your software is installed, print out the README.DOC file on each disk. These files contain the latest updates on the Huntron Tracker 5100DS troubleshooting system, such as any operational tips or changes in the system operation that may have occurred since the printing of this manual and a list of the files contained on each disk.

A simple way to do this is:

1. Make sure your printer is turned on, connected to your PC, and the ON LINE or READY light is lit.

2. Insert each disk in drive A: and type in,

"A:TYPE README.DOC>PRN" or "PRINT A:\README.DOC".

1-2. DEFINITIONS OF COMMON TERMS

Alphanumeric — Refers to letters, numbers, or both.

Arrows ← ↑ ↓ → — The arrow keys near the keypad or those in it, if the NUM LOCK key is off.

Character — A letter, digit, or other graphic symbol.

CRT — Cathode Ray Tube. Specifically, in this manual, the display on the 5100DS front panel.

Cursor — The small movable marker on your computer screen indicating where the next character will appear in a character entry field.

Digit — Any of the ten numbers 0 to 9.

DOS Prompt — The prompt of your computer operating system, when the 5100DS software is not running. Frequently "C:>"or similar in nature.

Keypad — The cluster of special keys to one side of the keyboard. Typically, this is a set of number keys, set in adding machine format.

Monitor — The viewing screen of your computer, or the unit containing that screen, if separate from the computer.

Screen — In this manual, this term is used to refer to what you see on your PC's color monitor, such as the MAIN MENU SCREEN.

Selector — The moveable highlighted item that allows selection of different modes or boards, sections, and components.

1-3. CONVENTIONS USED IN THIS MANUAL

The following conventions are used throughout this manual to make it easier to understand.

Special keys which you should press will be bold, such as: press **Alt, Esc, F1.**

Many operations require the use of two keys to activate which will be indicated by bold and a plus sign between them. For example, **Alt+M** means to press and hold down the **Alt** key, then press the letter **M** key once and release the keys.

The " ↵ **Enter** " key at the right of your keyboard is also called the " ↵ **Return**" key on some computers. When"↵" is shown, press the Enter key.

For a series of nonspecific keystrokes, type in as directed, such as: Enter your instructions for the first component.

If specific text has to be entered, it will be bold and within quotes in this manual, such as: type " DEMO BOARD ". After the text has been typed in, press "↵".

CHAPTER 2
INSTALLATION

2-1. SYSTEM CONFIGURATION

The Huntron Tracker 5100DS troubleshooting system is designed to be used with an IBM personal computer or compatible computer with a general purpose interface bus (GPIB), which follows the IEEE-488 standard. Before installing this system and putting it to use, make sure you have all the necessary components listed as follows.

INCLUDED IN THIS PACKAGE

These items will be referred to in the following pages. Check that your system consists of the following:

- One Tracker 5100DS
- Tracker 5100DS User's Manual containing the operating software on floppy diskettes.
- Tracker 5100DS Technical Reference Manual.
- One GPIB board
- One GPIB cable
- One power cable
- One demo board
- Test clip cables
- Test clips
- Test probes
- Front End Adapter Board with cable kit.

2-2. PC CONFIGURATION

If your computer system is not the recommended configuration, be certain it meets at least the minimum specifications:

MINIMUM

With a computer system meeting only the minimum requirements, you will be able to use the 5100DS and all of its functions. However, you may find that certain functions take longer, and that eventually, you may need more disk storage space.

- IBM PC/XT or 100% compatible
- MS-DOS/PC-DOS 3.0 or later
- 640K RAM
- One 5.25" or 3.5" floppy disk drive
- One 10 MB hard disk
- EGA video board
- EGA color monitor
- Parallel printer port
- One spare PC expansion slot (for GPIB board)

RECOMMENDED

Using this configuration, the system will run faster resulting in better performance.

- IBM PC/AT or 100% compatible, 8 MHz or faster
- MS-DOS/PC-DOS 3.3 or later
- Math coprocessor, 8 MHz or faster
- 640K RAM
- One 3.5" or 5.25" high density floppy disk drive
- One 30 MB hard disk (28 ms access time or faster)
- One VGA or EGA video board
- One VGA or EGA color monitor
- Parallel printer port
- One spare expansion slot (for GPIB board)

2-3. HARDWARE INSTALLATION

To install the hardware, you will need a screwdriver, slot or Phillips, etc., depending on the type of screws on the back of your personal computer.

First, you will need to install the GPIB board in a spare expansion slot of your computer.

INSTALLING THE GPIB BOARD IN THE IBM PC/XT/AT OR COMPATIBLES

Although the exact requirements for removing your computer cover may differ, due to the variety of IBM PC compatible computers available, the general GPIB board installation procedure is the same.

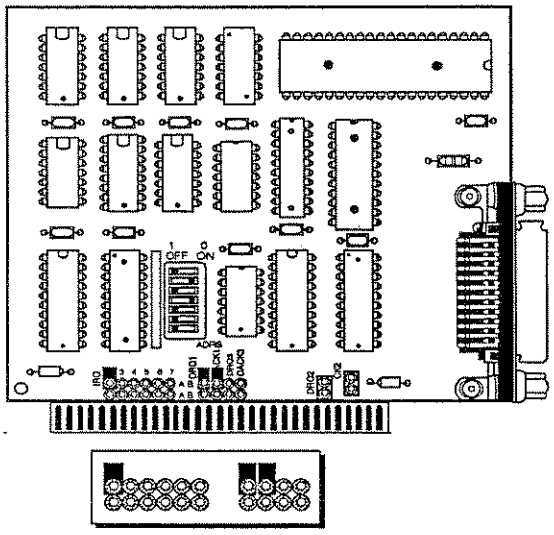
1. Turn your PC system off.
2. Remove the monitor, keyboard, printer and power cable from the PC.
3. Remove the PC's top cover. Refer to your PC's manual for specific information on how to access the PC's expansion slots.
4. With the expansion slots exposed, locate an unused slot and remove the rear cover plate for this slot.

NOTE

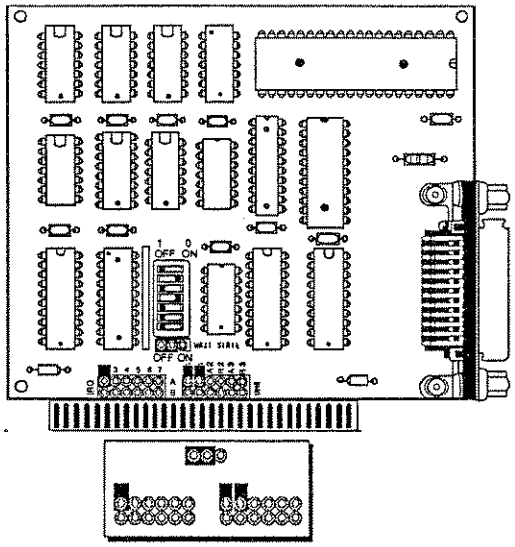
Do not install the GPIB board in either end slot if possible.

5. If possible, touch a grounded metal surface to discharge any static charges. Remove the GPIB board from its protective wrapping. Handle the GPIB board by its sides only and avoid touching the board's edge connector.
6. Verify that the GPIB board settings are correct. First, look at the component side of the GPIB board and find the revision letter of your board, then refer to Figure 2-1 to check its settings.

GPIB Board REV H or earlier



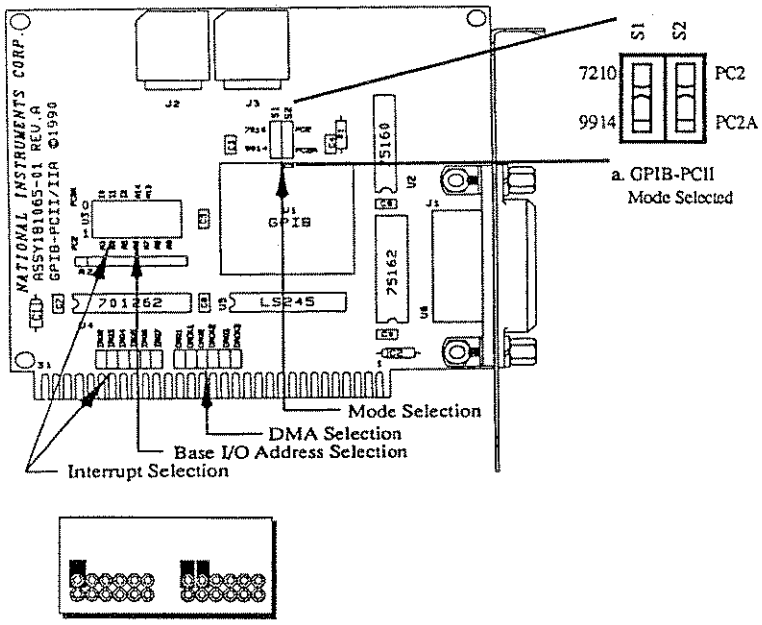
GPIB Board REV J



NOTE

For REV H or J: The GPIB Board's DIP switch should be setup as follows: switches 2 and 4 = ON, switches 1, 3, 5, 6, and 7 = OFF.

GPIB Board PCII/PCIIA REV A



NOTE

For REV A: The GPIB Board's DIP switch should be setup as follows: switches 4 and 6 = ON, switches 1, 2, 3, 5, and 7 = OFF.

Figure 2-1. Diagram of PC/XT/AT GPIB Board Setup.
(Dark side of DIP switches are pushed DOWN.)

7. Place the GPIB board over the spare slot with the board's edge connector down and the GPIB connector towards the rear access panel of the PC. Press the GPIB board down until mated with the PC's main board.
8. Secure the GPIB board with rear panel screw.
9. Install the PC's top cover and secure with screws.
10. Attach the monitor, keyboard, printer and power cable.

You are now ready to proceed with the next installation step of your Tracker 5100DS system. Skip to the next section.

INSTALLING THE MC-GPIB BOARD IN AN IBM PS/2 WITH MCA.

IMPORTANT NOTE:

Before proceeding with the installation, make backup copies of the Tracker 5100DS diskettes supplied with the hardware. Also, make backup copies of the IBM diskettes that were included with your PS/2 if you have not done so already.

1. Insert your backup copy of the IBM reference diskette (supplied with your PS/2) in floppy drive A and turn your PS/2 on.
2. Select "copy an option diskette" to copy the configuration files from the 5100DS GPIB disk supplied with your 5100DS.
3. When the reference program asks for the option disk, remove the IBM reference disk and insert the 5100DS GPIB disk in the disk drive.
4. After the files have been copied, exit the reference program, remove the 5100DS GPIB disk, then turn off your PS/2.
5. Remove the monitor, keyboard, printer and power cable from the PS/2.
6. Remove the PS/2's top cover. Refer to your PS/2's manual for specific information on how to access the PS/2's expansion slots.
7. With the expansion slots exposed, locate an unused slot and remove the rear cover plate for this slot.
8. If possible, touch a grounded metal surface to discharge any static charges. Remove the MC-GPIB board from its protective wrapping. Handle the MC-GPIB board by its sides only and avoid touching the board's edge connector.
9. Place the MC-GPIB board over the spare slot with the board's edge connector down and GPIB connector towards the rear access panel of the PS/2. Press the MC-GPIB board down until mated with the PS/2's main board.
10. Secure the MC-GPIB board with rear panel screw.
11. Install the PS/2's top cover and secure with screws.
12. Attach the monitor, keyboard, printer and power cable.
13. Insert the IBM reference disk in floppy drive A and turn your PS/2 on.

14. When the reference program asks you if you want to automatically configure the computer, press Y (yes). The reference program will automatically configure the MC-GPIB board. After the hardware has been configured, select "Set Configuration" from the Main menu of the reference program and then choose "View Configuration" from the Set Configuration menu. Record these settings in Table 2-1 for later reference.

Table 2-1. PS/2 MC-GPIB Board Configuration Settings.

MC-GPIB	SETTINGS
Base I/O Address:	
Interrupt Level:	
Arbitration Level:	

You are now ready to proceed with the next installation step of your Tracker 5100DS system.

2-4. ASSEMBLING THE TRACKER 5100DS SYSTEM

1. Check to see that the your 5100DS is correctly set to operate with the voltage in your area by inspecting the fuse holder on the back of the 5100DS. The correct voltage should be aligned with the small arrow below the fuse holder. For 100V units, use the 110-120 position.

   If incorrect, remove the AC power cable. Gently pry the fuse holder out using a small flat blade tool at the access slot just below the power cable plug. Remove and rotate fuse holder to align it with the correct voltage setting. Before reinstalling the fuse holder, make sure the correct fuse is used with the new voltage setting. Refer to the Tracker 5100DS Technical Reference Manual for further information.

CAUTION:
The 5100DS voltage setting must match your AC source before operating.

2. Attach the GPIB cable to the exposed connector of the GPIB board you have just installed in your computer. Attach the other end to the back of the 5100DS.

3. Attach the power cable, and turn the 5100DS on. The indicator lights (LOW, MED1, MED2, HIGH and TESTING) on the front panel will flash in sequence immediately after the power is switched on. The power light and MED2 light should remain on after the system test is completed.

   If you do not obtain these results, turn off the 5100DS, check connections and turn it on again. Refer to the Technical Reference Manual or contact Huntron if the unit does not pass this step.

4. Adjust the intensity control knob on the 5100DS front panel to a viewable setting. You should see a horizontal line on the Tracker CRT. Using the vertical and horizontal adjustment knobs to the left of the CRT, center this line on the graticule.

5. If the trace is not parallel to the horizontal graticule, adjust the Trace Rotation with a small plastic screwdriver until it is parallel.

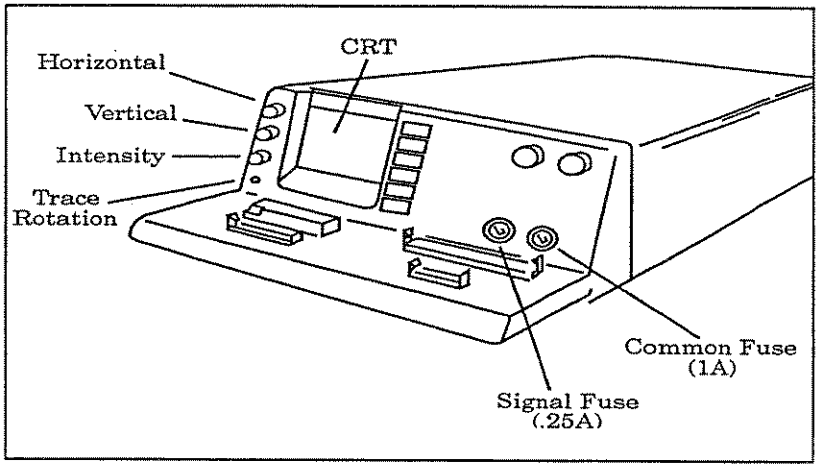


Figure 2-2. Front of the 5100DS, showing the adjustment knobs.

2-5. INSTALLING THE SOFTWARE

NOTE

Before proceeding with software installation, make backup copies of the diskettes supplied with the 5100DS. Keep your original 5100DS disks in a safe place for storage and use your backup copies for installation. If you need further details on how to make backup copies, refer to the "DISKCOPY" command in your PC's DOS manual.

Insert the backup copy of the 5100DS Program Disk #1 into floppy disk drive A or B of your computer. Log onto that disk drive, by typing either "A:" or "B:" and pressing ↵.

Type "INSTALL" and follow the instructions as directed by the installation program.

NOTE

If there is a mouse installed on your system, the mouse driver MUST be installed before the NI-488 handler (GPIB.COM) and the mouse cannot be used in the light pen emulation mode.

IMPORTANT NOTE

If you experience any difficulties getting the system operational refer to the 5100DS Technical Reference Manual or call Huntron for assistance. In the US, call (800) 426-9265. In Washington State, call (206) 743-3171. Outside the US, contact your local Huntron distributor.

CHAPTER 3
TRACKER ANALOG SIGNATURE ANALYSIS

3-1. INTRODUCTION

Analog Signature Analysis (ASA) is a unique, power-off troubleshooting technique. It uses a sinewave (AC) stimulus to display the current (I) vs. voltage (V) characteristic of an unpowered component on a CRT. The IV characteristic is called an analog signature and each pin of a component can have a unique signature. When components fail, their signatures change, so troubleshooting using ASA is simply a matter of comparing signatures of suspect components to signatures of known-good components.

Because the current applied across a unit under test (UUT) is limited, this technique is non-destructive, and will not damage it or other components in the circuit.

ASA has a number of advantages as a proven, fast, and effective troubleshooting technique.

You can:

- Troubleshoot circuitry that cannot be powered up due to a shorted condition.
- Troubleshoot in a qualitative mode, allowing you to see physical problems with a suspect component.
- Compare device characteristics with known types for better matching.
- Investigate intermittent problems by seeing marginal indicators, such as small amounts of leakage, noise, etc.
- Eliminate risk of accidental shorting across other points during POWER ON testing which could further damage the UUT or other components on the board.
- Eliminate risk of shock hazard.
- Perform preventative maintenance by seeing flaws in components that could possibly lead to premature failures.
- Look at replacement components before they are installed in circuitry to reduce the risk of installing defective ones.

ASA plots the current versus voltage across two terminals of a UUT, be it a passive component like a resistor, capacitor, or inductor, or a solid state component like a diode, transistor, SCR, digital, analog, or mixed IC. The resulting pattern is its analog signature. When troubleshooting a board, the resultant signature is a composite of various components at a particular node in the circuitry. By understanding what different signatures mean, you can determine what components are faulty, and most probably what is wrong with them.

For complete information on the theory of operation of the Tracker 5100DS, refer to the Technical Reference Manual.

3-2. SIGNATURE CHARACTERISTICS

Signatures of good components have distinct characteristics. They tend to be made up of straight segments, with sharp corners as shown in Figure 3-1.

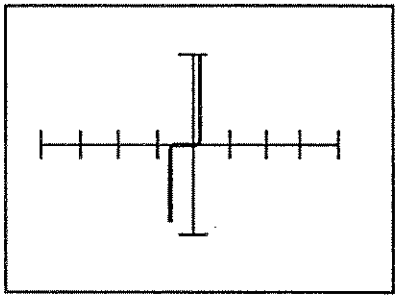


Figure 3-1. An Example of a Good Component's Analog Signature.

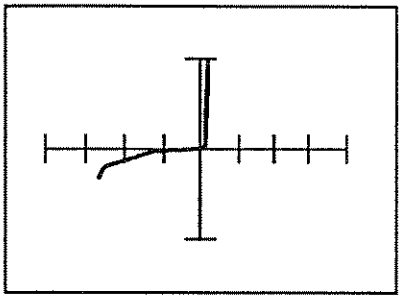


Figure 3-2. An Example of a Defective Component's Analog Signature.

Bad components, on the other hand, may exhibit signatures that have rounded corners and/or instability. These fault indicators can be used to help determine defective devices as shown in Figure 3-2.

An open circuit at the Tracker 5100DS test terminals has no current flow at any voltage, so its signature appears as a horizontal line on the CRT graticule as shown in Figure 3-3.

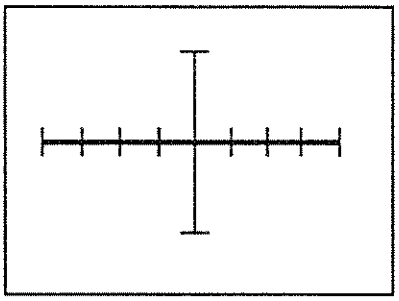


Figure 3-3. An Open Circuit Signature

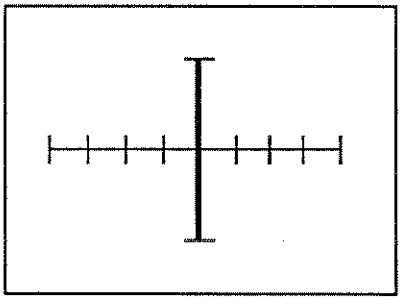


Figure 3-4. A Short Circuit Signature.

A short circuit across the test terminals has maximum current at zero voltage, so its signature appears as a vertical line on the CRT graticule as shown in Figure 3-4.

3-3. SIGNATURE ANALYSIS AND COMPARISON

These simple identifiers can be used to analyze complex problems. A shorted voltage regulator signature changes from a multiple line segment signature to almost a single vertical line signature. Partial internal current leakage in a power transistor can be quickly found because its signature turns a horizontal line (good signature) into a curve (defective signature). This problem is much more difficult to test using conventional test equipment.

Components like analog and digital integrated circuits, diodes, resistors, capacitors, and inductors all have their own, easily recognizable signatures. Refer to Appendix D and E of this manual for detailed information and examples of analog signatures. If you have any questions not covered in this manual about the theory of ASA or the intended applications for the 5100DS, please contact Huntron Technical Support.

3-4. BASIC INTRODUCTION TO THE TRACKER 5100DS

The Tracker 5100DS is the most advanced member of the Huntron Tracker family of troubleshooting systems. Not only is the 5100DS a fast system to learn, it's also the first ASA tool that features digital storage of analog signatures.

This enables you to store signatures of known good components. Once stored, they will always be available for reference, whether you are testing similar boards or retesting the same board later.

The 5100DS is software driven by your personal computer and can test components at high speed, pin by pin, and store the information in your computer's database. You can connect IC DIP clip cables to any of three test clip connectors on the front panel of the 5100DS, called insulation displacement connectors (IDCs). For discrete components such as resistors, capacitors, and diodes, you can also attach test probes to the test terminals (the red and black banana jacks shown in the following diagram). To test loose ICs with up to 40 pins, there is a ZIF (zero insertion force) socket on the front panel. You can also connect to test fixtures and adapters to simplify interfacing your UUT to the 5100DS using the IDC connectors. Refer to the application notes in Appendix F of this manual or contact Huntron for more information.

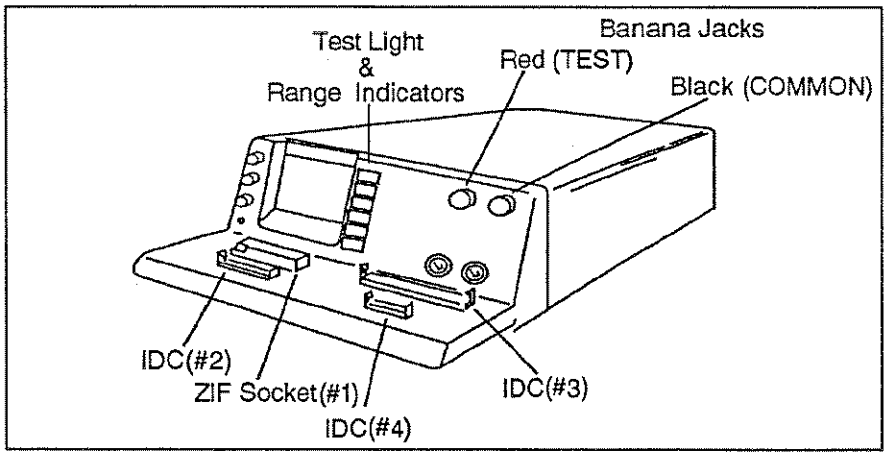


Figure 3-5. Front Of 5100DS Showing Test Connectors and Range Lights.

Although the 5100DS has a built-in CRT, the main display is your computer monitor. The 5100DS is software driven, so your computer tells the 5100DS how to test and then processes the data for viewing on your computer screen.

The 5100DS CRT serves as an analog signature real time monitor, providing you with immediate feedback of what is being tested and also, whether or not the 5100DS is obtaining signatures. During the signature digitizing cycle, the signatures are displayed in quick succession on the CRT screen.

The 5100DS is capable of testing in any or all of four impedance (current/voltage) ranges. These ranges (LOW, MEDIUM1, MEDIUM2, and HIGH) allow you to choose the range(s) that displays the most descriptive signature.

Table 3 - 1. Tracker 5100DS Impedance Ranges.

RANGE	OPEN CIRCUIT VOLTAGE (V_p)	SHORT CIRCUIT CURRENT (sine) (mArms)	MIN/MAX RESISTANCE VALUES (Ω)	MIN/MAX CAPACITANCE VALUES (µF)
LOW	10	132.0	1 - 400	.5µF - 100µF
MEDIUM 1	15	8.5	50 - 10k	.02µF - 5µF
MEDIUM 2	20	0.53	1k - 200k	.001µF - .5µF
HIGH	60	0.57	3k - 1 M	500pF - .1µF

NOTE

It is very important to choose ranges correctly. Follow these general guidelines:

If the analog signature for the device you wish to test in a selected range is not an open signature but is too close to the horizontal line of the graticule to show useful details, then you should choose the next higher range to see if a more descriptive signature can be generated. Repeat this step if needed.

If the signature is too similar to a vertical line to show useful details for analysis, go to the next lower range. Again, repeat this step if needed.

As you test, you will see the range indicators light up in succession as the different ranges are selected during testing.

For more information on range selection, refer to the appendices D and E in this manual or contact Huntron Technical Support.

CHAPTER 4
SOFTWARE OVERVIEW

4-1. INTRODUCTION

The 5100DS operating software has a menu driven user interface and is divided into 3 parts: TREE, LEARN/TEST, and UTILITIES.

IMPORTANT NOTE

When running the 5100DS software always exit back to the DOS prompt before turning off your computer or performing a RESET or REBOOT. Failure to do so may result in loss of data.

4-2. MAIN MENU

The Main menu is the hub of this troubleshooting tool. To select a function, either press the highlighted letter of the desired function or use the ↑ ↓ or ← → arrow keys to move to the desired function and then press the ↵ key to activate.

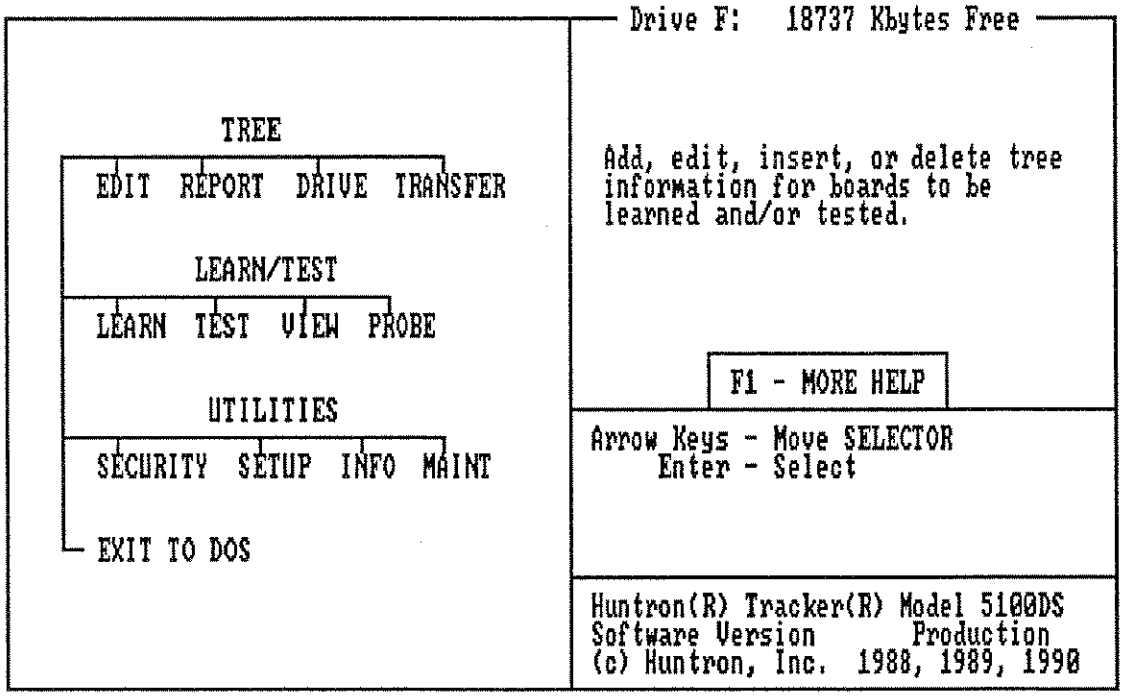


Figure 4-1. Main Menu.

4-3. DEVELOPING A DATABASE

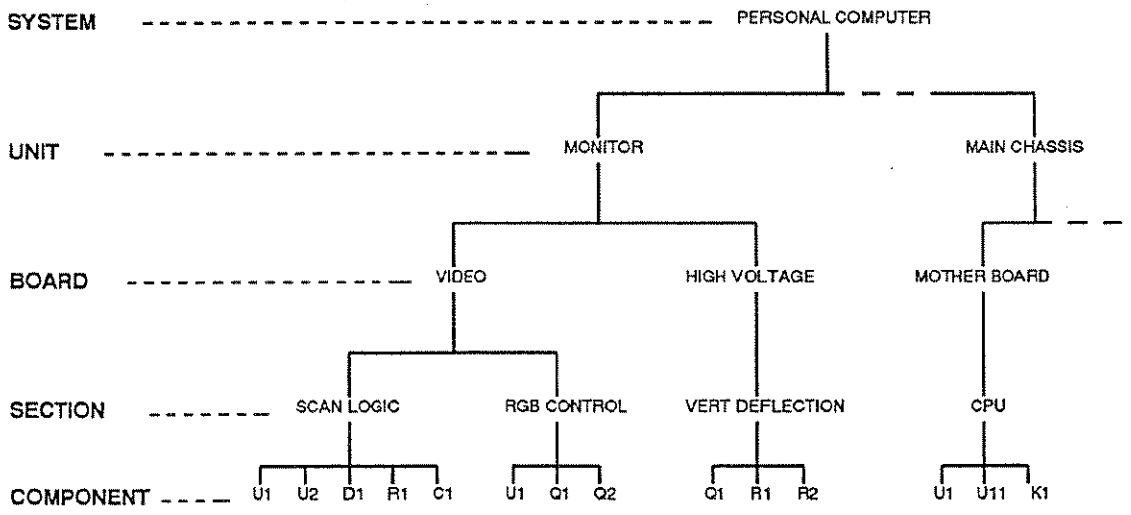
Before a test can be performed, information about the unit under test (UUT) is needed by the 5100DS program. There are several ways of describing the UUT to the 5100DS that will help make it easier to maintain the test data and keep the test results organized to simplify troubleshooting.

One way of developing a UUT database is to divide the system to be tested into logical levels. The 5100DS software allows up to 5 levels of division. This scheme can be modeled after a tree type structure starting from the highest level at the overall system under test (tree trunk) downwards to units (limbs), boards (branches), sections (twigs), and finally to the lowest level with components (leaves).

A simple description of these levels is given below.

System Name	A descriptive name for the system under test, such as Personal Computer.
Unit Name	A descriptive name for the unit in the system, such as Monitor. A unit consists of one or more boards.
Board Name	A descriptive name for each board in the unit, such as Video. A board consists of one or more sections.
Section Name	A descriptive name for each section on the board, such as Scan Logic. A section consists of one or more components.
Component Name	A descriptive name for each component in the section, such as U1 for an integrated circuit (IC).

An example of a system tree divided by function for a typical UUT consists of the following:



Other ways of developing a UUT database is to divide the board into sections by physical location of components (i.e. all components on upper right corner), or by same package types (i.e., all 16 pin DIPs). If the UUT is not very complicated, or doesn't have a large number of components, then the entire board may be entered as a single section.

Table 4-1 lists the maximum UUT database capactiy for the Tracker 5100DS Operating Software .

Table 4-1. Tracker 5100DS UUT Database Capacity.

Number of Systems	= Number of Boards
Number of Units	= Number of Boards
Number of Boards	110 per path
Number of Sections	110 per board
Number of Components	330 per section

NOTE

The maximum number of Systems, Units, Boards, Sections, and Components that the Tracker 5100DS software can handle is specificied in Table 4-1 above. However, the actual capacity that your own Tracker 5100DS will handle will depend upon the hard disk storage capacity of your PC and may be less than Table 4-1.

4-4. TREE MENU

The TREE menu consists of 4 modes: EDIT, REPORT, DRIVE, and TRANSFER.

In EDIT, you can create a complete database for each board to be tested and make any changes to its database , if needed.

In REPORT, you can print a listing of the full database for any board that has been entered in the EDIT mode.

In DRIVE, you can select where the system tree and its signature database are accessed in your computer.

In TRANSFER, you can COPY, MOVE, BACKUP or RESTORE the complete database for any board.

EDIT MODE

Beginning in the TREE menu, and throughout this program, you will use the selection screen to choose a board for testing.

This screen utilizes pop-up windows or boxes for data entry and allows you to type in the same place on the screen for each entry in TREE, leaving more of the screen available for display of the tree and other vital information.

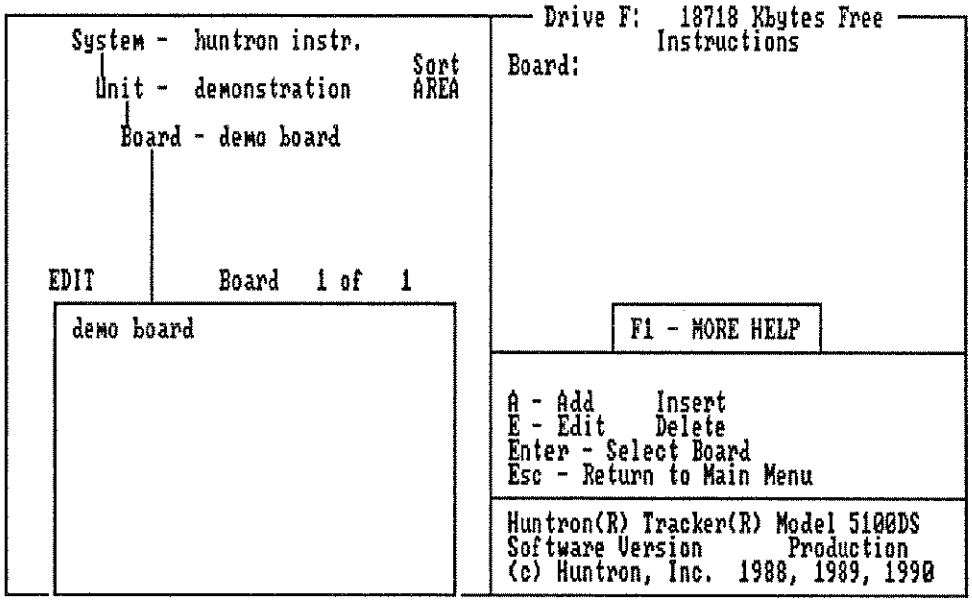


Figure 4-2. Board Selection Screen in EDIT Mode.

Initially, the screen displays the existing board information. Move the cursor to select the board on which you want to work, then press one of the following keys:

Table 4 - 2. Table of Active Keys at the Board Edit Selection Screen.

KEY	FUNCTION	KEY	FUNCTION
A	Add a board.	Home	Go to first item.
E	Edit a board.	End	Go to last item.
Ins	Insert a board	Enter ↵	Select item.
Del	Delete a board.	Esc	Return to Main menu.
PgUp	Move to previous page.	PgDwn	Move to next page.

Pressing the A(dd), E(dit), or I(nsert) key will activate one of the following pop-up windows on the Selection Screen.

The BOARD ENTRY POP-UP WINDOW, where you will enter system, unit, and board names, and specific test instructions or notes.

The SECTION ENTRY POP-UP WINDOW, where you will enter section names, maximum number of samples, and instructions or notes.

The COMPONENT ENTRY POP-UP WINDOW, where you will enter component name, component type, number of pins, common pin number(s), tolerance, package type, learn ranges, test ranges, special instructions or notes, and select FILTER on or off.

EXITING EDIT MODE

After defining a tree in EDIT, you will be ready for the next step which is to digitize and store component test signatures from known good boards. This is done in the LEARN/TEST menu so you must first return to the Main menu. Press **Alt+M** once or **Esc** a few times to get back to the Main menu.

REPORT MODE

In the REPORT mode, you can print out a report of the board tree, down to the component level including all special instructions and notes that you entered. REPORT also can print out a listing of component pin information if it has been created. These listings can be helpful in planning how to perform an effective board test that will lead to identifing defective components. Use the board tree report to check that a board's component information has been correctly entered.

DRIVE MODE

DRIVE mode allows you to select where the tree and data files are stored in your computer. This mode provides a means of better organizing your test database within your computer. (For more details on DRIVE, refer to Chapter 6 of this manual.)

TRANSFER MODE

This mode allows you to MOVE, COPY, BACKUP, or RESTORE a board tree and signature database to another disk drive or path. MOVE and COPY transfers a board database an entire section at a time to a floppy disk drive. This allows you to operate directly from the floppy disk or make working copies that can be used for sharing the database with other 5100DS test stations or for archiving. BACKUP and RESTORE transfers an entire board's database at a time to a selected floppy or hard disk drive for archiving purposes. (For more information on TRANSFER, refer to Chapter 6 of this manual).

4-5. LEARN/TEST MENU

The LEARN/TEST menu consists of 4 modes: LEARN, TEST, VIEW, and PROBE. LEARN and TEST are similar in operation, using the full facilities of the 5100DS. VIEW and PROBE are also similar in operation, allowing you to bypass the digital storage capabilities of the system and use the 5100DS manually.

LEARN MODE

In the LEARN mode, the 5100DS digitizes and stores "LEARN" signatures for each of the components defined in the EDIT mode for a board tree. Signatures are stored and used for later reference. Do this with known-good boards or components.

You will encounter five screens in the LEARN mode. These screens are described briefly as follows:

The BOARD SELECTION SCREEN. Board names will appear on the screen. Select the board for which you want to store data. The SYSTEM and UNIT names associated with the selected board will appear along with the rest of the tree information.

The SECTION SELECTION SCREEN. Displays all the sections of the selected board. Select the section you want to access.

The COMPONENT SELECTION SCREEN. Displays all the components of the selected section. Get LEARN signature data, and after the LEARN operation is complete, you can view the signatures, save them, relearn, or move on to another component . You can also display previously learned component signatures at this screen.

The LEARN SIGNATURES SCREEN. Shows signatures of up to eight pins of the selected component at a time.

The ZOOM SCREEN is a feature of the LEARN SIGNATURES SCREEN. It displays any one pin signature at 250% of normal size for detailed analysis.

TEST MODE

In the TEST mode, you test any identically configured components against previously stored "LEARN" signature data and can optionally view these signatures on your PC's monitor.

You will encounter five screens in the TEST mode.

The BOARD SELECTION SCREEN. Select the one against which you want to compare. Your board trees will appear on the screen. The SYSTEM and UNIT names associated with the selected board will appear along with the rest of the tree information.

The SECTION SELECTION SCREEN. Displays all the sections of the selected board. Select the one against which you want to compare.

The COMPONENT SELECTION SCREEN. Displays all the components of the selected section. Start the comparison test by pressing ↵ after attaching clips to component. After the TEST operation is complete, you can view the signatures, retest, or continue on to another component.

The TEST SIGNATURES SCREEN. Shows signatures of up to eight pins of the selected component at a time. The stored, or reference signatures and the test signatures are superimposed for ease in determining differences.

The ZOOM SCREEN is a feature of the TEST SIGNATURES SCREEN. It displays the learn and test signatures for any one pin at 250% of normal size for detailed analysis.

VIEW MODE

The VIEW mode allows you to use the 5100DS manually to display signatures on the 5100DS's built-in CRT. Select pin settings and ranges for a component at the software prompts on your PC's monitor. Signatures are viewed in real time. No signatures are digitized and stored. Only one signature can be viewed at a time. The testing interface to the board can be from any of the 3 IDC sockets or the 40 pin ZIF socket on the 5100DS's front panel.

PROBE MODE

The PROBE mode is similar to the VIEW mode, but is used for testing components by using HUNTRON test probes that are connected to the TEST and COMMON jacks on the 5100DS front panel.

NOTE

For more information on applications of VIEW and PROBE, refer to Chapter 6 of this manual.

4-6. UTILITIES MENU

The UTILITIES menu consists of 4 modes: SECURITY, SETUP, INFO, and MAINTENANCE.

SECURITY MODE

The SECURITY mode allows a supervisor level user to limit access of other users to specific 5100DS operating modes. This helps to keep stored component signatures and data from any unauthorized or accidental modification.

SETUP MODE

The SETUP mode allows you to select the visual aspects and other operational defaults of the software. The colors and style of the LEARN and TEST signatures can be set in this mode. The signature box and graticule displayed in the LEARN or TEST signatures screen can be turned on or off. The operational defaults include signature display order, sorting method used by the software when comparing signatures, and setting the allowable tolerance if you choose to merge several LEARN signatures. Also, the default drive/path for the signature database files is specified here. Your PC's printer type is also selected in this mode.

INFO MODE

The INFO mode gives specific information about your PC. It provides a detailed internal description including computer type, DOS version, memory size, and number of disk drives. INFO may be helpful in troubleshooting any installation and operational problems between your PC and the 5100DS.

Refer to Chapter 6 in this manual for more information about the Utilities menu.

MAINTENANCE MODE

The MAINTENANCE mode allows you to check the operation of the 5100DS using 5 utility functions. These functions are Performance Test, Calibration Check, Hardware Calibration, Relay Check, and Analog Diagnostics. For information on using the MAINTENANCE mode, refer to the Tracker 5100DS Technical Reference Manual.

4-7. MENU SHORT CUTS

After you become accustomed to the operation of the 5100DS, there are a number of convenient short cuts:

KEY(S)	DESCRIPTION
Alt+B	In EDIT, increments name of the current item and adds a new item with that new name and with the data of the current item. The Build routine takes the current board, section, or component and looks at the name. If there is a number at the end of the name, it will be incremented by 1 and this entry will be saved as the next entry WITHOUT displaying the entry screen (also see **Alt+R**). Build is not allowed if the name that would be created already exists.
Alt+C	Change section ranges/tolerance at the section level only, this routine allows you to make global changes on all the components in the section if none have been learned or have pin information. The LEARN ranges, TEST ranges, and TOLERANCE can be changed.
Alt+E	The EDIT mode can be accessed from LEARN or TEST modes with the proper security level.
Alt+F1	Displays the ALT key help.
Alt+G	When viewing signatures, toggles the graticule ON and OFF.
Alt+I	Initializes the data for the current troublesheet. All components are set to untested.
Alt+L	The LEARN mode can be accessed from EDIT or TEST with the proper security level.
Alt+M	The Main menu can be accessed from the board, section, or component screens.
Alt+N	Displays section disk space needed pop-up window.
Alt+O	Performs a sorting of component names alpha-numerically.
Alt+P	Activates the PROBE mode. If used at the component level, the enabled ranges are set.
Alt+Q	Quick change the test ranges and tolerance for the next test of the current component.

KEY(S)	DESCRIPTION
Alt+R	In EDIT, creates a new item with the data of the current item. The Repeat routine takes the current board, section, or component and makes a new entry by copying the previous information except for the item name which is cleared. The entry screen then displays all of the data from the last entry and the new item name can then be entered by the user (also see Alt+B).
Alt+S	When viewing signatures, toggles the signature style between DOT and LINE display modes.
Alt+T	The TEST mode can be accessed from EDIT or LEARN modes, with the proper security level.
Alt+V	Activates the VIEW mode. If used at the component level, the component information is set.
Alt+#	Random access zoom.
End	Moves the screen selector to the last item of the board, section, or component selection screens.
Home	Moves the screen selector to the first item of the board, section, or component selection screens.
Page Up	Moves the screen selector to the previous page of board, section, or component selection screens.
Page Down	Moves the screen selector to the next page of board, section, or component selection screens.

NOTE

Refer to Chapters 5 and 6, and Appendices C and F in this manual for information on how to use these features.

In Chapter 5, a tutorial will guide you through system operation for testing a board. It may be used as a keystroke reference if you use the 5100DS to test your own board now, or an in-depth training session to learn more about this easy to operate and powerful troubleshooting system before using it.

NOTES:

CHAPTER 5
TUTORIAL

NOTE

Before starting this chapter, we strongly suggest that you read Chapter 3 and 4 first, if you haven't done so already.

5-1. INTRODUCTION

In this section, you will use the Huntron Demo Board and the 5100DS software to familarize yoursef with the capabilities of this powerful troubleshooting system. This demo board is specially designed to show a variety of components you can test, and give you practice entering a database and interpreting test results. In addition, you can simulate failed conditions, so that component signatures will differ when you perform comparison testing.

Remove your demo board from its protective wrapping and orient it to the following illustration.

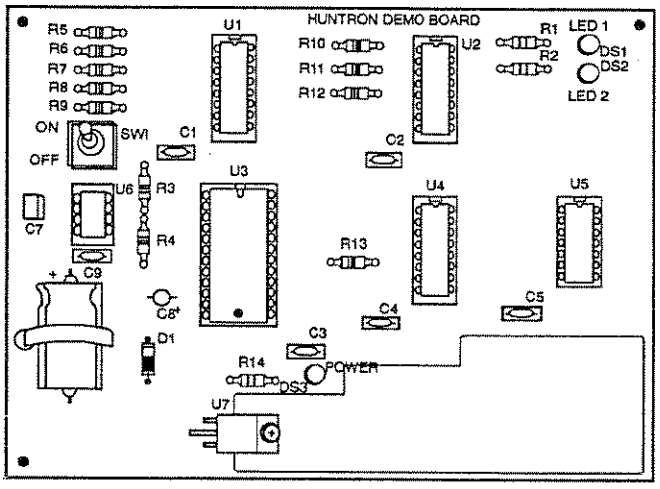


Figure 5 - 1. Huntron Demo Board.

There is a wide variety of components on the demo board which include linear (U6, U7) and digital (U1, U2, U3, U4, U5) integrated circuits (ICs), capacitors (C1 - C9), resistors (R1 - R14), diodes (D1, DS1, DS2), and a switch (SW1).

5-2. GETTING THE 5100DS SOFTWARE STARTED

IMPORTANT NOTE

When running the 5100DS software, always exit back to the DOS prompt before turning off your computer or performing a RESET or REBOOT. Failure to do so may result in loss of data.

This tutorial starts at the conclusion of the 5100DS system installation described in Chapter 2. If you have not yet done this, go to Chapter 2 before proceeding here.

Turn on your computer and wait until your computer boots up.

At your computer's DOS Prompt (typically "C:>"), type "cd\51DS ↵ " then "51DS ↵ "to start the program. The HUNTRON logo screen will appear as shown in the following figure.

Figure 5 - 2. HUNTRON Logo Screen.

NOTE:

If you cannot see the HUNTRON logo on your PC monitor, your PC may not meet the minimum requirements to work with the 5100DS. Recheck the hardware and software installation instructions in Chapter 2 of this manual. If you still have difficulties contact Huntron Technical Support for assistance.

Press any key to see the Log-on screen as shown in the next figure.

The Security function displays this screen to allow a supervisor at his option to restrict users so that they can only access only specific modes of the 5100DS system. This helps prevent unwanted modification or loss to any of the stored component information and signatures. Refer to Chapter 6 for complete information on Security.

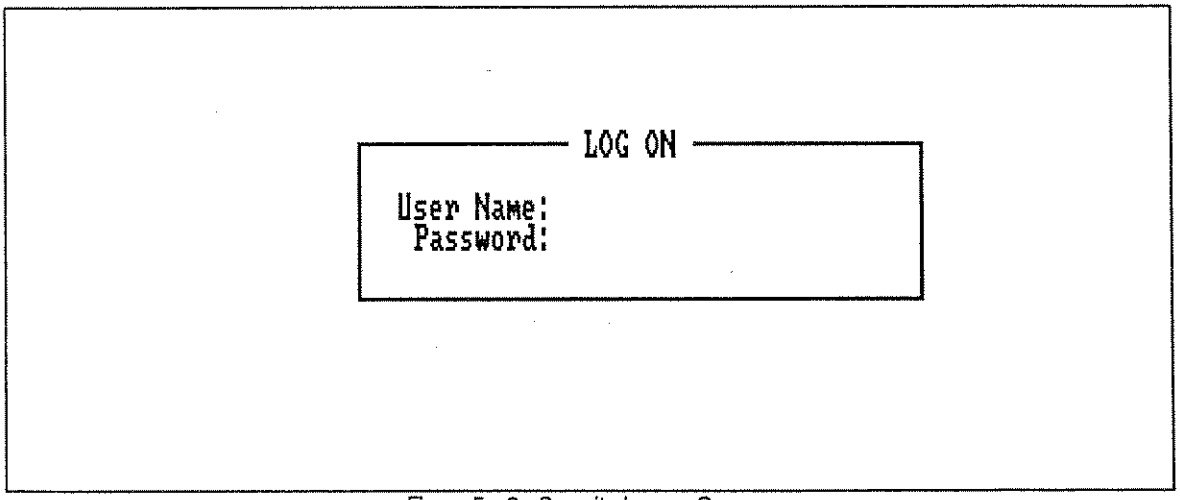


Figure 5 - 3. Security Log-on Screen.

For now, use the factory default user name and password which is the Enter (key) and press ↵ twice. The Main menu screen will be displayed next.

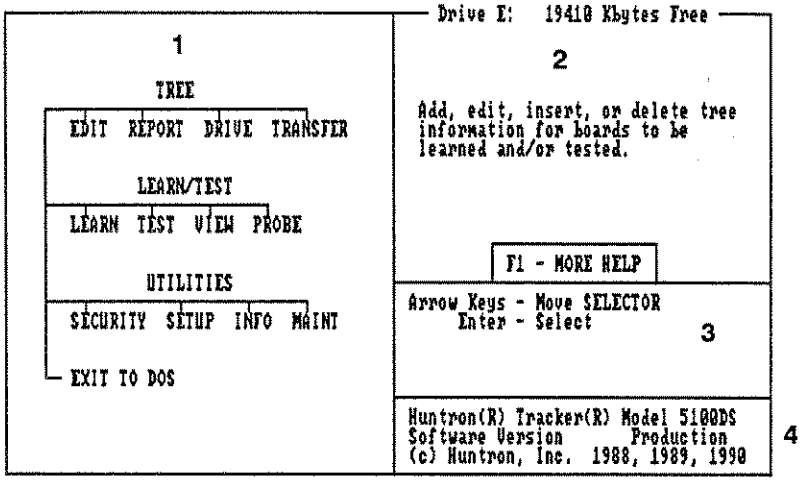


Figure 5-4. Main Menu Screen.

The Main menu screen is divided into 4 different areas. Area 1 is the menu selection box which displays the different modes to choose from. Area 2 is the on-line help box which provides infomation about the current mode selected from the Main menu. Detailed information for most selections are displayed in this area when the F1 key is depressed. Area 3 is the active key selection box that displays specific keys which are used to select or access various modes. Area 4 shows the current version number of the Tracker 5100DS software.

From the Main menu, you can press specific keys and do the following:

- ← → ↑ ↓ keys highlight different items (this is called the SELECTOR).
- ↵ selects and accesses the highlighted item.
- F1 gives detailed help on a highlighted item.
- A single highlighted letter from each item gives quick access of that mode.

Move the cursor around the menu. ↑ ↓ arrows move up and down the menu, and ← → arrows move along sideways. You can also use the arrows in your number keypad if the NUM LOCK is turned off. If you inadvertently access a mode, pressing Esc will return you to the Main menu.

NOTE:

Press the F1 key for HELP if you need additional information about a specific mode or function that has been highlighted. Detailed information will appear in the right window of the screen. Press Esc to clear the HELP window and return to previous screen.

5-3. DEFINING A SYSTEM

Look at the TREE part of the Main menu. Its functions consist of EDIT, REPORT, DRIVE, and TRANSFER.

In this section, you will learn how to create a system information database using the demo board . This board will be divided into three functional sections and the information will be used later for testing. For a complete board test, you may wish to enter a board that includes all the components on the demo board. For now, all components will not be entered to keep this exercise to a reasonable length.

The following figure shows the tree type diagram of the system that you will be entering into your database.

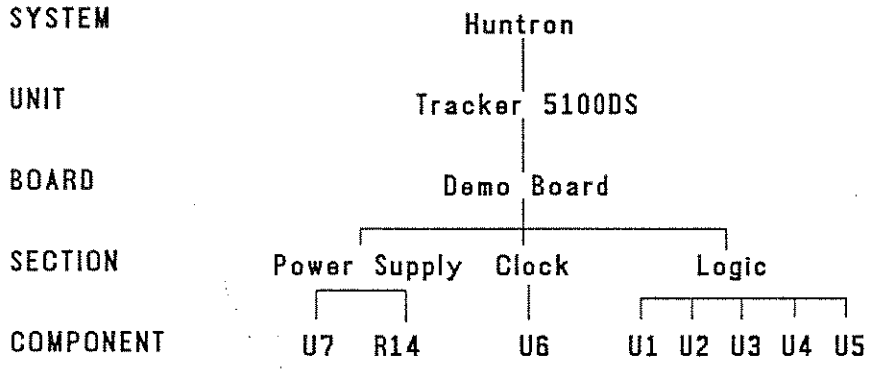


Figure 5-5. Demo Board Tree Diagram for Tutorial.

You will now create a database for the demo board. EDIT starts with the EDIT board screen. Press E to activate the EDIT function and refer to the following figure.

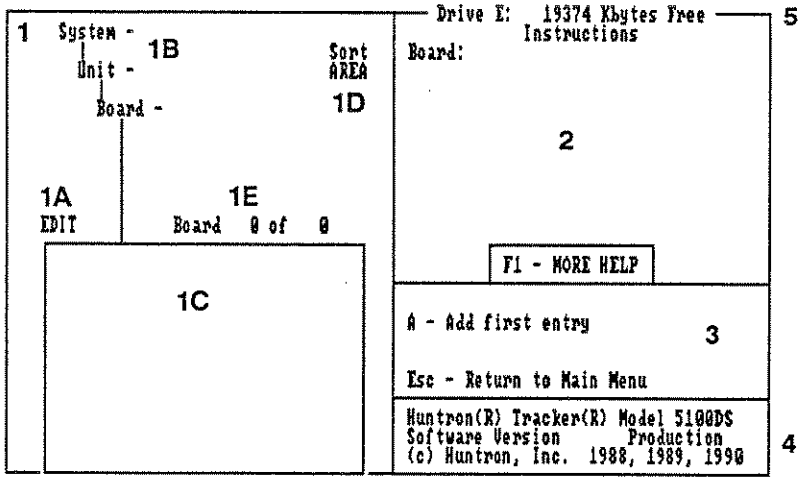


Figure 5-6. EDIT Board Screen.

The EDIT board screen is made up of five areas.

Area 1 on the left half of the screen is the database information box. Area 1A is the mode indicator and always tells you what mode is currently active. In this case, EDIT is displayed since this is the mode that is activated. Area 1B displays the associated tree type diagram for the system and unit of the board that is currently selected. Area 1C is the board window box which lists boards stored in the current drive/path. In this case since this is the first time, there are no boards displayed. Area 1D indicates which sort method is selected. Sort method refers to the order in which test results are displayed. Area and Peak are the two choices for sort method and this is selected in the Setup mode. Area is the default setting and should be used for most testing. Chapter 6 contains detailed information on this topic under the Setup Mode section and Sort is also covered in Appendix 2, section 5 Sort Methods in this manual. Area 1E is the board counter indicator. It gives the total number of boards for the current drive/path. There are no boards yet so this counter shows zero.

Area 2 is the board instructions box and displays any user entered text for the selected board. Again, there is no text in this box now since this is the first time in this mode.

Area 3 is the active key box and displays what features are available in this mode. Only A (Add) and Esc are displayed now since this is the first time, however if there were previous entries, then other features would be available.

Area 4 is the program copyright and version box. In this manual, the version number is absent to avoid any confusion between any versions of the program that this manual covers. Look at your computer monitor to see the current program version.

Area 5 shows the disk drive that is currently selected and the remaining amount of free space left on it.

5-4. ENTERING SYSTEM INFORMATION

To make your first entry for this database, press A for Add. Notice that the active key box shows which keys are available for this mode. A pop-up window will appear and ask for the following information:

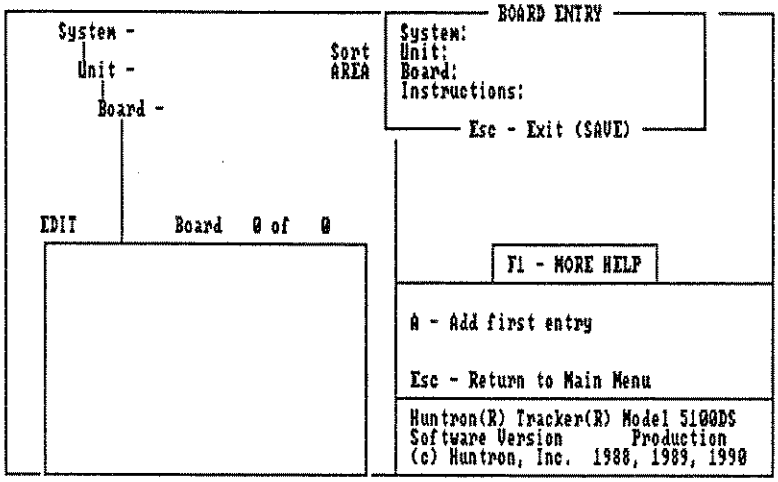


Figure 5-7. Board Entry Pop-up Window.

Each database must be given a name. The program uses it for keeping track of signature information. Each name can be made up of any combination of alphanumeric characters (alphabetic and numerical symbols) up to 14 characters in length. The program is case insensitive, that is, a name like "BOARD1" is the same as "Board1" or "board1". Names for System and Unit are optional but the program requires an entry for Board name .

In this tutorial, we will call this the HUNTRON system, the TRACKER 5100DS unit, and the DEMO BOARD. Enter the following:

For System, type "HUNTRON"↲ (14 characters max).
For Unit, type "TRACKER 5100DS" ↲ (14 characters max).
For Board, type "DEMO BOARD" ↲ (14 characters max).

Instructions are used to provide specific details about the UUT, such as a part number, serial number, revision level, or a description (30 characters max). Under Instructions, type "DIVIDED INTO 3 SECTIONS". Press Esc to return to the EDIT board screen. Refer to the next figure for this discussion.

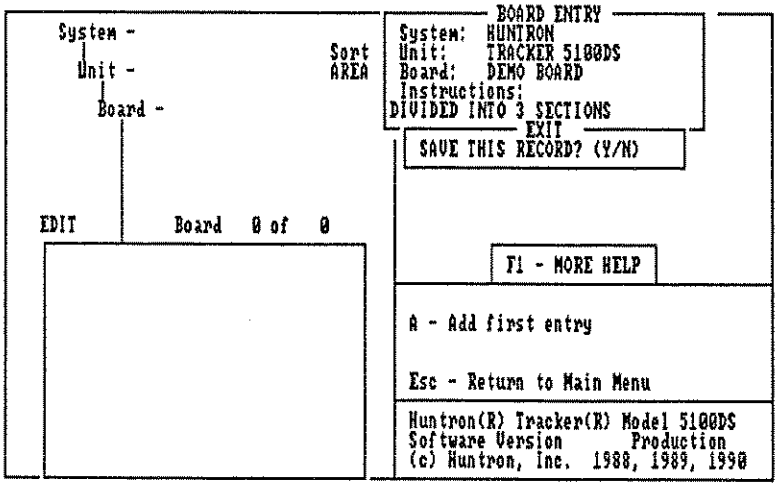


Figure 5-8. Demo Board EDIT Board Screen.

The save prompt appears: "SAVE THIS RECORD? (Y/N)". Press Y to save. Pressing N would have discarded the information you just typed.

IMPORTANT NOTE

Although you can define your board as a single section (each section can have a maximum of 330 components), dividing your board into sections (each board can have a maximum of 110 sections) has advantages such as more effective testing and troubleshooting, and more manageable data storage when using floppy disks. How you define board sections may depend upon the experience you have with the board under test.

Generally, you can partition your boards by following one of these procedures:

- *By failure category based on a prior test history of the board, starting with most likely component to fail. This can be the fastest method if you already know what fails repetitively.*
- *By logical section (memory, input/output, etc). This can be the fastest method if you have an idea of what is wrong.*
- *By component size especially if you're not familiar with the UUT or lack documentation on it. This procedure minimizes the number of times you need to change between different IC clips during testing.*

5-5. ENTERING SECTION INFORMATION

To enter section information, with the selector at DEMO BOARD, press ↵. Notice that the board window changes to section and the board counter changes to section. Since this is the first time entry, there will be no sections listed. At the section level of the EDIT function, a new indicator "Max" appears below "Sort". This feature has to do with how the 5100DS captures an analog signature and is user setable in the section entry pop-up window. There is more information about "Max" in the following paragraphs as well as in Appendix F, Application Note 2 of this manual.

Type A (Add) to add a new section. A section entry pop-up window will appear and ask for the following:

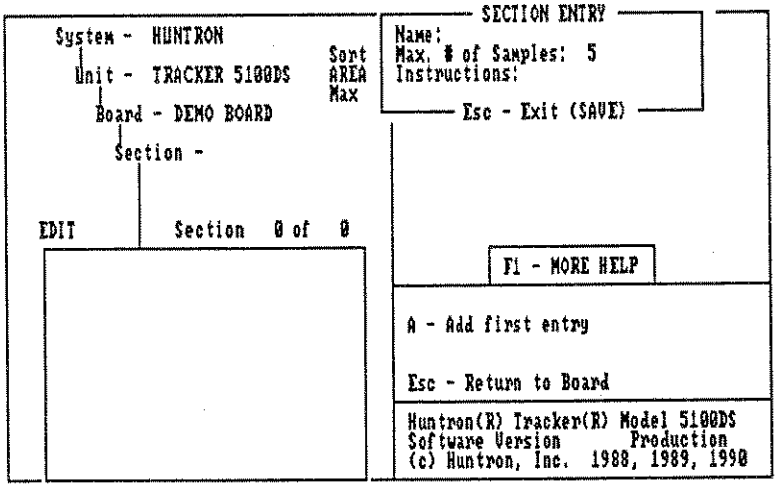


Figure 5-9. Section Entry Pop-up Window.

For this tutorial, the demo board has been divided into 3 sections by function, i.e. power supply, clock, and logic. Each of these sections will demostrate some different features of the 5100DS to give you a fairly comprehensive introduction to the operation of the 5100DS.

You will now start entering information about each section into the database.

POWER SUPPLY SECTION

At Section Name, type "POWER SUPPLY" ↵. (Maximum 14 characters).

For Max. # of Samples: use the default value of 5. Press ↵ to accept and go to next line.

> **NOTE: Max # of Samples**
>
> This field sets the upper limit number of times the 5100DS will attempt to capture an analog signature during LEARN or TEST. Normally, the 5100DS will usually capture the analog signature on the first try. However, under certain conditions, the 5100DS may repeat capturing to insure the analog signature is stable and accurate. If the number of samples reaches the maximum number entered here, then the 5100DS uses the last sample for input. You should always set this value to the smallest number practical for your board in order to obtain the shortest test times. Refer to Appendices E, F, and H in the back of this manual for more information about "Max".

One use of the section instructions is to describe the physical location of the section on the board. At Instructions, type "LOWER LEFT SIDE". (30 characters max.)

Press Esc to return to the section screen.

At the save prompt, "SAVE THIS RECORD? (Y/N)", press Y to save. The following figure shows the screen after the save operation.

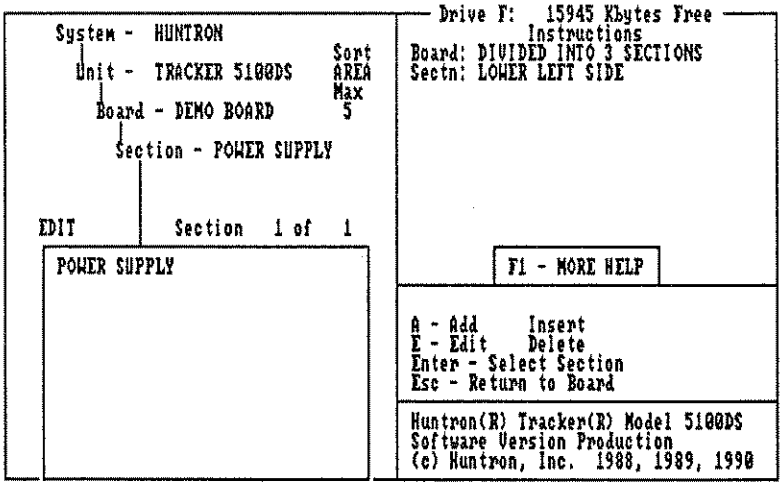


Figure 5-10. Power Supply Section EDIT Screen.

CLOCK SECTION

To enter the next section information into this database, press A (Add) to add this section after the power supply section. A section entry pop-up window will appear (see the next figure).

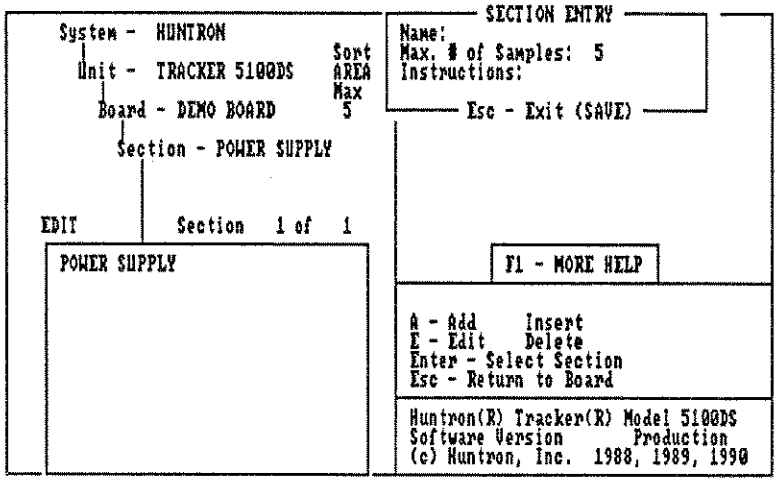


Figure 5-11. Clock Section Entry Pop-up Window.

Enter information about the clock section on the demo board as follows:

At Section Name, type "CLOCK" ↵ . (14 characters max).

For Max. # of Samples: use the default value of 5. Press ↵ to accept and go to next line.

For section instructions, type "LEFT SIDE OF DEMO BOARD" (30 characters max).

Press Esc to return to the section screen.

At the save prompt, "SAVE THIS RECORD? (Y/N)", press Y to save. The next figure shows the resulting screen.

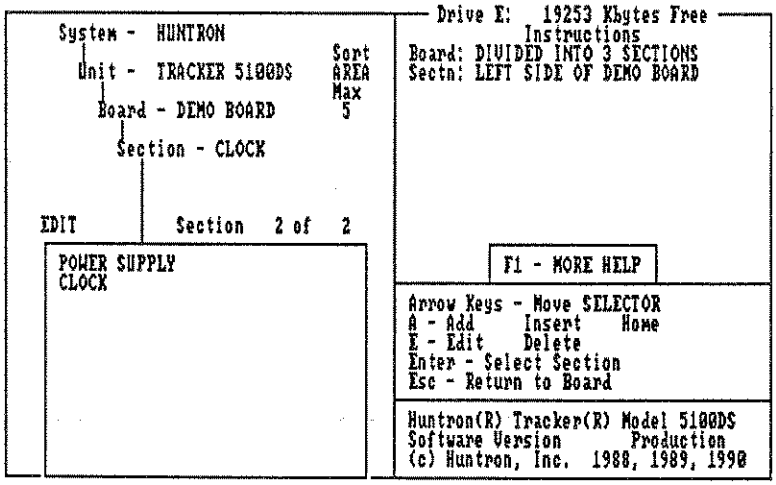


Figure 5-12. Saving the Clock Section Information.

LOGIC SECTION

To enter the next section information, press A (Add) to add the next section. A pop-up window will appear as shown below.

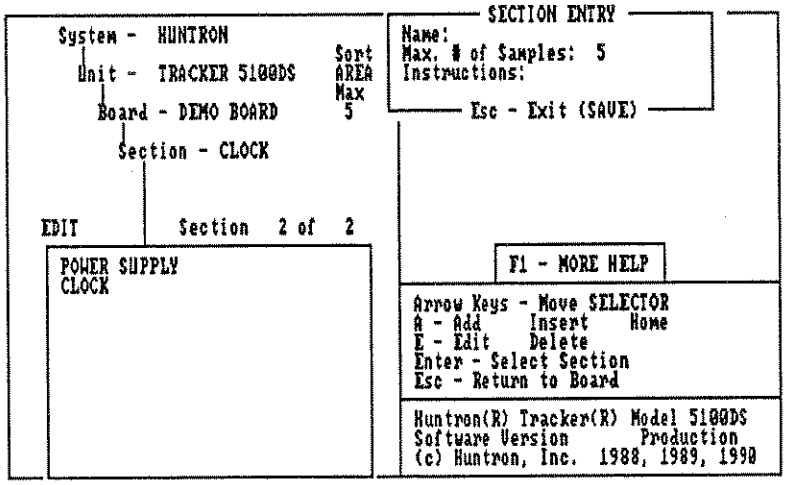


Figure 5-13. Logic Section Entry Pop-up Window.

Enter information about the logic section on the demo board.

At Section Name, type "LOGIC" ↵. (14 characters max).

For Max. # of Samples: use the default value of 5. Press ↵ to accept and go to next line.

For section instructions, type "ALL TTL ICS" (30 characters max).

Press Esc to return to the section screen.

At the Save prompt, "SAVE THIS RECORD? (Y/N)", press Y to save. The figure below shows the saved information.

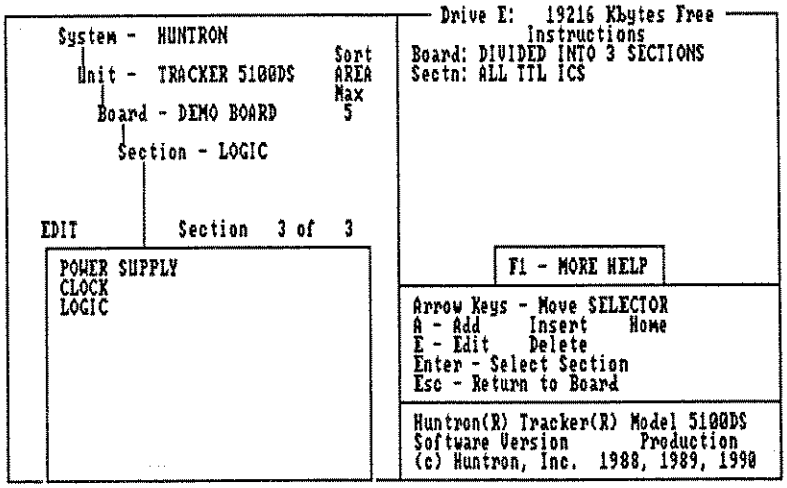


Figure 5-14. Saving the Logic Section Information.

You have completed entry of the section information for the demo board and are now ready to proceed to the next step.

5-6. ENTERING COMPONENT INFORMATION

The final step in defining a system database is entering specific details about all components in each section of the board you wish to test. You can start with any of the sections that were just created, but for this exercise, begin with the power supply section of the demo board first.

Each component on the demo board has reference names printed next to it and each IC has the manufacturer's part number marked on it as well. Use the component reference name and the part number for entries in the database. In other situations where there are no reference names or part numbers on your own board, you may be able to refer to a schematic or block diagram if available for this information. Otherwise, you will need to devise a scheme to identify all the components to be tested. Use the Instructions line to clearly explain and document your procedure especially if another person might do the testing.

POWER SUPPLY COMPONENTS

To enter information about each component in this section into the database, move the selector to POWER SUPPLY on the EDIT section screen and press ↵. Note that the section box changes to component. Press A (Add) to enter the first component. A window will appear as shown below.

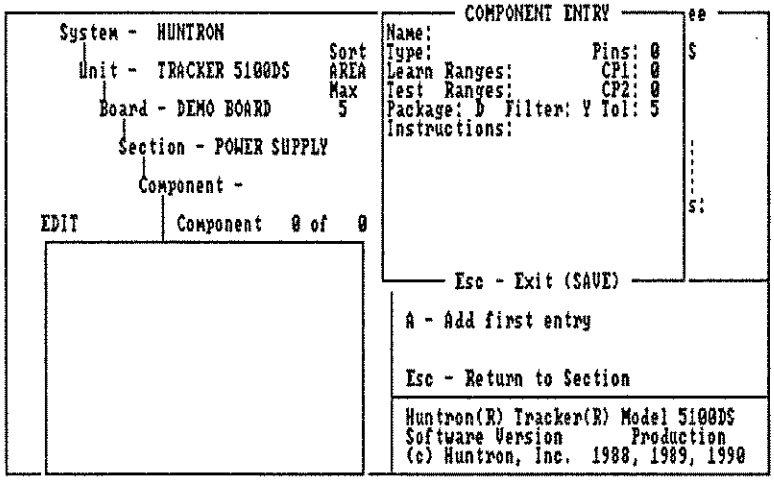


Figure 5-15. Power Supply Section Component Entry.

For Name, type "U7" ↵. Use this field to enter a descriptive name (6 characters maximum).

For Type, use the manufacturer's part number on the component, i.e. type "LM340T5" ↵ (14 characters max).

For LEARN ranges, you can learn in any combination of the four impedance ranges: Low, Medium 1, Medium 2 and High. In this exercise, type "L1" ↵ to specify Low and Medium 1 ranges (4 characters maximum, from following set: L(ow), (Medium)1, (Medium)2, H(igh),or A(ll)).

IMPORTANT NOTE

Although you can select any combination of the 5100DS's four ranges, it is usually not necessary or recommended to select testing in ALL ranges. Most components are consistently best tested in certain ranges, and test time can be reduced by testing only those ranges. This also saves disk space. Refer to Appendices D, E, and F in the back of this manual for more information on range selection for different types of components.

For Test Ranges, when testing unknown components, they are compared against stored good signatures. Test ranges must be equivalent to or a subset of the Learn ranges for each component. Type "L1" ↵ (4 characters maximum , from following set: L, 1, 2, H, or A).

For Package, this refers to the type of test connection you will use on the component. The choices are (S)ingle inline package (SIP), (D)ual inline package (DIP),or P(robe). S can be selected when a component has a single inline row of pins like a header strip or card edge connector on a board. D can be selected when a component has two parallel rows of pins like an IC. P can be selected if you will be using probes to access component pins that cannot be easily tested by standard test clips. In this example, U7 has only 3 pins and you will type P ↵ (Single character from the following set: S, D or P).

IMPORTANT NOTE

The 5100DS will automatically test the component from its first pin to its last pin in numerical order by package type. Refer to Appendix F in this manual for more information related to package types and test pin sequencing.

For Filter, accept the default Y by pressing ↵. This feature looks for a certain type of noisy signature and only if found removes the noise before digitizing. This subject is covered in depth in Appendix F, application note 2 of this manual.

For Pins, this component has 3 pins so type 3 ↵ (2 digits maximum, 1 to 64 max).

For C(ommon) P(in) 1, all tests are made with respect to a reference pin which is called a common pin. The recommended way to enter a common pin is to locate a ground or power pin on the component under test and designate this pin as common pin 1 (generally, if you are unable to locate the ground pin on an IC, then divide number of pins in half and enter that number as common pin 1). In this case, when using probes, type 0 ↵ (2 digits, 0 to 64 max) because you will be connecting the common lead directly to the board.

For C(ommon) P(in) 2, in most cases, there is no need to enter a second common pin. Under certain circumstances, you may need to use more than a single pin of a component as a common at a time. Accept the default of zero (none) and press ↵ to continue (2 digits, 0 to 64 max).

Refer to the appendices in this manual for more information on proper common pin selection.

For TOL(erance): Tolerance is the amount of allowable difference between component signatures (reference and test) before the software alerts you that they are different.

Accept the default of 5 for the tolerance, press ↵ (2 digits, 0 to 99, max.).

IMPORTANT NOTE

This is not a percent of difference, but a discrete number you choose between 0 and 99. A low value of tolerance alerts you to subtle differences, and a high value of tolerance alerts you to only catastrophic differences. Refer to Chapter 6 and the appendices in this manual for more information about tolerance.

For Instructions, you can specify type of clips, placement of probes, etc. Type "PLUG RED LEAD TO TEST JACK. PLUG COMMON LEAD TO COMMON JACK,CLIP TO C9(-). PIN 1 IS ON BOTTOM".(180 characters max).

Press Esc to return to the EDIT Component Screen.

At the prompt," SAVE THIS RECORD? (Y/N)", press Y to save.

To enter next component information, press A (Add). A pop-up window will appear as shown in the next figure.

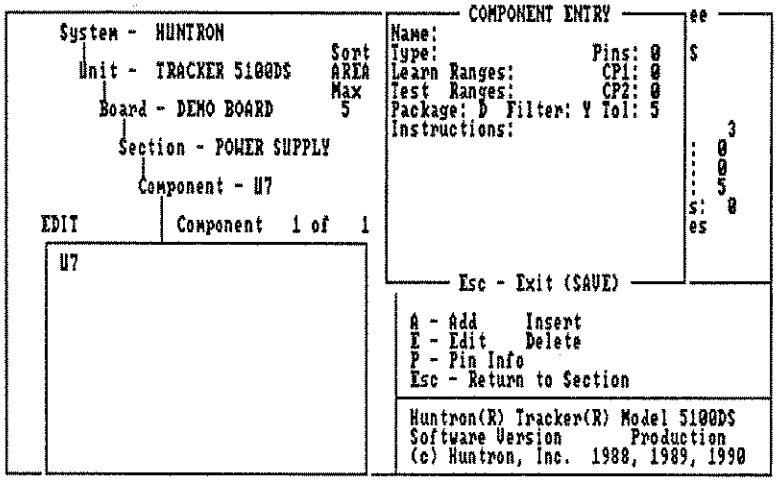


Figure 5-16. Power Supply Section R14 Entry.

For Name, type "R14" ↵ (6 characters max).

For Type, use the resistor value, i.e. type "180 OHM" ↵ (14 characters max).

For Learn Ranges, type "L1" ↵ to specify Low and Medium 1 ranges (4 characters maximum , from following set: L(ow), 1(Medium 1), 2(Medium 2), H(igh) or A(ll)).

For Test Ranges, type "L1" ↵ (4 characters maximum, from following set: L, 1, 2, H, or A).

For Package, type P ↵ to access this component with a probe (Single character from the following set: S, D or P).

For Filter, accept the default Y by pressing ↵. This parameter is covered in depth in the appendices of this manual.

For Pins, this component has 2 pins so type 2 ↵ (2 digits, 1 to 64 max).

For C(ommon) P(in) 1, type 0 ↵ (2 digits, 0 to 64 max) because you will be connecting the common lead directly to the board.

For C(ommon) P(in) 2, accept the default of 0 so press ↵ (2 digits, 0 to 64 max).

For TOL(erance), accept the default of 5 for the tolerance, press ↵ (2 digits, 0 to 99, max.).

For Instructions, type "CONNECT RED PROBE TO TEST JACK.CONNECT COMMON LEAD TO C9(-) FROM COMMON JACK. PIN 1 ON LEFT" (180 characters max).

Press Esc to return to the EDIT component screen.

At the prompt, "SAVE THIS RECORD? (Y/N)", press Y to save.

You have now completed entering component information for the power supply section of the demo board. Press Esc to return to the EDIT section screen to select the next section.

CLOCK SECTION

This section of the demo board has one component. To enter component information, move the selector to CLOCK on the EDIT section screen and press ↵. Note that the section box changes to component and the section counter changes to component. Press A (Add). The figure below shows the pop-up window that will appear:

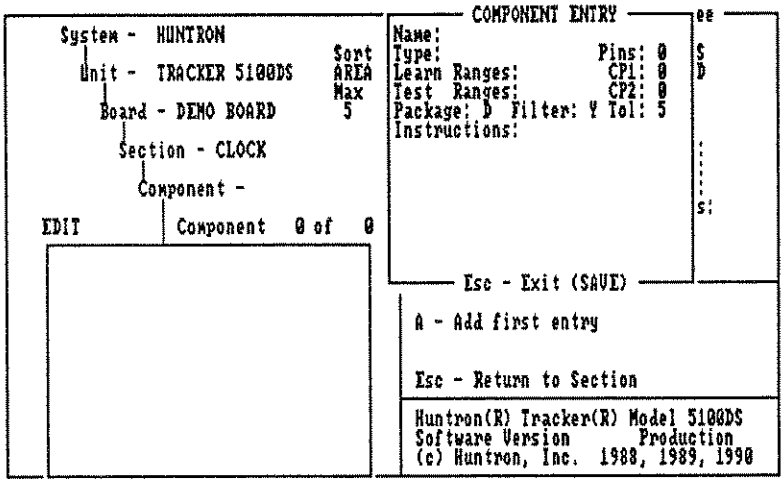


Figure 5-17. Clock Section Component Entry Pop-up.

For this component entry, a new feature will be introduced. Autorange Select allows you to let the 5100DS pick the range that gives the most descriptive signature. To activate Autorange Select, type the following information in the same manner as you have just done for the previous section.

Component Name:	**U6**
Component Type:	**NE555**
Learn Ranges:	**?**
Test Ranges:	**?**
Package:	**D**
Filter:	**Y**
# of Pins:	**8**
Common Pin 1:	**1**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	**MAKE SURE SWITCH SW1 IS SET TO CLOCK-ON**

Note for the LEARN and TEST ranges, "?" was entered. This "?" entry enables the Autorange Select feature of the 5100DS. This feature will select a single TEST range for each pin of the component. The LEARN ranges are set to "L12" and the test range is determined after LEARN is completed. Autorange Select is just one of the features of the Component Pin Info option. To edit any of the Component Pin Info features, use "P - Pin Info" at the EDIT component screen instead of "E - Edit".

IMPORTANT NOTE:

The Autorange Select feature is not a replacement for Analog Signature Analysis knowledge. This feature will select the TEST range based on the LEARN range that gave the most descriptive signature. There will be times that the selected test range will not be as useful in finding your particular faults on your boards as could be done by setting the test range manually. Autorange Select is intended to be used only for IC components. It is not recommended for discrete components.

For more information about the Autorange Select feature and Component Pin Info option, refer to Chapter 6, section 6-2 in this manual.

Press Esc to return to the EDIT component screen when finished. At the save prompt, "SAVE THIS RECORD? (Y/N)", press Y. The EDIT component screen shows what has just been entered.

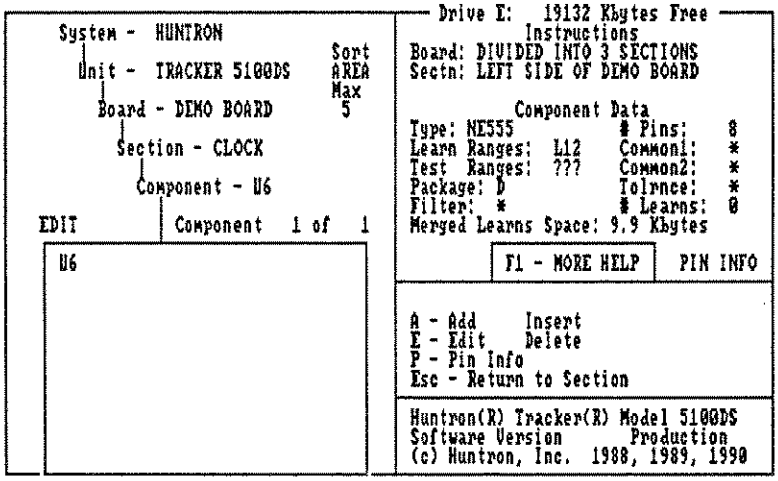


Figure 5-18. Clock Section Component EDIT Screen.

IMPORTANT NOTE:

Once this component is saved, several of the fields in the above figure change to an *. This means that the PIN INFO settings for this component are controlling those fields. Refer to Chapter 6, section 6-2 for more information.

Press Esc to go back to EDIT section screen and go to the next section.

LOGIC SECTION

Move cursor to highlight LOGIC and press ↵. At the EDIT component screen, press A to add a component and type the following information in the component entry pop-up:

Component Name	**U1**
Component Type:	**74161**
Learn Ranges:	**L2**
Test Ranges:	**L2**
Package:	**D**
Filter:	**Y**
# of Pins:	**16**
Common Pin 1:	**8**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	**USE THE 16 PIN CLIP FROM SOCKET 4**

Press Esc to return when finished. At the prompt, "SAVE THIS RECORD? (Y/N)", press Y. The EDIT component screen shows what has just been entered.

NOTE

The software provides 2 handy functions, BUILD and REPEAT to speed up data entry. BUILD and REPEAT are available in the EDIT mode at the board, section, and component entry levels. In this example, we will only be using these functions at the component entry level. Use BUILD to shortcut entry of component information when you have identical devices. BUILD makes a copy of the previous component's information and adds the copy as a new component if the previous component name contains a number after it. BUILD will make the new name with the number incremented by one (e.g. U1 is renamed to U2). REPEAT is similar to BUILD in that it adds a new component by copying the previous component's information except that no component Name is created. This Name field is left blank for you to complete before the new component is added to the section. For more information on BUILD and REPEAT, refer to Appendix H in this manual.

Before you enter information for the next component U2, notice that the information for the previous component U1 is almost the same except for the Component Name and Type. Instead of pressing A to add the next component, use BUILD to add the next component. BUILD will copy the previous component's information and add it as a new component to the section. The component name will be incremented by one because the name contains a number at the end of it. If the component name does not contain a number suffix, then the new component will not be added and a "Duplicate Name" error message will be displayed.

In order to use BUILD, move the selector to the component you want to BUILD on and press Alt+B . When BUILD is finished, look at the following figure to see the new component entry.

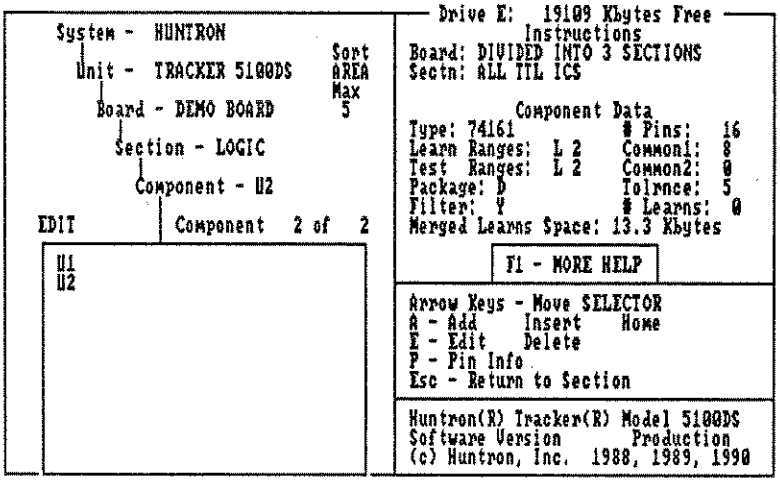


Figure 5-19. Using BUILD Feature For Component Entry.

After using BUILD to create and add U2, press E to edit and move the cursor to Component Type in the entry pop-up window. Change 74161 to "74162", press Esc to exit and Y to save to complete this component entry.

For the next component, use the REPEAT feature. Press Alt+ R to activate.

At the Component Entry pop-up, type in the following in place of the previous component. If a particular line does not require any changes, then just skip over it by using the arrow keys or by pressing ↵ to go to the next line.

Component Name:	U5
Component Type:	74LS02
Learn Ranges:	L2
Test Ranges:	L2
Package:	D
Filter:	Y
# of Pins:	14
Common Pin 1:	7
Common Pin 2:	0
Tolerance:	5
Instructions:	USE THE 16 PIN CLIP FROM SOCKET 4. MAKE SURE PIN 1 OF CLIP IS ON PIN 1 OF U5.

Press Esc to exit when finished.

At the prompt, "SAVE THIS RECORD? (Y/N)" press **Y**.

The EDIT component screen shows what has just been entered.

For the next component, use the REPEAT function again. Press **Alt+ R** to activate.

At the Component Entry pop-up, type in the following in place of the previous component. If a particular line does not require any changes, then just skip over it by using the arrow keys or by pressing ↵ to go to the next line.

Component Name:	U4
Component Type:	74LS138
Learn Ranges:	L2
Test Ranges:	L2
Package:	D
Filter:	Y
# of Pins:	16
Common Pin 1:	8
Common Pin 2:	0
Tolerance:	5
Instructions:	USE THE 16 PIN CLIP FROM SOCKET 4

Press Esc to exit when finished.

At the prompt, "SAVE THIS RECORD? (Y/N)", press **Y**.

The EDIT component screen shows what has just been entered.

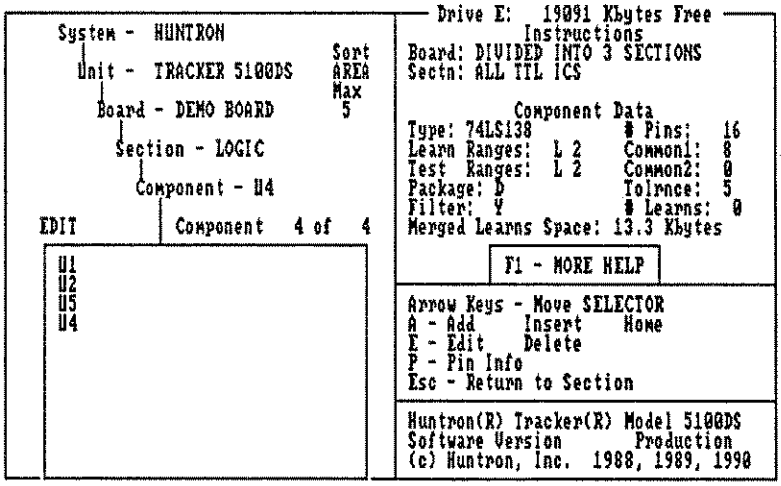


Figure 5-20. EDIT Component Screen For U4.

For the last component in this section, use REPEAT again. Press **Alt+ R** to activate.

At the Component Entry pop-up, type in the following in place of the previous component. If a particular line does not require any changes, then just skip over it by using the arrow keys or by pressing ↵ to go to the next line.

Component Name: U3
Component Type: 74154
Learn Ranges: L2
Test Ranges: L2
Package: D
Filter: Y
# of Pins: 24
Common Pin 1: 12
Common Pin 2: 0
Tolerance: 5
Instructions: USE THE 24 PIN CLIP FROM SOCKET 2

Press Esc to exit when finished.

At the prompt, "SAVE THIS RECORD? (Y/N)" press Y.

The EDIT component screen shows what has just been entered.

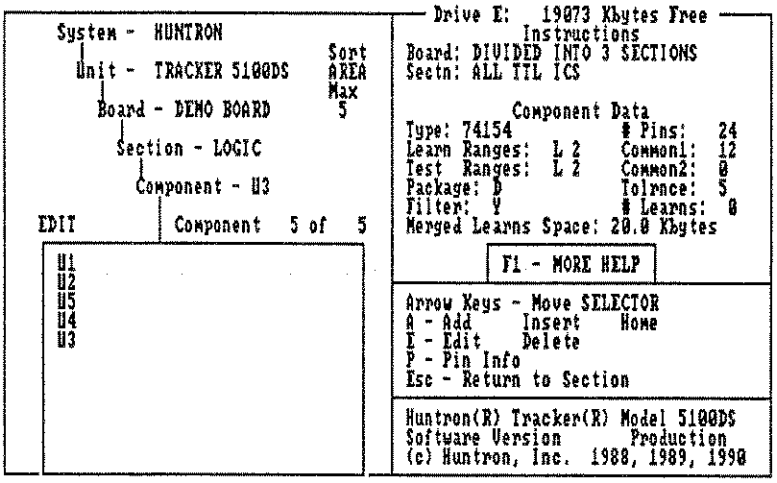


Figure 5-21. EDIT Component U3 Screen.

You have completed entering all the components and are ready to proceed with the next step, printing a TREE REPORT of the demo board. Press Alt+M to return to the Main menu.

5-7. GENERATING A TREE REPORT

You can print a hard copy of the board information database that was just entered with the REPORT function of the TREE mode. At the Main menu, select REPORT by pressing **R**. Make sure your printer is connected to your PC and is on-line. At the REPORT Board selection screen, select the demo board. Press ↵ to bring up the REPORT pop-up window. There are 2 choices, T - Tree and P- Pin Info in this window. First, press T to print the TREE report. When REPORT is done, the program wil return to the REPORT selection screen. The TREE report consists of a complete section by section listing of the selected board. Within each section, each component is listed by name, type, range (Rang), tolerance (Tol), filter (F), number of pins (#P), common pins (CP), package type (P), and Instructions. Refer to the following figures for samples of the TREE report for each section of the demo board.

```
 System: HUNTRON                TREE REPORT                    Page: 1
   Unit: TRACKER 5100DS                                        Date: 06/11/90
  Board: DEMO BOARD       DIVIDED INTO 3 SECTIONS              Time: 16:26:24
Section: POWER SUPPLY     LOWER LEFT SIDE

Name   Type            Rang Tol F #P CP P Instructions
-------------------------------------------------------------------------------

U7     LM340T5         L1    5  Y  3 0  P PLUG RED LEAD TO TEST JACK.PLU
                       L1                  G COMMON LEAD TO COMMON JACK,C
                                           LIP TO C9(-).PIN 1 ON BOTTOM.

R14    180 OHM         L1    5  Y  2 0  P CONNECT RED PROBE TO TEST JACK
                       L1                  .CONNECT COMMON LEAD TO C9(-)
                                           FROM COMMON JACK.PIN 1 ON LEFT
                                           .
```

Figure 5-22. Tree Report For the Power Supply Section.

```
 System: HUNTRON                TREE REPORT                    Page: 2
   Unit: TRACKER 5100DS                                        Date: 06/11/90
  Board: DEMO BOARD       DIVIDED INTO 3 SECTIONS              Time: 16:26:27
Section: CLOCK            LEFT SIDE OF DEMO BOARD

Name    Type            Rang Tol F #P CP P Instructions
-------------------------------------------------------------------------------

U6      NE555           L12    * *  8  * D MAKE SURE SWITCH SW1 IS SET TO
                        ???           *    CLOCK-OFF
```

Figure 5-23. Tree Report for the Clock Section.

```
 System: HUNTRON                TREE REPORT                    Page: 3
   Unit: TRACKER 5100DS                                        Date: 06/11/90
  Board: DEMO BOARD       DIVIDED INTO 3 SECTIONS              Time: 16:26:30
Section: LOGIC            ALL TTL ICS

Name    Type            Rang Tol F #P CP P Instructions
-------------------------------------------------------------------------------

U1      74161           L 2   5  Y 16 8  D USE THE 16 PIN CLIP FROM SOCKE
                        L 2             8    T 4


U2      74162           L 2   5  Y 16 8  D USE THE 16 PIN CLIP FROM SOCKE
                        L 2             8    T 4


U5      74LS02          L 2   5  Y 14 7  D USE THE 16 PIN CLIP FROM SOCKE
                        L 2             8    T 4 MAKE SURE PIN 1 OF CLIP IS
                                              ON PIN 1 OF U5
```

Figure 5-24. Tree Report for the Logic Section.

Next, return to the REPORT pop-up window to print the PIN INFO report. Select DEMO BOARD and press ↵. At the REPORT pop-up window, press P to print. In each section, a component's information database will be listed by each individual pin when this feature's been activated. Only the clock section has any PIN INFO because U6 used the Autorange Select feature that sets a test range for each pin. The power supply and logic sections do not use any of the PIN INFO features. (PIN INFO features will not be covered in depth in this chapter. Refer to Chapter 6 in this manual for complete information.) The following figure shows the PIN INFO report for the clock section of the demo board. The power supply and logic sections PIN INFO report is blank since there was no pin information.

```
System: HUNTRON                PIN INFO REPORT                    Page: 2
  Unit: TRACKER 5100DS                                          Date: 06/11/98
 Board: DEMO BOARD        DIVIDED INTO 3 SECTIONS               Time: 16:37:37
Section: CLOCK            LEFT SIDE OF DEMO BOARD

Name       Pin Name R Tol F CP1 CP2      Pin Name R Tol F CP1 CP2
-------------------------------------------------------------------

U6          1   1   2  5  Y  1   0       5   5   2  5  Y  1   0
            2   2   2  5  Y  1   0       6   6   2  5  Y  1   0
            3   3   2  5  Y  1   0       7   7   2  5  Y  1   0
            4   4   2  5  Y  1   0       8   8   2  5  Y  1   0
```

Figure 5-25. Pin Info Report For Clock Section.

IMPORTANT NOTE:
This pin information will change after the LEARN process when autorange selects the range for each pin.

You are now ready to proceed with the next step, store signatures for each component. Press Esc to return to the Main menu.

5-8. LEARNING COMPONENT SIGNATURES ON THE DEMO BOARD

In this section of the tutorial, you will practice how to store good signatures of components in the demo board database you have previously created. They will be used for reference and comparison later. You will also discover how to view these signatures on your PC display and zoom-in by individual pin to view at 2 1/2 times original size.

NOTE

Before starting with the next step, make sure you switch the demo board's toggle switch to the CLOCK ON (up) position. You will be changing the switch setting later in the TEST mode to simulate failed conditions. Also, turn on the Tracker 5100DS and make sure it has been properly connected to your PC. Refer to Chapter 2 Installation if the 5100DS has not been installed yet.

From the Main menu, move the cursor to LEARN, then press ↵ to select.

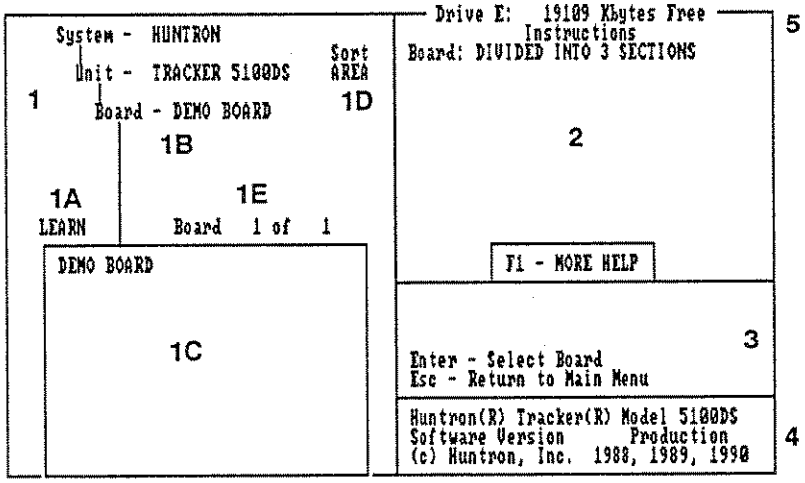


Figure 5-26. LEARN Board Screen.

Observe that the LEARN screen is quite similar to the EDIT screen. The LEARN board screen is made up of five areas.

Area 1 on the left half of the screen is the database information box. Area 1A is the mode indicator and always tells you what mode is currently active. In this case, LEARN is displayed since this is the mode that is activated. Area 1B displays the associated tree type diagram for the system and unit of the board that is currently selected. Area 1C is the board window box which lists boards stored in the current drive/path. Area 1D indicates which sort method is selected. Area 1E is the board counter indicator. It gives the total number of boards for the current drive/path. The demo board is the only one entered so far, so this counter shows one board.

Area 2 is the board instructions box and displays any user entered text for the highlighted board.

Area 3 is the active key box and displays what features are available in this mode. The **Enter** (↵) and **Esc** keys are active at this level.

Area 4 is the program copyright and version box. In this manual, the version number is absent to avoid any confusion between any versions of the program that this manual is valid. Look at your computer monitor to see the current program version.

Area 5 shows the disk drive that is currently selected and the remaining amount of free space left on it.

At LEARN board, select DEMO BOARD in the board selection window, by pressing ↵ to select.

LEARNING THE POWER SUPPLY SECTION

At LEARN Section, select POWER SUPPLY, then press ↵. The selection window changes to LEARN component and shows its components as in the figure.

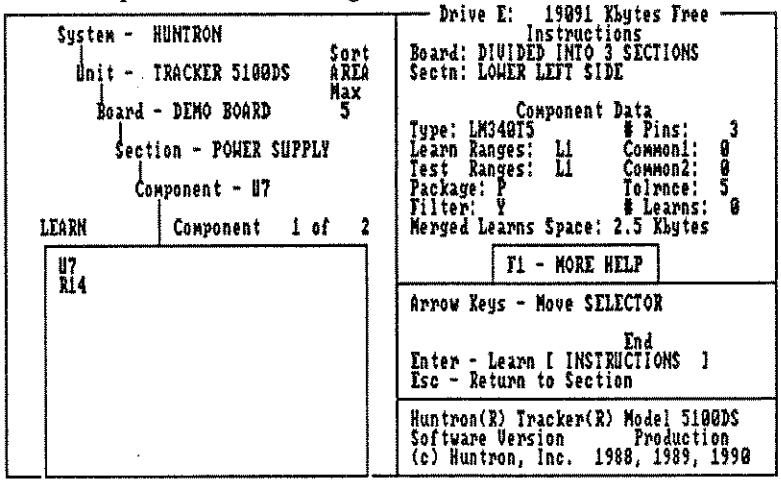


Figure 5-27. LEARN Component For Power Supply Section.

The LEARN component screen is similar to the EDIT component screen. The component data box has two entries that have not been discussed so far. The first one, "Merged Learns Space:" gives you information about how much space is needed for the selected component when creating a merged signature.

NOTE

If there are multiple samples of the known good component available, then you can combine each sample's signature together in the same file. This is called a merged signature. A merged signature takes in to account each sample component's minor differences that are due to the manufacturing process. This signature becomes the reference when comparing against a suspect one and can result in a better test. The drawback to using this feature is that merged signatures requires twice as much storage space on your PC's disk drive. Make sure each sample is known good, because merging a good component with a faulty component will create a bad reference. When testing, faulty components will pass as good. The tutorial will not cover this topic in depth. For detailed information, refer to Appendix F, Application Note 2.

The second additional entry in the component data box is "# Learns:". This is a counter that keeps track of the number of times a component signature has been learned. This number is especially useful if you are using the signature merge feature and want to know how many signatures have been stored.

Make sure U7 is selected (if not move the selector to highlight U7). Locate the black common clip lead supplied with your 5100DS. This cable has a spring-loaded grabber hook on one end and a banana plug on the other. Push the plug end of the common clip lead into the black banana jack labeled COMMON on the 5100DS front panel. Clip the grabber end of the common lead to the negative leg of the large capacitor C9 (the end closest to U7).

CAUTION

The Probe tips are very sharp. Use caution and handle with care to avoid injury.

Next, locate the red TEST probe supplied with the 5100DS and insert the plug into the TEST jack on the 5100DS front panel. Make sure the metal contact end of the probe is extended slightly. Adjust if needed by holding the body of the probe and twist the barrel near the tip counterclockwise to loosen. Extend the metal tip to the desired length by pushing or pulling on the probe wire. Twist the probe barrel clockwise to lock the tip in position.

You are now ready to activate the 5100DS, so press ↵. Follow the Component Instructions as directed in the Instructions pop-up window.

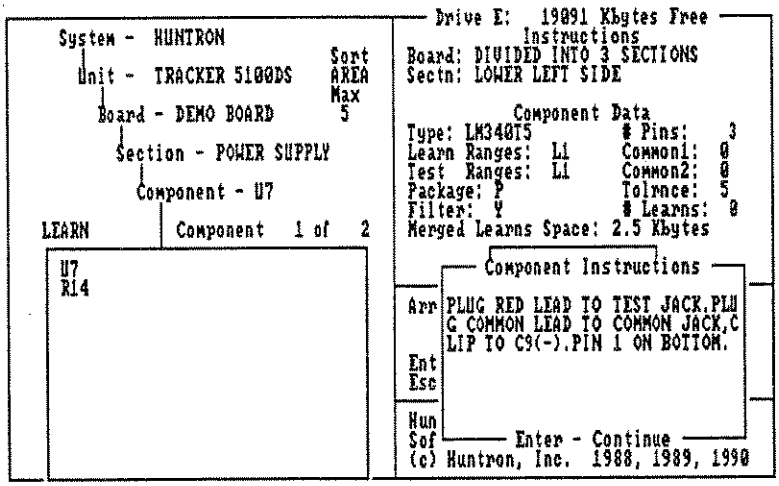


Figure 5-28. U7 Component Instructions Pop-up Window.

NOTE

The Component Instructions display may be disabled if not used or to streamline testing. Activate the SETUP mode at the Main menu to control this feature (refer to Chapter 6, section 6-8 in this manual for complete details).

Press ↵ to continue. Observe that the lower right window on your screen now displays "Enter - Scan Pin: 1". Because the Package Type for this component was P (probe), the LEARN status window displays a prompt to connect to the component's pin. Place the probe tip on pin 1 of U7. Remember that the Component Instructions have specified pin 1 to be the one closest to the edge of the board. Hold the probe steady and press ↵ to scan pin 1.

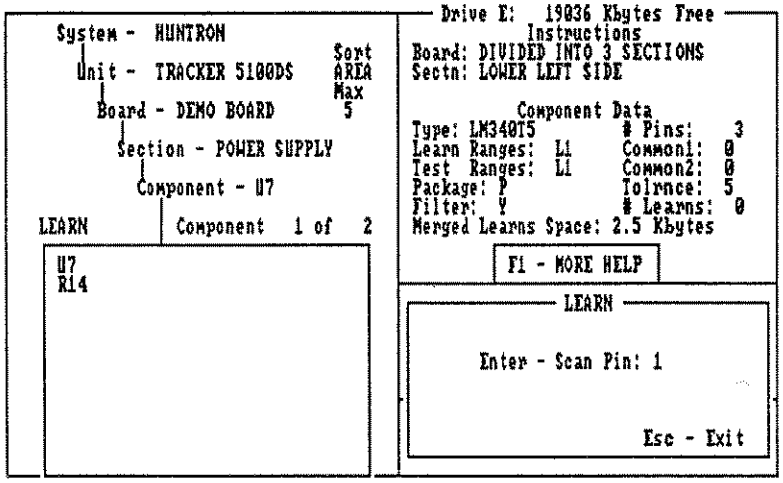


Figure 5-29. LEARN Scanning Prompt For U7, Pin 1.

When the 5100DS has finished scanning pin 1, the LEARN status window will prompt you for the next pin. Move the test probe to pin 2 of U7 and press ↵.

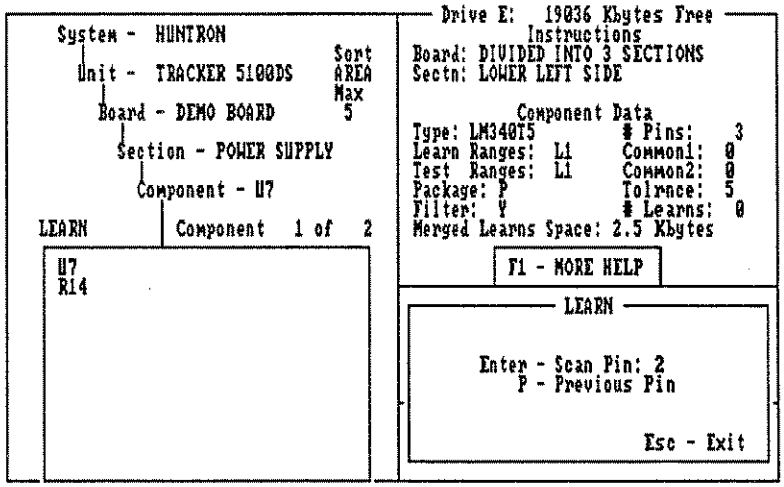


Figure 5-30. LEARN Scanning Prompt For U7, Pin 2.

Watch for the prompt in the LEARN status window and repeat the operation for pin 3.

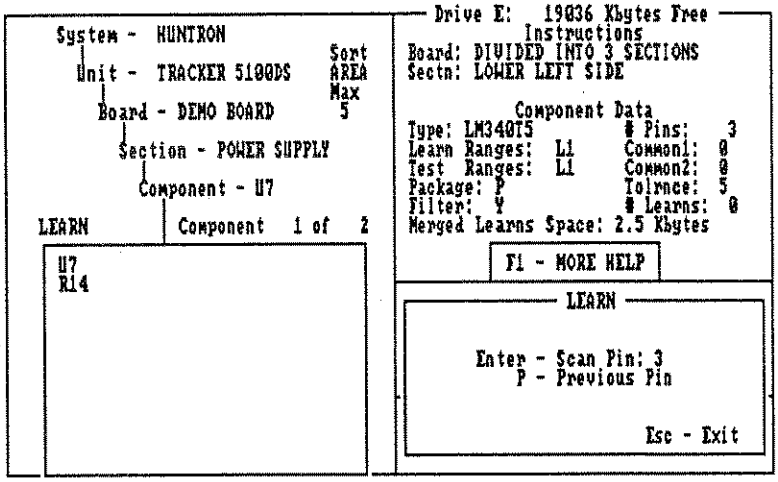


Figure 5-31. LEARN Scanning Prompt For U7, Pin 3.

NOTE

After a pin is scanned, the program automatically prompts for the next pin. You can go back to the previous pin by pressing P and then ↵ to scan again in case the first attempt was questionable.

NOTE

If "P - Previous Pin" is used more than once in succession each of the pins will have to be scanned again.

When all pins have been probed, the program will prompt either to continue to exit this component scan or go back to the previous pin.

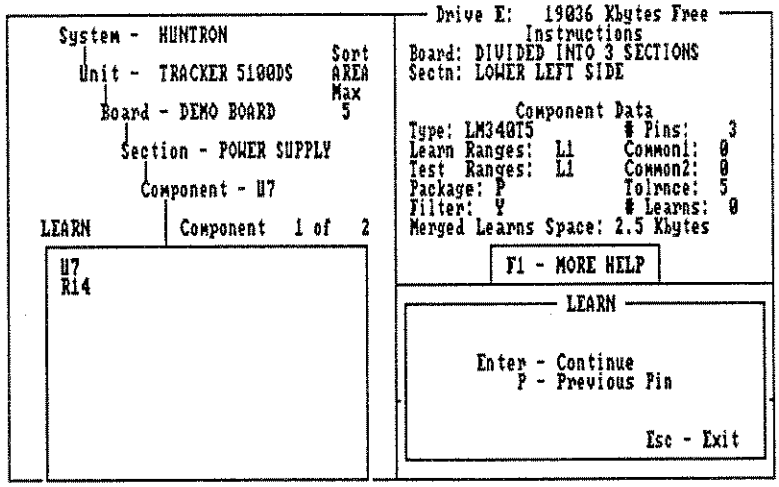


Figure 5-32. LEARN Screen After Scanning U7.

NOTE

While scanning in LEARN or TEST, component signatures are acquired and transmitted by the 5100DS to the PC. Signatures will also flash on the 5100DS CRT. This provides you with an immediate feedback on whether or not there is a good electrical connection between the 5100DS and the component pin.

If you do not have a good connection, or if there are any pins that have open circuit signatures, the OPEN PINS window will appear and display the component's pins that were detected. The next figure shows what would be displayed if U7 was poorly connected.

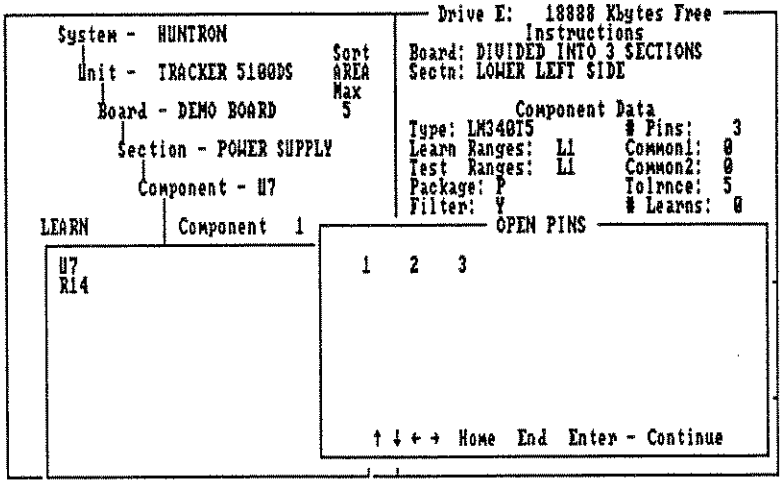


Figure 5-33. Open Pins of U7 Due to Faulty Connections.

If you know that there are pins that are really not connected to anything else on the board, then you can just ignore this caution and save all the signatures. But if you are unsure then check the connections to the pins of the component to verify that a good contact has been made, then retest. The demo board's U7 does not have any open circuit pins.

Press ↵ to continue. The program then displays the LEARN results window showing that this is the "First Learn". At this point, you can either store U7's signatures to disk or display the signatures onscreen. The following figure shows the "First Learn " screen.

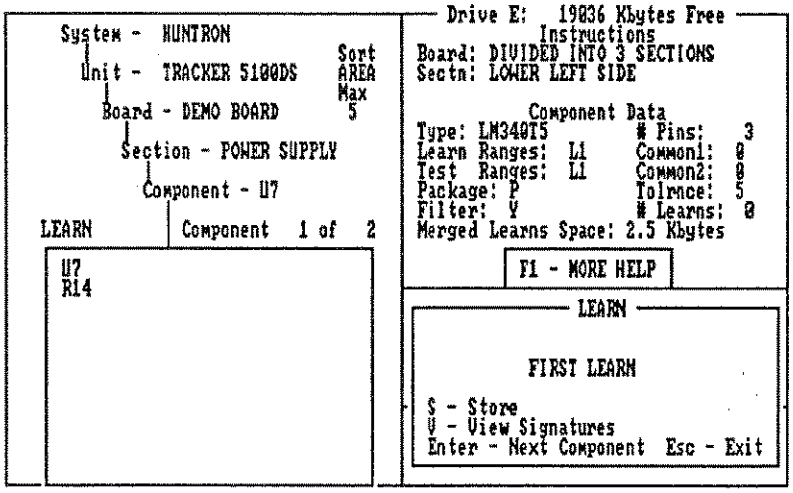


Figure 5-34. LEARN Screen For "First Learn" of U7.

Take a look at what signature results you have obtained for this component before continuing. Press V to display U7's pin signatures onscreen. The display changes to the LEARN view signatures screen.

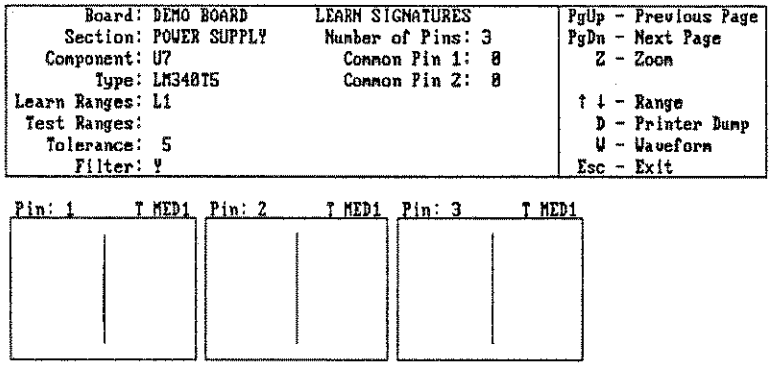


Figure 5-35. LEARN View Signatures Screen For U7.

NOTE

This signature screen is shown with the graticule turned off so that the signatures can be seen more easily. You should be looking at these signatures WITH graticules on your computer monitor. We will show signatures in this manual where it is necessary for clarity. Alt+G toggles the graticule on/off.

The VIEW signature screen displays up to 8 pins in one range of a component at a time. To see the next group of 8 pins, press the PageDown key. Press PageUp key to look at the previous pins. In this case, U7 only has 3 pins so only one screen is available.

You can also view other ranges in the LEARN signatures screen by pressing the ↑ and ↓ arrow keys. Press ↓ arrow key to see the pin signatures in the next range, LOW.

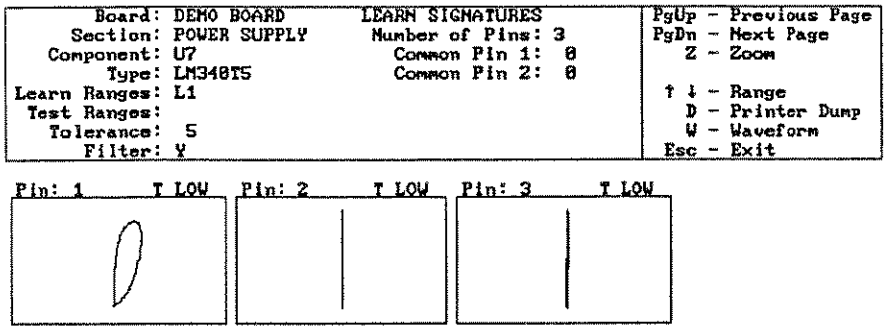


Figure 5-36. LEARN View Signatures Screen in LOW Range.

The entire signature screen can be printed to produce a hardcopy by pressing D, but make sure your printer is attached to your PC, online, and has been configured correctly in SETUP.

NOTE

To configure your printer, you must run SETUP mode from the Main menu. The default configuration is for a IBM graphics compatible Okidata model 192/193 printer. If your printer is not configured correctly, the hardcopy will probably be unusable. Refer to Chapter 6 for SETUP details.

Next, you will look at a single pin signature close-up in the LEARN signatures screen by activating the ZOOM feature.

Press Z to zoom to 2 ½ times original size.

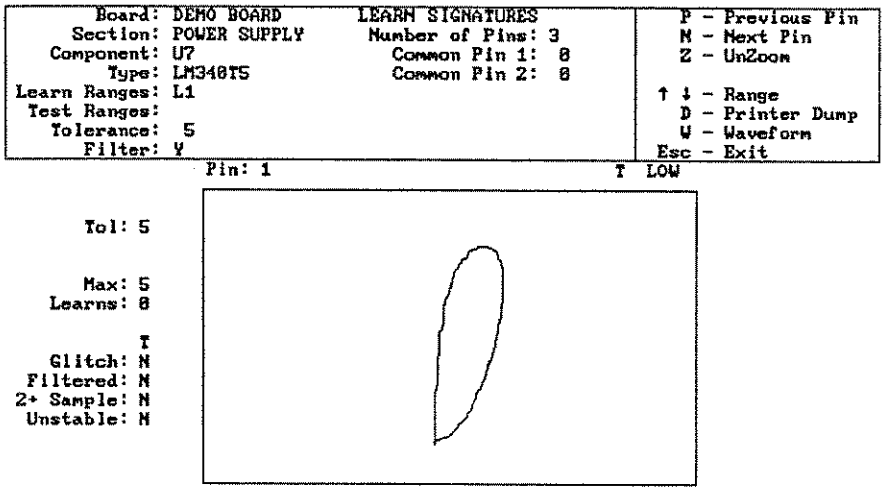


Figure 5-37. Zoom Signature Screen For U7 Pin 1.

ANALYZING A SIGNATURE IN THE ZOOM SCREEN

From here, you can press:

N to look at the next pin.

P to move back a pin.

↑ and ↓ arrow keys to view the next range that was tested.

D (Printer Dump) if you want to print this single signature (but make sure you have your printer setup beforehand).

W (Waveform) to change the display from signature to waveform mode. The Waveform feature shows the test signature separated into its two discrete sinusoidal current and voltage components. This feature is useful for explaining how an analog signature is derived. Refer to Chapter 3 and the appendices in this manual for further information about analog signatures.

Z to unzoom and return to the multiple signatures screen.

Look on the left side of the signature zoom screen. A column of annunciators are displayed which show various parameters of the signature in the zoom screen. Starting from the top:

TOL: 5

This is the default tolerance setting. In LEARN, this value is only used to compare between another LEARN with the first LEARN data. It is not used in this situation since this is the first LEARN.

Max: 5

The maximum number of samples that the 5100DS will take in trying to acquire a stable signature before it marks a signature UNSTABLE.

Learns: 0

This number denotes the total times a LEARN has been saved for this particular component.

Glitch: N

Indicates that during a sample period, there was no bad data that was detected and corrected.

Filtered: N

Signature was not processed through the filter algorithm.

2+ Sample: N

This shows if multiple samples were needed to acquire a stable signature (e.g. more than 1 sample).

Unstable: N

This tells if MAX was exceeded due to either oscillation in a signature or inadequate waiting time for a signature to stabilize.

A "T" above Glitch: without a "L" tells you that there is no stored (LEARN) signatures for this pin, hence "T" means Test in this case.

Press Esc to return to the LEARN component screen and press S to store the signatures for U7. The program will save the signatures and automatically move to R14, the next component in this section.

Press ↵ to select and follow the Component Instructions pop-up window as directed. Check that the black common clip lead is still connected to the negative leg of the large capacitor C9 (the end closest to U7).

Press ↵ to start the scan. Observe that the lower right window on your screen now displays "Enter - Scan Pin: 1". Since the Package Type for this component was P (probe), the LEARN status window will prompt to connect to the component pin. Place the probe tip on pin 1 of R14. Note that the component instructions have specified pin 1 to be on the left. Hold probe steady and press ↵ to scan pin 1.

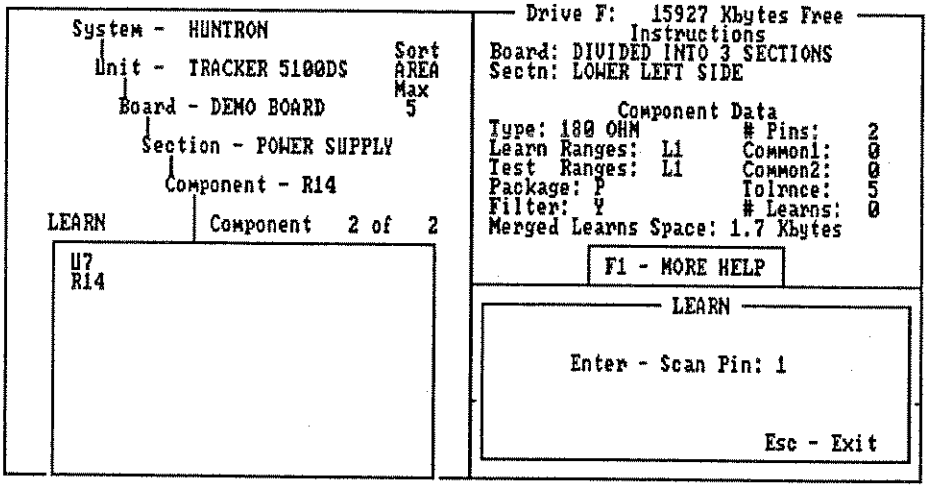


Figure 5-38. LEARN Scanning Prompt For R14 Pin 1.

When the 5100DS has finished scanning pin 1, the LEARN status window will prompt you for the next pin. Move the test probe to pin 2 of R14 and press ↵.

Watch for the prompt in the LEARN status window and when done the LEARN status window will reset and display the active keys. Press ↵ to continue.

If you wish to look at the signatures for R14 before storing, press **V**. After inspection, press Esc to return to the LEARN component screen and press **S** to store signatures.

The program will return you back to the first component of this section (i.e. U7). Press Esc to go back to the LEARN section selection screen. You are now ready to LEARN the next section of the demo board.

LEARNING THE CLOCK SECTION

Select CLOCK, then press ↵. The selection window now shows component names and instructions. There is only one component in this section.

Remove the black common clip lead from the 5100DS front panel jack and disconnect the other end from the negative lead of C9.

Locate the 8 pin IC test clip and the 20 conductor IC clip flat ribbon cable that was included with the 5100DS. Insert the pins of the IC test clip into the cable end with two single row connectors. Insert the other cable end in IDC socket 4 (20 pins) on the front panel of the 5100DS. Make sure that the cable's colored edge is nearest the IDC's pin 1 mark.

Squeeze the IC test clip to open and position it with the colored edge of the cable at the same end as U6 pin 1 (notched end of IC). Make sure the clip is securely attached and seated properly. You can check this by gently moving the IC clip from side to side.

Press ↵ to view the Component Instructions. Follow the instructions. Press ↵ again to start scanning.

NOTE

If a poor connection is made between the IC clip and the component being tested, then an "OPEN PINS" message will appear. If this happens, recheck your clip connections and retest. If the error message reappears and the IC clip connection is good, then the component may have opens that are part of the circuit so you need to verify the circuit.

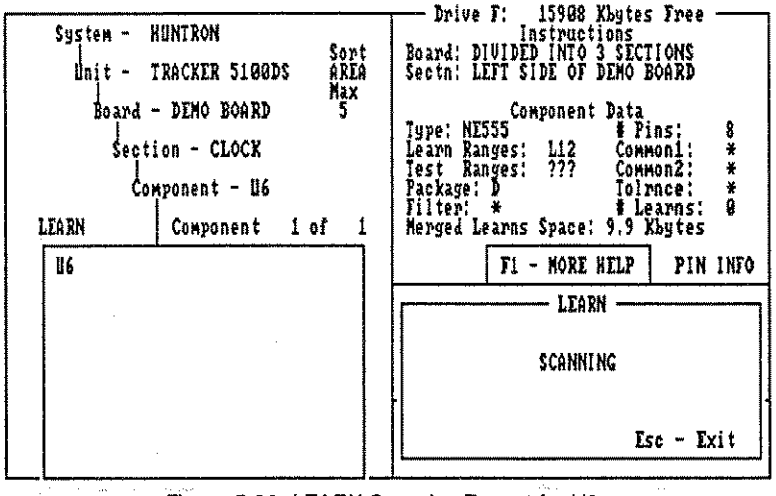


Figure 5-39. LEARN Scanning Prompt for U6.

When the 5100DS has finished scanning, the LEARN results window will appear and display the active keys.

If you wish to look at the signatures for U6 before storing, press **V**.

After inspection, press S to store signatures and return to the LEARN component screen.

Look at the Component Data box on the LEARN component screen. Since this component is using the Autorange Select feature, TEST range is set to PIN to indicate that pin info is present. The Autorange Select feature selects a single test range for each pin of U6.

Press Esc to go back to the Section selection screen. You are now ready to LEARN the last section of the demo board.

LEARNING THE LOGIC SECTION

Select LOGIC, then press ↵. The selection window now shows component names and instructions.

There are 5 components in this section.

Remove the 8 pin IC test clip from U6 of the previous section if you have not alreadydone so. Remove the 8 pin IC test clip from the 20 conductor cable. Locate the 16 pin IC test clip and attach it to the cable. Make sure that the colored edge of the cable is flush with the edge of IC clip.

The first component to be learned is U1. Verify that this IC is highlighted on the Component selection screen.

Place the 16 pin IC test clip on U1. Make sure colored side of the cable (i.e. test clip pin 1) is aligned with pin 1 of U1.

To start learning U1, press ↵. After the LEARN results window appears and displays active keys, you are ready to store the signatures. Press S to store and continue to the next component.

Attach cable and test clip to U2, aligning test clip pin 1 with pin 1 of U2.

To start learning U2, press ↵.

Press S to store data and continue to next component.

Attach cable and test clip to U5, aligning test clip pin 1 with pin 1 of U5.

NOTE

Although U5 is a 14 pin component, you can use a 16 pin IC test clip on a 14 pin IC as long as pin 1 of the IC is aligned with pin 1 of the test clip (i.e. test clip pin 1 is the one connected to the striped wire of the test cable).

To start learning U5, press ↵.

Press S to store data and continue to the next component.

Attach cable and test clip to U4, aligning test clip pin 1 with pin 1 of U4.

To start learning U4, press ↵.

Press S to store data and continue to the next component.

The last component of this section is a 24 pin IC. You will need to change the test clip for this component. Locate the 24 pin IC test clip and the 40 conductor flat ribbon cable. Remove the 16 pin test clip from U5. Assemble the 24 pin clip to the 40 conductor cable. Connect the cable to socket 2 on the 5100DS front panel making sure the cable's striped edge is nearest the pin 1 mark of the socket.

Attach cable and test clip to U3, aligning test clip pin 1 with pin 1 of U3.

To start learning U3, press ↵.

Press S to store data and press Esc to return to the section selection screen. Press Esc two times to return to the Main menu. You have now completed storing signatures for the Demo Board and are now ready to proceed to TEST where you can perform comparison testing.

NOTE

A keystroke short cut to return to the Main menu is to press Alt+M. Refer to Appendix C of this manual for a complete listing of all keystroke short cuts.

5-9. TESTING COMPONENTS ON THE DEMO BOARD

In this section, you will learn how to test suspect components and match their signatures against known good signatures.

> **NOTE**
>
> **Before testing these components, change the switch setting to the DOWN, or CLOCK OFF position to simulate failed conditions. Some of the component signatures will vary; others will not. Using the 5100DS, you can isolate those components which have different signatures.**

From the Main menu, move the selector to TEST, then press ↵.

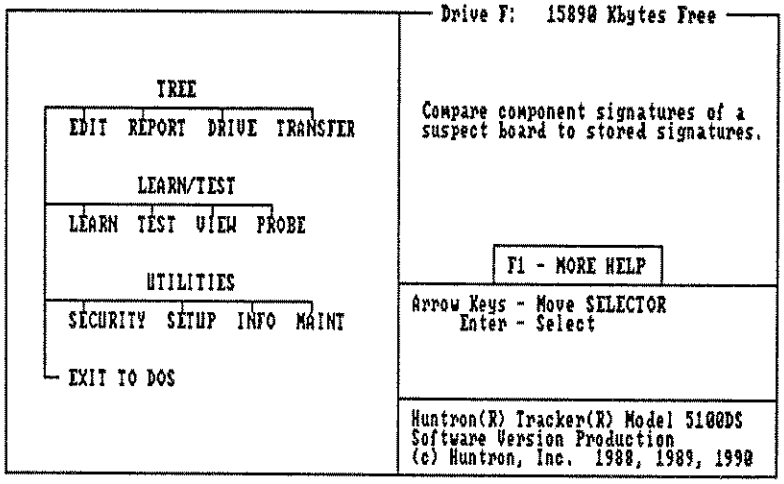


Figure 5-40. Selecting TEST Mode from Main Menu.

Select DEMO BOARD, then press ↵.

Section names and instructions will appear. Select LOGIC section, then press ↵.

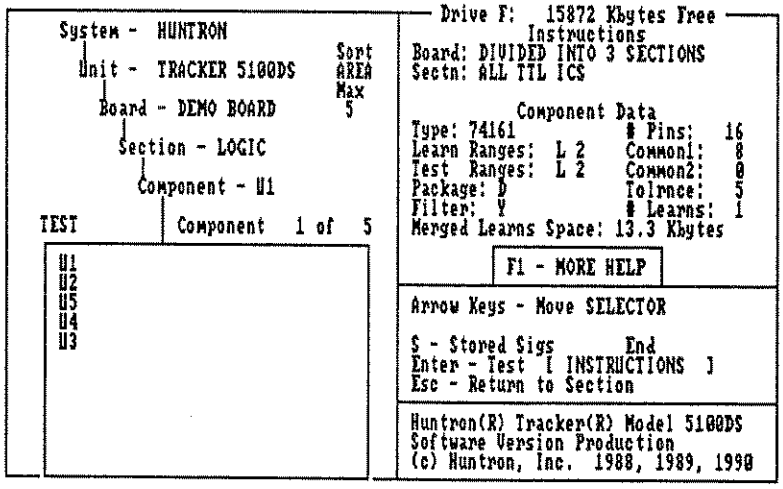


Figure 5-41. Logic Section TEST Screen.

Attach test clip to U1 according to instructions, making sure U1 pin 1 is aligned with pin 1 of IC test clip.

To test U1, press ↵. After the Component Instructions appear, press ↵ again. The TEST status pop-up window will appear in lower right window of screen. When done testing, the TEST status window will display "1 Different Pins".

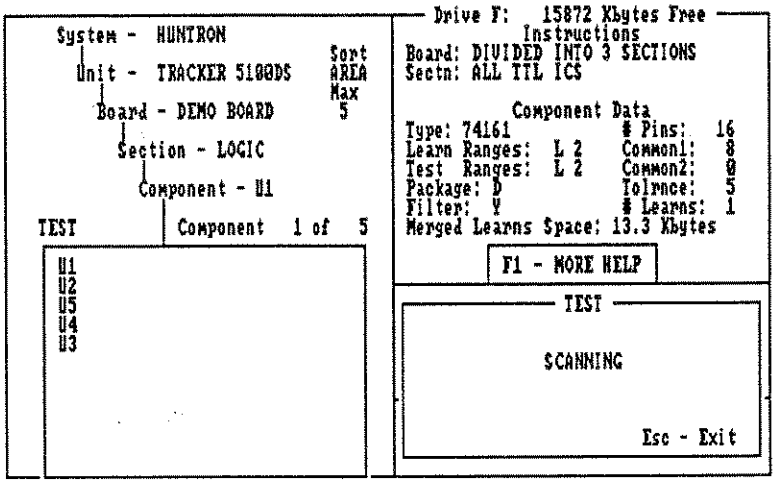


Figure 5-42. Testing U1 of the Demo Board.

Take a look at the results before continuing. Press V to examine the signatures for U1 on the view TEST SIGNATURES screen.

VIEWING COMPONENT SIGNATURES

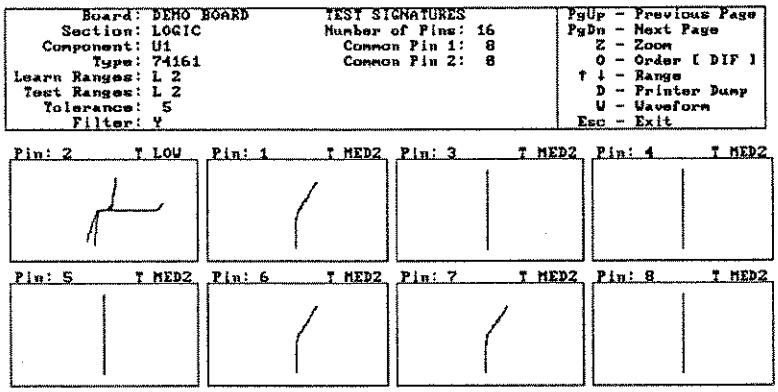


Figure 5-43. VIEW Test Signatures Screen for U1.

Note that there are two signatures. On your PC monitor, the green signature is the stored or LEARN signature and the red is the TEST signature.

Signature order is set to DIF so signatures of the pins are displayed in order of difference, greatest to least. Since U1 only has 1 different pin, when order is set to DIF, pin 2 is displayed first and the remainder of the pin signatures are displayed in ascending numerical order.

You can also view the signature differences in different ranges. Press ↑ key to see how the signatures change at the Med2 range.

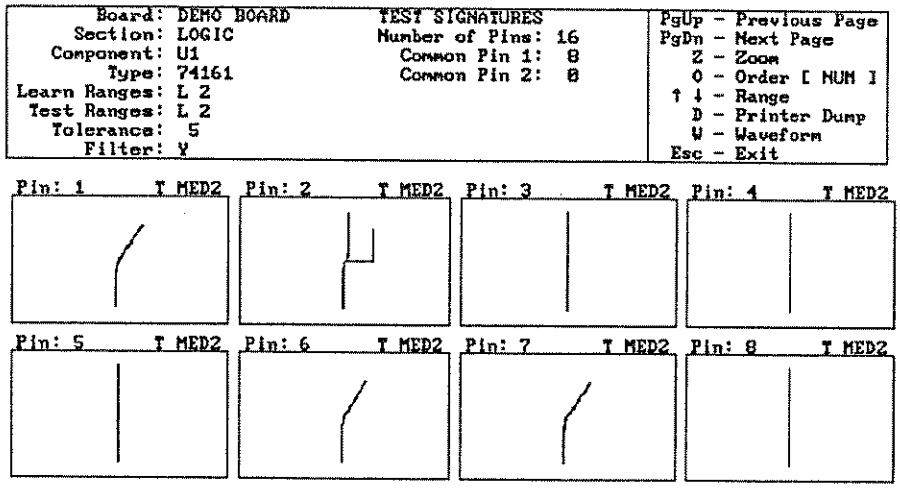


Figure 5-44. VIEW Test Signatures for U1, ORDER = NUM.

NOTE

DIF will display pins in order of greatest differences between LEARN and TEST signatures in the worst range.

ANALYZING A SIGNATURE IN THE ZOOM SCREEN

Press Z to magnify a single signature to 2½ times.

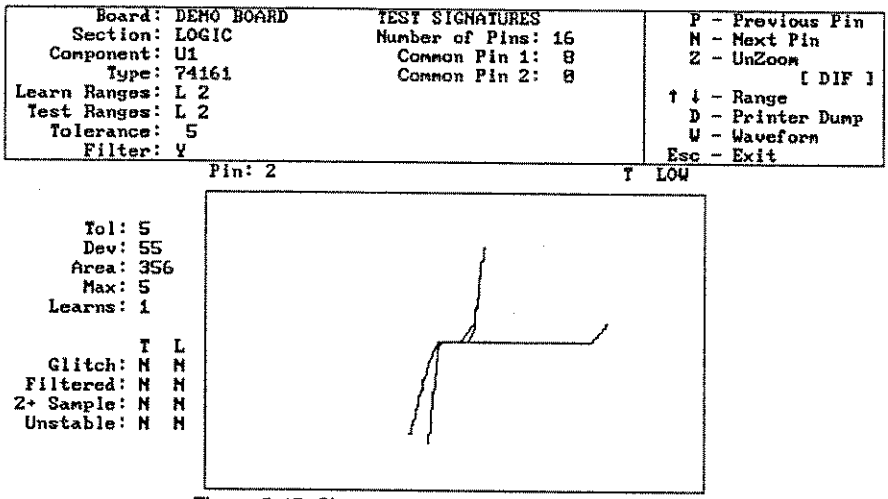


Figure 5-45. Signatures of U1 Pin 2 in ZOOM Screen.

NOTE

When performing a TEST on your own Demo Board, the test results may not match exactly as in this tutorial. This may be due to variations in components used in the manufacturing of the board. Refer to section 5-12 of this chapter for more discussion on this topic.

Look on the left side of the screen. A column of annunciators are displayed which show various parameters of the signature. Starting from the top:

TOL: 5

This is the TEST margin within which a component is still equivalent when being tested. The tolerance setting that was selected in EDIT. In this case, pin 2 of U1 has exceeded this number.

Dev: 55

This number indicates the largest deviation detected for TEST signature data points from the corresponding LEARN signature data points when comparing. DEV is the maximum difference between the TEST and LEARN signature data points. For example, DEV = 55 means that the biggest difference found for a single data point between a LEARN and TEST signature was 60 (i.e. 60 - 5 (tolerance) = 55). This information helps to interpret the degree of failing or defective components. The larger the DEV number the more likely the component is defective.

Area: 356

This number shows the total sum of all the deviations for a TEST signature from the LEARN signature data points. This information helps to interpret the degree of failing or defective components. A bigger AREA means that there were more deviations found. So a component with AREA = 356 is more likely to be defective than one with AREA = 30 even if DEV is the same.

Max: 5

The maximum number of samples that the 5100DS will take in trying to acquire a stable signature before it marks a signature UNSTABLE.

Learns: 1

This number denotes the total times a LEARN has been done for this particular component.

Glitch: N

Indicates that during a sample period, there was no bad data that was detected and corrected.

Filtered: N

The signature was not processed through the filter algorithm.

2+ Sample: N

This shows if multiple samples were needed to acquire a good signature (e.g. more than 1 sample).

Unstable: N

This tells if MAX was exceeded due to a either oscillation in a signature or inadequate waiting time for a signature to stabilize.

The "T" and "L" columns above Glitch: show TEST and LEARN status respectively.

Press Esc to return to the TEST component screen. To retest a component you just tested, press Esc to return to the component selection screen. For now, press ↵ to go to U2, the next component in this section.

Remove the test clip from U1 and attach to U2 according to instructions, making sure pin 1 is aligned with pin 1 of IC test clip.

To test U2, press ↵. After the Component Instructions appear, press ↵ again. The TEST status pop-up window will appear in lower right window. When finished, the TEST results window will display "1 Different Pins".

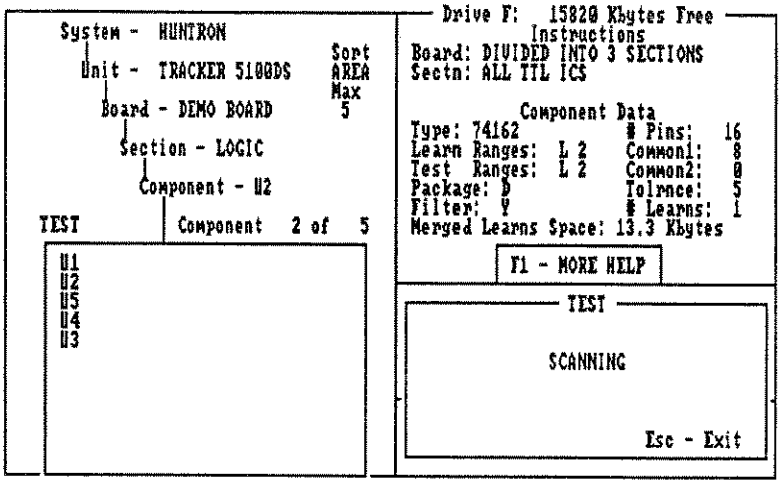


Figure 5-46. Testing U2 of the Demo Board.

You can inspect signatures by pressing V. When done, continue to the next component by pressing ↵.

Remove the test clip from U2 and attach to U5 according to instructions, making sure pin 1 is aligned with pin 1 of IC test clip.

Press ↵ to start scanning. After the Component Instructions appear, press ↵ again. The TEST status pop-up window will appear in lower right window. When finished the TEST status window will display "EQUIVALENT". Continue testing, press ↵ to move to the next component.

Remove the test clip from U5 and attach to U4 according to instructions, making sure pin 1 is aligned with pin 1 of IC test clip.

Press ↵ to start scanning. After the Component Instructions appear, press ↵ again. The TEST status pop-up window will appear in lower right window. When finished the TEST status window will display "EQUIVALENT". Continue testing, press ↵ to move to the next component.

NOTE

While the 5100DS is scanning, you can stop and abort by pressing Esc. The program will return to the TEST component screen.

Remove the test clip from U4. The next component is a 24 pin IC and requires a different cable and clip assembly. Remove the 16 pin IC test clip and cable assembly from socket 4 on the 5100DS front panel. Plug in the 24 pin cable assembly you used previously in LEARN. Attach test clip to U3 according to instructions, making sure pin 1 is aligned with pin 1 of IC test clip.

Press ↵ to start scanning. After the Component Instructions appear, press ↵ again. The TEST status pop-up window will appear. When finished the TEST status window will display "EQUIVALENT".

You have now completed testing the logic section of the demo board. Press ↵ to return to the TEST component screen. The program will move back to the first component of this section (i.e. U1).

Press Esc to return to the section level.

5-10. PRINTING A TROUBLESHEET REPORT

After testing, you can print out a Troublesheet Report which summarizes test results. Make sure your printer is connected and on-line.

Press T to activate the troublesheet report pop-up window. At the Troublesheet serial number pop-up window, you can type in a serial number for the board that has been tested. This feature takes the serial number of the board. Press ↵ if no serial number is desired or any keys up to 20 characters (max.).

Once you have entered a serial number for the board, press P to select the Print Troublesheet mode. You can choose between two types of reports. The Simple Troublesheet report lists the failed components with only their names, type, number of pins, common pins, test ranges, filter, failed pins. The Detailed Troublesheet report contains all the information on the Simple report plus fail range, tolerance, deviation, and area for each failed pin. Both reports also include a summary at the end that lists the number of components found different and equivalent, and the number of components removed from troublesheet (see the next section for information on removing a component from the Troublesheet report).

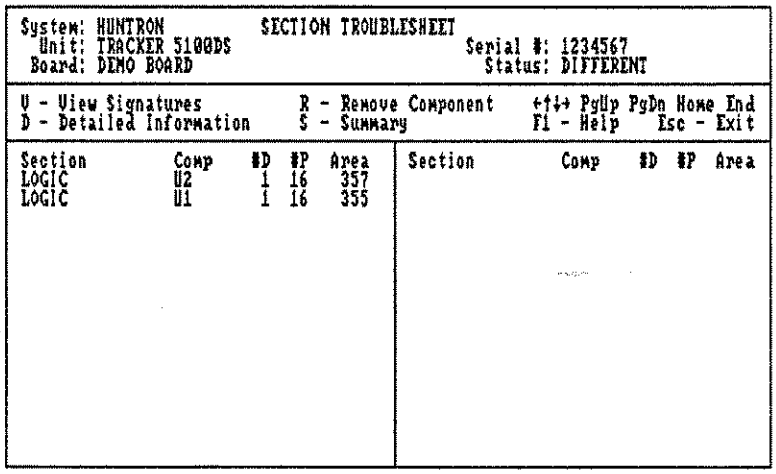


Figure 5-47. Simple Troublesheet for Logic Section.

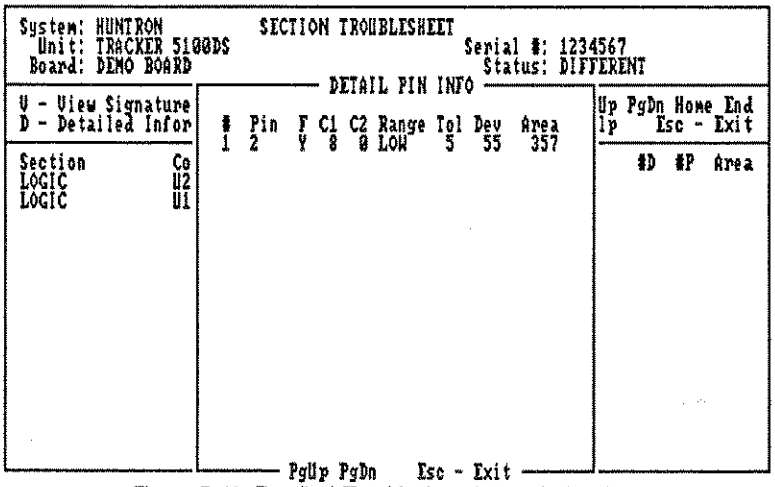


Figure 5-48. Detailed Troublesheet for Logic Section.

5-11. REMOVING A COMPONENT FROM THE TROUBLESHEET

A helpful feature in TEST is the ability to prevent a component that has been tested from being listed on the Troublesheet. For example, after examining signatures of a component that were found to be DIFFERENT, you determine that these signatures are really ok because the test tolerance was set too low.

Go back to the component level, move the selector to U1 and press T. This will redisplay the Test results window. Press R. The TEST results window will display "Removed". Notice that in the active keys list, "R - Remove component" has changed to "R - unremove component" in the window. If you wish to unremove the component, press R again. Verify by watching the TEST results window for the correct message. The Troublesheet report will note any components that were removed. You can also remove components in the troublesheet mode. Press Esc to continue. Print the troublesheet to see this feature.

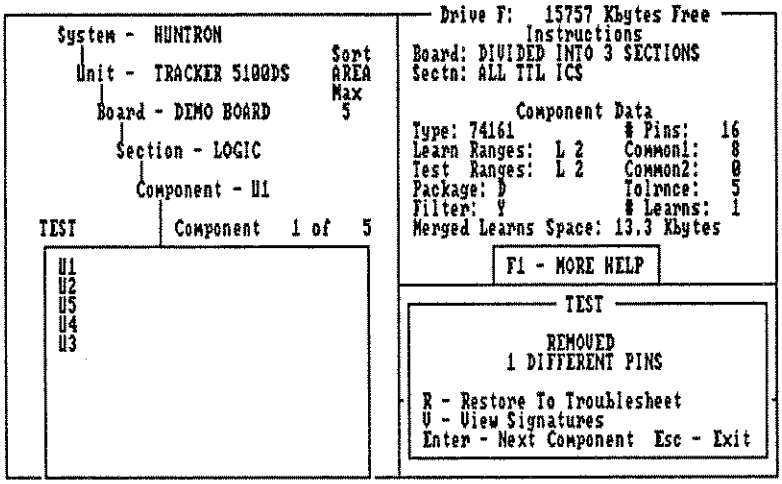


Figure 5-49. Removing a Component from Troublesheet.

You have completed testing the logic section of the demo board. The remainder of the testing for the power supply and clock sections are left up to the user. Using the previous logic section test as a guide, select each section and components and perform a TEST. Afterwards, continue the tutorial starting with the next section.

5-12. MERGING COMPONENT SIGNATURES

Analog signatures for components are unique and they can be compared for differences between a known good component and a suspect component. Differences not only exist for suspect components but also between different known good components. This is due to normal process variations of a manufacturer between batches of ICs, and variations in IC designs for the same part from multiple manufacturers or even a single manufacturer.

When the Tracker 5100DS compares and finds signature differences, it is difficult to discern just by using a single TEST tolerance value whether the found differences are caused by physical failures or are just due to the variations listed above. In order to account for this situation, the 5100DS gives you the ability to combine or "merge" good signatures. Thus, an equivalence band will be created from the merged signatures and used in testing suspect components. If the TEST signature falls within this equivalence band of stored signatures plus the tolerance, then it is probably ok. If the TEST signature is outside the merged signature plus the tolerance, then the component is most likely defective.

The following is an example of "merging" a component's signatures. We'll use the demo board and practice on U1 of the logic section.

To "MERGE" signatures, return to the LEARN mode. If you are at the Main menu, select LEARN, press ↵ and select the logic section of the demo board. If you are still in TEST, return to the component selection screen. Then you can jump quickly to LEARN mode by pressing **Alt+L** to activate the LEARN mode short cut (see Appendix C in this manual for a complete listing).

Remove any test clips from the demo board. Connect the 16 pin IC clip and cable assembly to socket 4 on the 5100DS. Make sure the colored edge of the cable is aligned with pin 1 of socket 4. Attach the IC clip to U1 and check to see that the clip is properly seated on the component. Also, make sure that U1 pin 1 is aligned with pin 1 of the IC clip.

The stored signatures for U1 were created with the switch on the demo board in the CLOCK ON position so by turning this switch to the CLOCK OFF position, a different signature will result on pin 2 (see previous section on testing components). Turn the switch to the CLOCK OFF position.

Select U1 and note that the # of Learns = 1 since this was done in a previous section, and then press ↵ to start scanning. When done, the LEARN results window will display "1 Different Pins".

Press **V** to inspect these signatures. Pin 2 has two distinctive signatures. Press **Esc** to return to the LEARN status component screen.

To MERGE signatures, press **M**. The MERGE signature pop-up window appears on your screen.

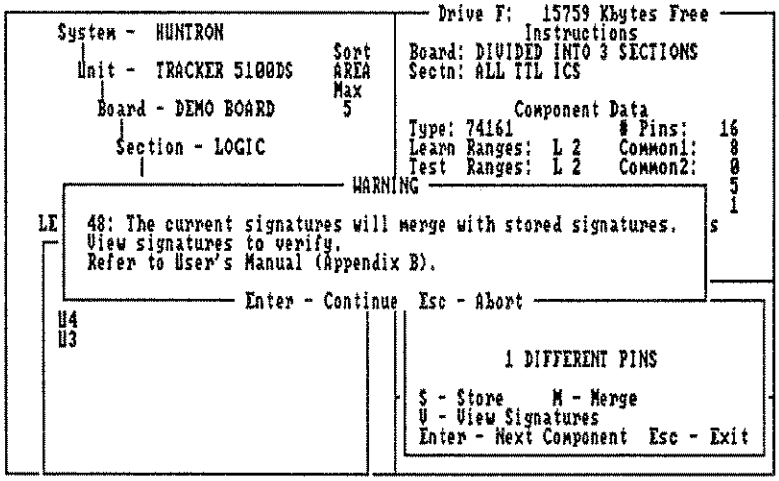


Figure 5-50. Merging Signatures for U1.

Press ↵ to activate. When the program is done, the display will return to the LEARN component selection screen with the next component, U2 highlighted.

Press ↑ key to select U1 again and notice that the # of Learns = 2. Press S to look at the stored signatures and observe that pin 2's stored signature is a composite.

To verify the merged signature and obtain more practice using your Tracker 5100DS, go to TEST (use the shortcut **Alt+T** key). Retest U1 with the switch on the demo board set to both positions. The TEST signature should be equivalent to the stored signature in either switch position.

IMPORTANT NOTE

Signatures for known good components can be continually merged to form a better model of a composite equivalence band to take account of normal variations due to manufacturing processes or design differences of the same IC from different manufacturers. When merging signatures, if the new signature falls within the equivalence band defined by the stored merged signature, then the stored signature will be not be updated. However, if the new signature falls outside of the equivalence band, then a new merged signature is created and stored using the new signature to redefine the boundaries of the equivalence band.

You cannot selectively remove a single signature out of a merged signature. So always make sure the new signature is good by careful inspection and analysis before merging signatures.

You are now ready to return to the Main menu, so press Alt+M.

5-13. SUMMARY

The results you have obtained in this exercise show that for the logic section, U1 and U2 had different signatures which were induced by throwing the switch on the demo board. If this had been a real troubleshooting situation, those results would tell you that at least one of the two components should be replaced. After any device is replaced, the board should then be given a functional power-on test to verify that the problem is fixed.

The 5100DS often points out several devices as being different, from "greatest" difference to "least" different. Begin by replacing the most different components, then do a power-on test. If the problem is still not fixed, try replacing the next most different component until you have a functional board.

For more practice with the 5100DS, return to TEST mode and complete testing on the power supply and clock sections of the demo board. You can also go back to EDIT and define a new system. For example, make the demo board a single section and enter all the components on the board into it.

For more information on subjects not covered in detail by this exercise, refer to Chapter 6 Reference and the appendices in the back of this manual.

CHAPTER 6
REFERENCE

6 - 1. INTRODUCTION

This chapter serves as the Tracker 5100DS software reference guide. The following sections will give you a summary of various menus and modes including a brief description and examples where applicable. For more information on how to use your Tracker 5100DS, refer to other chapters or the appendices in this manual or contact Huntron.

6 - 2. COMPONENT PIN INFORMATION

This feature allows separate settings of some of the component fields to have different values for each pin. Pin information can be created or edited for the current component by pressing **P** at the component level of EDIT. Use the **PgUp** and **PgDn** keys to select the pin to edit. The common pin(s), filter setting, and tolerance that were set when the component was added become the default settings for each pin in the pin information file. An example of component pin information is located at the end of this section.

NOTE

If the TEST ranges are not set to "PIN" or "???", the pin information for the current component can be deleted by pressing D at the component level of EDIT.

NAME PER PIN

Each pin of a component can be given a unique name with up to 3 alphanumeric characters. This name will be used in place of the pin number throughout the software (except when scanning probe packages which displays both). This allows the user to use symbolic names such as DI1, OUT, and A21 instead of pin numbers 1, 2, and 3. The pin names are defaulted to the corresponding pin number of a component if no symbolic name is used.

RANGE PER PIN

Components with test ranges of "PIN" or "???" (see TEST Autorange Select) allow each pin to be given an individual TEST range. For components with LEARN ranges of "PIN" this individual range is also used for learning.

TEST AUTORANGE SELECT

This feature selects a single range to test each pin of the component based on the LEARN signatures. The component will be learned in ranges "L12" or "L12H". If a particular pin is found to be more accurately tested in a different range, the pin information entry window can be used to select the new range. The component can then be tested in this new range without relearning the component.

The algorithm sets the TEST range to MED 2 unless it finds LOW or MED1 to be a better impedance match.

When the component signatures are stored or merged the range information is then stored in the pin information file. At this point the TEST ranges are changed from "???" to "PIN".

You can re-autorange on a later LEARN by editing the TEST ranges back to "???". Then the next LEARN will be used to determine the TEST range per pin information.

COMMON PER PIN

Each pin can be given separate common pin values. This is useful for edge connectors where several different common pins are sometimes necessary to test different sections of a board.

FILTER PER PIN

Each pin may have the filter set to "Y" or "N". Since the filter algorithm is designed for certain types of unstable signatures, pins that are stable on a given IC can be set to "N" while oscillating pins are set to "Y". Be sure to check all ranges to be used in VIEW before setting the filter to "N".

TOLERANCE PER PIN

Each pin can have a different test tolerance value. This option may be useful when some pins of a component may have a greater or lesser signature difference than the rest of the pins and are still considered acceptable. For instance, a component with some of its pins connected to passive or linear devices may require a higher tolerance to take into account greater electrical and physical variations. The remainder of the pins of this component may be connected to other similar pins of other components that need a lower tolerance setting. Tolerance per pin allows the user to address the situation when a single tolerance for a multi-pin component may not be sufficient to identify possible failures during testing. The allowable Tolerance value is between 0 to 99.

The following is an example of how to create a component using the per pin features just discussed.

1. Start up the software by typing "51DS" and log on with your user name and password.
2. At the Main menu, select EDIT by pressing E. Before any pin information can be entered, a component must be created.
3. In the EDIT selection screen, choose the board/section you wish to add a component to or create a new board/section for this component.
4. Go to the EDIT component selection screen and press A to add a component.
5. For this example, we will enter an 8 pin IC. Type in the following in the component entry window that is shown in the next figure.

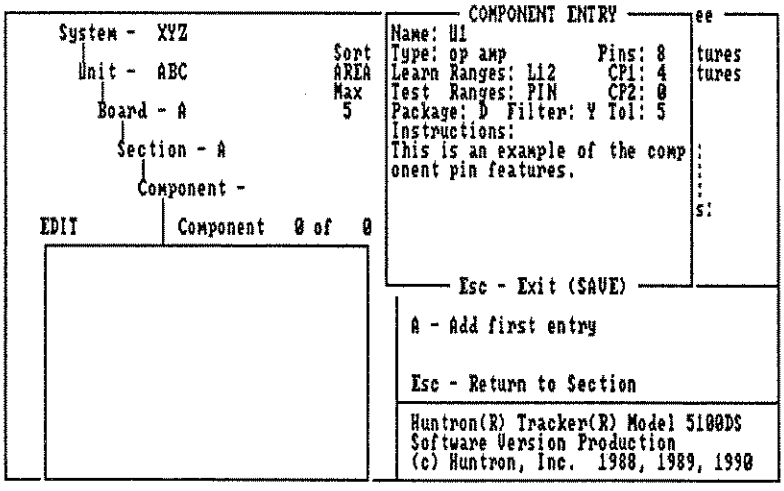


Figure 6-1. Component Entry Pop-up Window.

Name: U1

Type: op amp

Learn Ranges: L12

Test Ranges: P (changes to "PIN")

Package: D

Filter: Y

Pins: 8

CP1: 4

CP2: 0

Tol: 5

Instructions: This is an example of the component pin features.

NOTE

When entering range information for LEARN in the component entry window, you can choose a single range (LOW, MED 1, MED 2, HIGH), multiple ranges, or PIN. When entering range information for TEST in the component entry window, you can choose a single range, multiple ranges, PIN, or ???. If you select PIN TEST ranges, then the pin entry "Range:" must be one of these LEARN ranges and will be used in TEST. If you select PIN LEARN ranges, then the pin entry "Range:" will be the same range used for LEARN and TEST.

6. Press Esc and Y to save and exit back to the EDIT component screen. Note that "PIN INFO" is displayed just to the right of the HELP box. Also, look at the Active Key box and see that "P - Pin Info" is displayed.
7. Make sure U1 is still selected and press P to activate the EDIT Pin Entry pop-up window.
8. This pop-up window allows you to enter data for the component one pin at a time. Type in the following in the Pin Entry window.

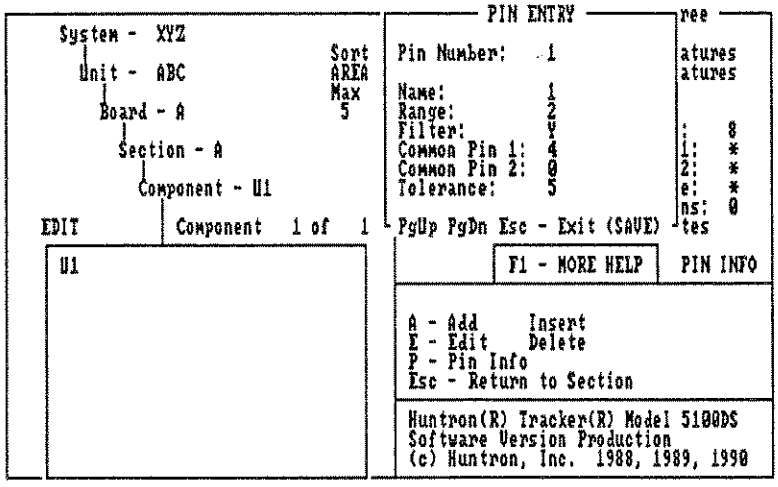


Figure 6-2. Pin Entry Pop-up Window for U1 Pin 1.

Pin Number: 1 (No user entry on this line.)

Name: **NUL** (3 alphanumeric characters maximum)

Range: **1** (choose one test range)

Filter: **Y** (Y or N)

Common Pin 1: **4**

Common Pin 2: **0**

Tolerance: **5** (0 to 99)

9. Press **PgDn** to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number: 2 (No user entry on this line.)

Name: **IN-** (3 alphanumeric characters maximum)

Range: **2** (choose one test range)

Filter: **Y** (Y or N)

Common Pin 1: **4**

Common Pin 2: **0**

Tolerance: **5** (0 to 99)

10. Press **PgDn** to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number: 3 (No user entry on this line.)

Name: **IN+** (3 alphanumeric characters maximum)

Range: **2** (choose one test range)

Filter: **Y** (Y or N)

Common Pin 1: **4**

Common Pin 2: **0**

Tolerance: **5** (0 to 99)

11. Press **PgDn** to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number: 4 (No user entry on this line.)

Name: **V-** (3 alphanumeric characters maximum)

Range: **L** (choose one test range)

Filter: **Y** (Y or N)

Common Pin 1: **7**

Common Pin 2: **0**

Tolerance: **10** (0 to 99)

12. Press PgDn to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number:	5 (No user entry on this line.)
Name:	NUL (3 alphanumeric characters maximum)
Range:	1 (choose one test range)
Filter:	Y (Y or N)
Common Pin 1:	4
Common Pin 2:	0
Tolerance:	5 (0 to 99)

13. Press PgDn to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number:	6 (No user entry on this line.)
Name:	OUT (3 alphanumeric characters maximum)
Range:	2 (choose one test range)
Filter:	Y (Y or N)
Common Pin 1:	4
Common Pin 2:	0
Tolerance:	5 (0 to 99)

14. Press PgDn to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number:	7 (No user entry on this line.)
Name:	V+ (3 alphanumeric characters maximum)
Range:	L (choose one test range)
Filter:	Y (Y or N)
Common Pin 1:	4
Common Pin 2:	0
Tolerance:	10 (0 to 99)

15. Press PgDn to go to the next pin of U1. Type in the following in the Pin Entry window.

Pin Number:	8 (No user entry on this line.)
Name:	NC (3 alphanumeric characters maximum)
Range:	2 (choose one test range)
Filter:	Y (Y or N)
Common Pin 1:	4
Common Pin 2:	0
Tolerance:	5 (0 to 99)

16. When done entering information for each pin of this component, press Esc, then Y to save and exit.

17. At the EDIT component selection screen, note that in the component information box for U1, there are asterisks(*) in several of the fields. This indicates that the pin information settings are controlling those fields. Also "PIN INFO" is displayed just to the right of the F1 - Help box to indicate that U1 has pin data.

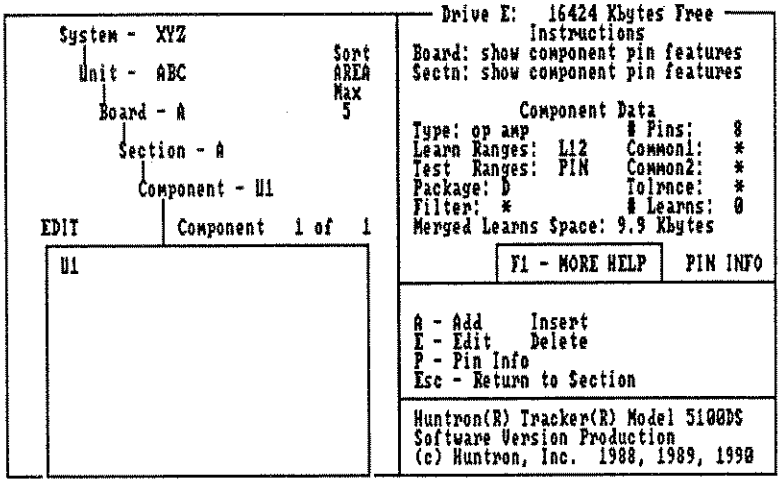


Figure 6-3. Completed Conponent/Pin Entry for U1.

6 - 3. DRIVE

This feature, activated at the Main menu by selecting DRIVE or pressing the D key, allows the user to select a different disk drive and/or path. All subsequent data will be written to and read from the new drive/path (except for temporary files which use a separate drive/path controlled by the SETUP program). When you select a path that does not exist, the program will create the path. When 51DS.EXE is started, the current path is set to the startup path which is controlled by the SETUP program. The path used most often should be the startup path and then DRIVE can be used to switch to other paths. Each drive/path can contain up to 110 boards depending on the storage capacity of the disk. If a floppy is selected, the floppy disk containing the stored data can be used on other 5100DS systems, and it can be archived and protected until the stored data is needed.

A drawback of running off a floppy is its limited storage capacity and slower operating speed. The maximum number of SYSTEMS/UNITS/BOARDS, SECTIONS, and COMPONENTS stored on a floppy is limited by the maximum storage capacity of the floppy. It is highly recommended that you use the highest capacity floppy drive in your PC if using this option. A minimum recommended storage capacity would be 720K (3.5 inch floppy) or 1.2M (5.25 inch floppy). In addition, you must be careful and make sure that the floppy has adequate capacity for the number of components to be stored (the **Alt+N** feature at the component level of EDIT mode is quite helpful).

Another disadvantage of running off a floppy disk is that typical operating speed of a floppy drive, compared to a fixed hard drive, is considerably slower (from 3 to as much as 10 times). Therefore, using your PC's floppy drive will result in slower overall operation of your 5100DS system.

The following table shows what typical storage capacities you can expect when using floppy diskettes with the 5100DS (EDIT, LEARN, and TEST):

IC SIZE	RANGES	PIN INFO	NUMBER OF IC's PER DISK			
			FLOPPY DISK TYPE			
			5.25" 1.2MB	5.25" 360KB	3.5" 1.4MB	3.5" 720KB
64 pins	4	YES	11	3	13	6
16 pins	2	NO	92	27	110	55

Table 6 - 1. Floppy Disk Storage for the 5100DS.

NOTE

The maximum storage capacity for each type of floppy disk includes the troublesheet report file which is generated during testing.

The following is an example of the DRIVE feature:

1. Start up the 5100DS system: type "51DS".
2. Log on with user name and password.
3. Type D which tells the program to switch to a different drive/path.
4. A pop-up window will appear as follows:

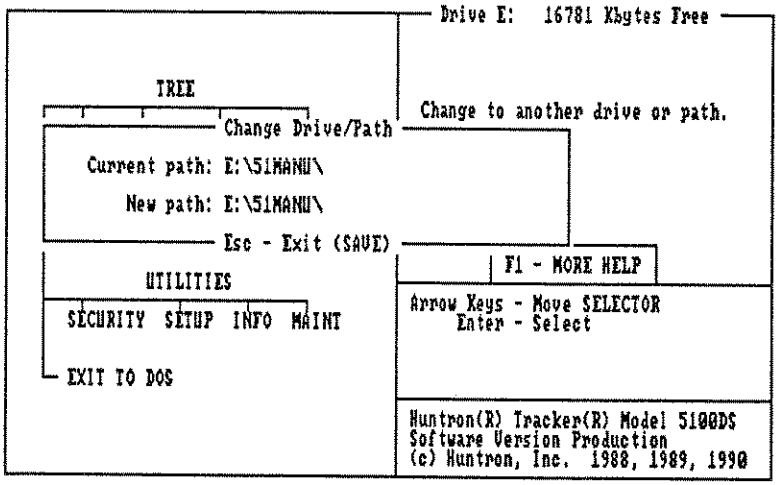


Figure 6-4. DRIVE Pop-up Window.

5. Type in the new drive/path "D:\DATA\" and press Esc.

6. Another pop-up window will appear asking "SAVE THE NEW PATH (Y/N)"? Press "Y" to save the new path (or switch to an existing path). Press "N" to return to the Main menu without changing from the original path.

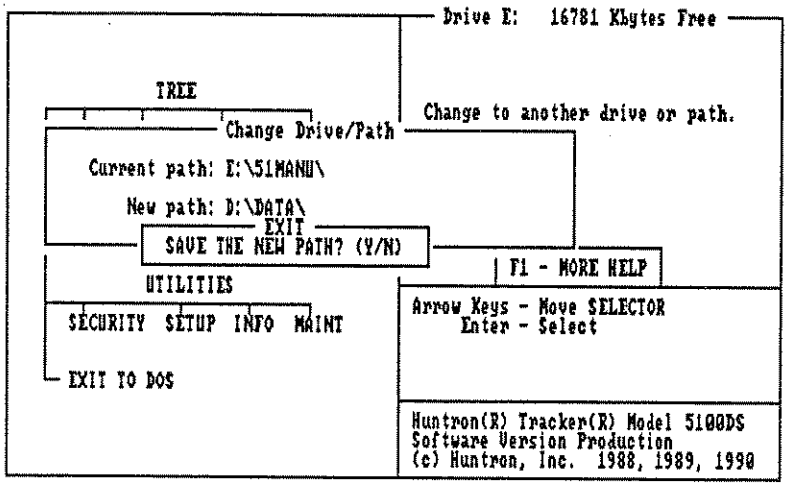


Figure 6-5. Save the New Path Prompt for DRIVE.

7. The program will return to the Main menu with the selected drive/path activated. Look at the free disk space counter in the upper right corner to see the new drive.

Proceed with the EDIT function to input your BOARD, SECTION, and COMPONENT information. See Chapter 5 for more information on EDIT. You can also RESTORE a board to the new path.

All data operations will be accessed from the selected drive/path for this current session.

IMPORTANT NOTE

If you exit from the 5100DS program, the next time the 5100DS program is started, it will go back to the SETUP startup path for data. You must use the "D" - DRIVE function to change the path in order to use the data that was generated by the DRIVE option.

6 - 4. INFO MODE

The INFO mode from the UTILITIES function of the Main menu is intended to help identify possible hardware and software compatibility problems that can arise when running the Tracker 5100DS with your PC. It is activated at the Main menu by selecting INFO or pressing the I key. This mode provides useful information to Huntron Technical Support for solving these kinds of problems.

INFO displays on your PC's monitor detailed information about your PC's hardware and software configuration .

An example of a typical INFO screen is displayed below:

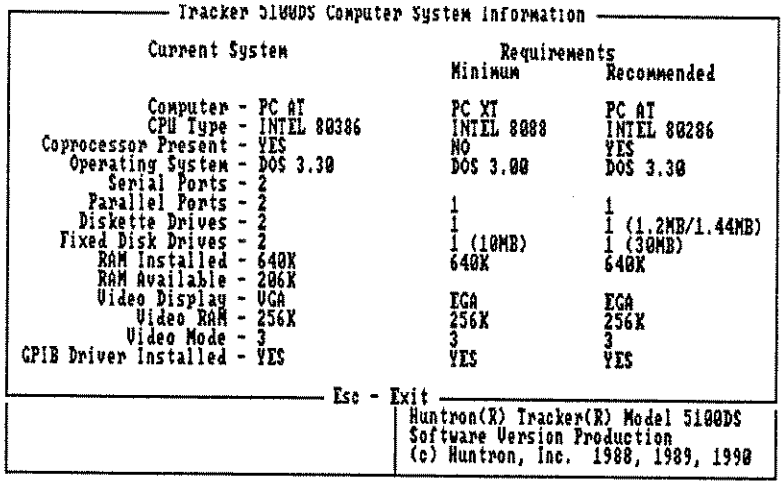


Figure 6-6. Typical INFO Screen.

The INFO screen displays the current state of your computer configuration and the minimum and recommended computer requirements that are needed in order to run the 5100DS. If any of the items displayed do not meet the minimum specification, they will be highlighted.

When you need assistance from Huntron Technical Support on the 5100DS, run INFO and print this screen on your printer by pressing the Print Screen (or Prt Scn) key. This configuration information can be very helpful in solving any problems you may be having with your computer and the operation of the Tracker 5100DS.

6 - 5. TRANSFER MODE

The TRANSFER mode under the TREE function of the Main menu allows you to COPY, MOVE, BACKUP, or RESTORE the 5100DS system information and signature database files for data protection, security, and transportability. This mode is activated by selecting TRANSFER or by pressing the F key.

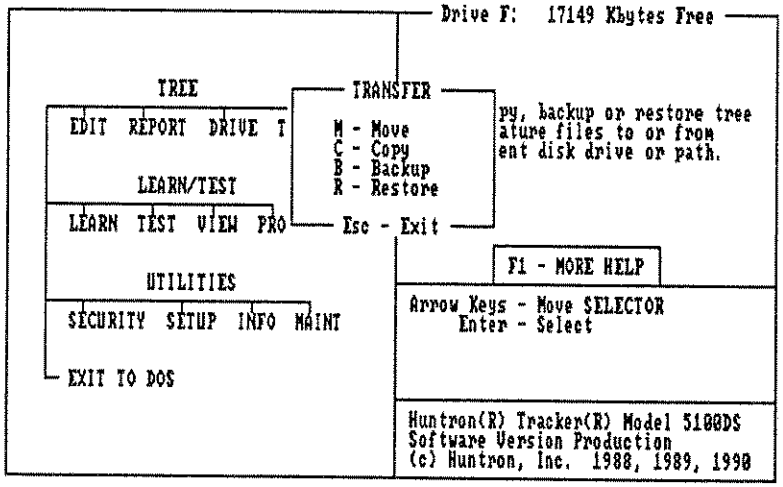


Figure 6-7. Transfer Pop-up Screen.

NOTE:
BACKUP and RESTORE are preferred over COPY and MOVE since the disk space is used more efficiently.

COPY/MOVE

COPY and MOVE both transfer a complete board to floppy disks using one disk for each section. The board data can only be copied out to or in from, drives A and B. MOVE removes the source files from the hard disk after transfer while COPY leaves the source files intact. COPY and MOVE are also used to transfer files from the floppy disks back to the hard disk. Each section of the board to be moved or copied must fit on one floppy disk. To determine the section size, press the Alt+N key combination at the component level of EDIT, LEARN, or TEST.

IMPORTANT NOTE:
To use the MOVE and COPY feature, each section must fit on one floppy disk. Monitor the size of your sections using the Alt+N feature when building your trees. When the number of Kbytes for the section reaches the size of your floppy disks, start adding components to another section.

MOVE is intended to give you one method to keep your PC's fixed hard disk capacity from filling up, by off-loading the 5100DS data to floppy disks.

COPY is intended to give you a simple method of copying the 5100DS data from your PC's fixed hard disk to floppy disks for data backup.

NOTE:
MOVE will remove the selected 5100DS data from the PC's hard disk and transfer data to the selected floppy disk. To use this data again with the 5100DS, the data can be loaded back from the floppy disk to the hard disk using the MOVE or COPY feature. Also, the floppy disk made by MOVE or COPY can be used directly for LEARN or TEST. To use a floppy directly rather than loading its data back to the hard disk, use DRIVE to select the floppy drive. Make sure the correct floppy disk containing the board section data you wish to test is in the drive.

The following are examples of using MOVE and COPY.

MOVING data from hard disk to floppy disk(s).

1. Start up the 5100DS system by typing "51DS".
2. Log on with user name and password.
3. At the 5100DS Main menu, select TRANSFER by pressing F then press M for MOVE.

4. You will see the following display:

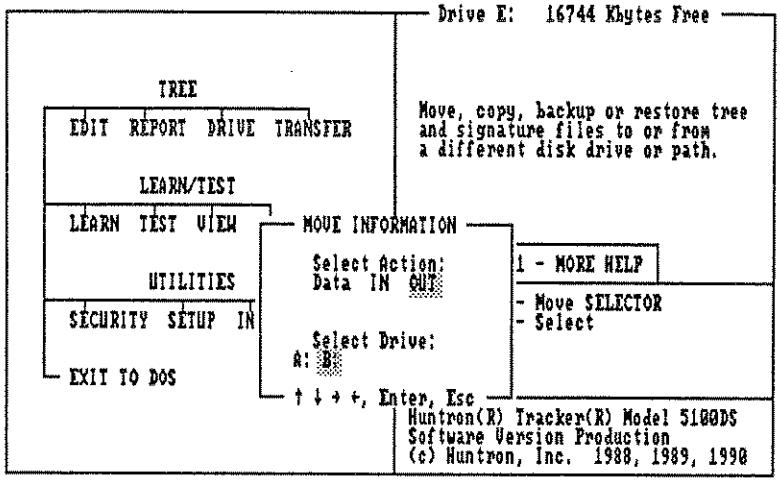


Figure 6-8. Move Screen.

5. For the first example, we will MOVE data from a hard disk to a floppy disk drive so use the → arrow key to position the cursor over OUT.

6. Next, use the ↓ arrow key to move the cursor to SELECT DRIVE: then use the ← or→ arrow keys to select the floppy drive you wish to use for off-loading the 5100DS data. Press ↵ after selecting the B floppy drive.

7. Observe that the Main menu screen has disappeared and been replaced with a display of the stored board(s) on the current drive/path.

8. Select the desired board to be MOVED from the hard disk to floppy disk using the arrow keys and then press ↵.

9. The program will prompt you for the number of formatted floppy disks needed for the selected board you want to transfer.

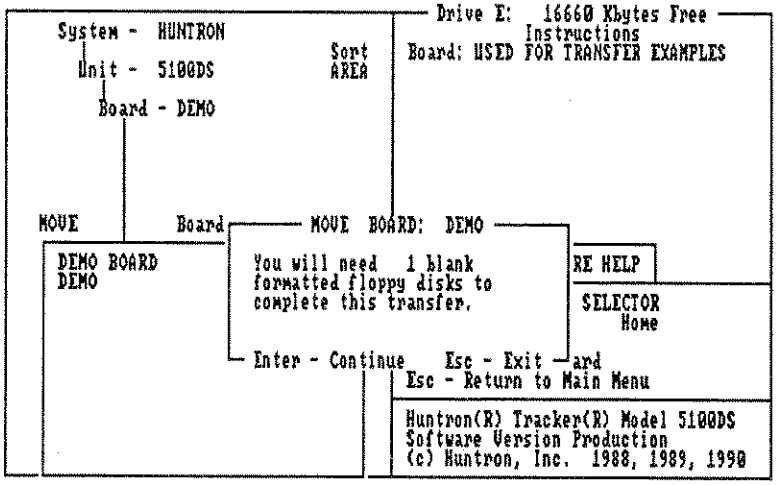


Figure 6-9. Number of Floppy Disks Needed for MOVE.

IMPORTANT NOTE

One floppy is required for each section of each board in the selected system. In this example, the selected board has one board with one section so only one floppy disk is needed.

10. Press ↵ and you will be prompted for the first disk.

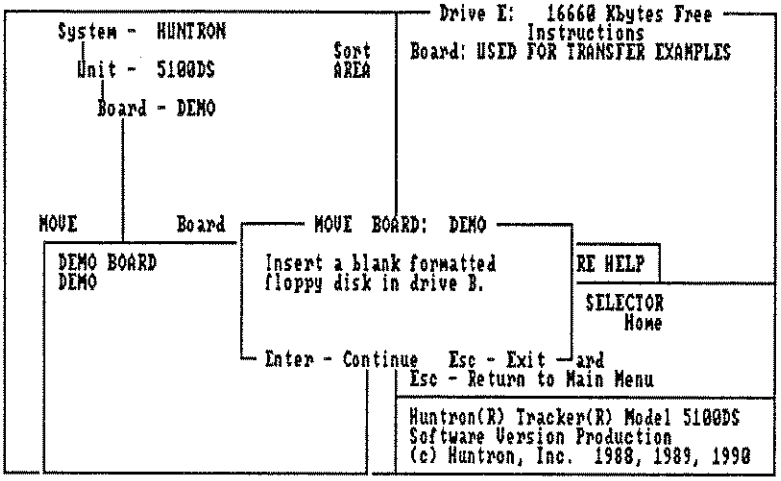


Figure 6-10. Disk #1 Prompt for MOVE.

Insert a blank formatted disk in the floppy drive and press ↵.

11. Watch the window on the display monitor for a status message "transferring data". When the program has completed data transfer, it will display:

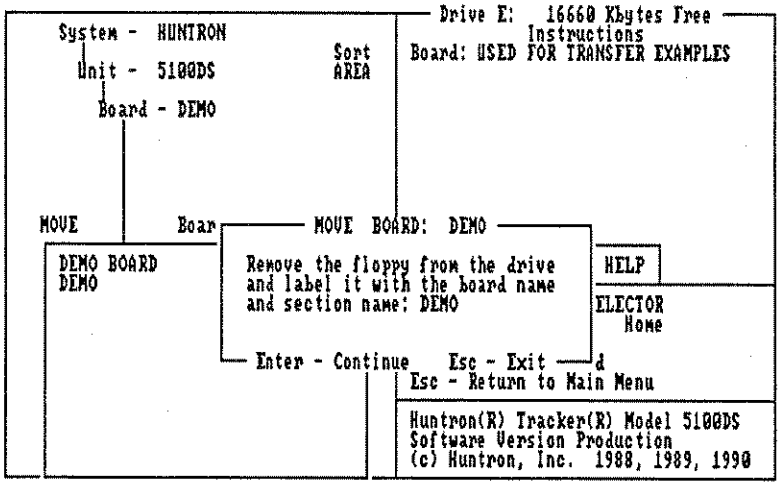


Figure 6-11. MOVE Completed Screen

After you remove the floppy disk from the disk drive, make sure to label it with the board and section name and press ↵.

12. The selected data has been transferred to the floppy disk so the duplicate data on your PC hard disk can be removed. The display will ask the following:

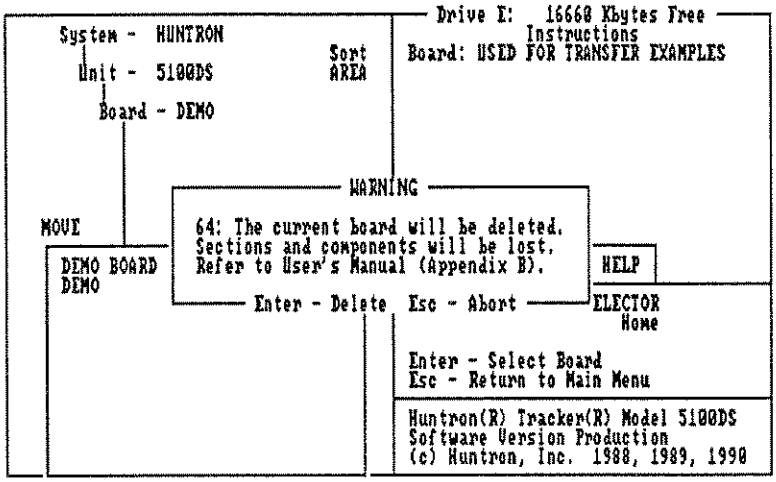


Figure 6-12. OK to DELETE Current Board.

Press ↵ to remove the information from the hard disk.

13. Observe that the hard disk access light flashes momentarily, then the program displays:

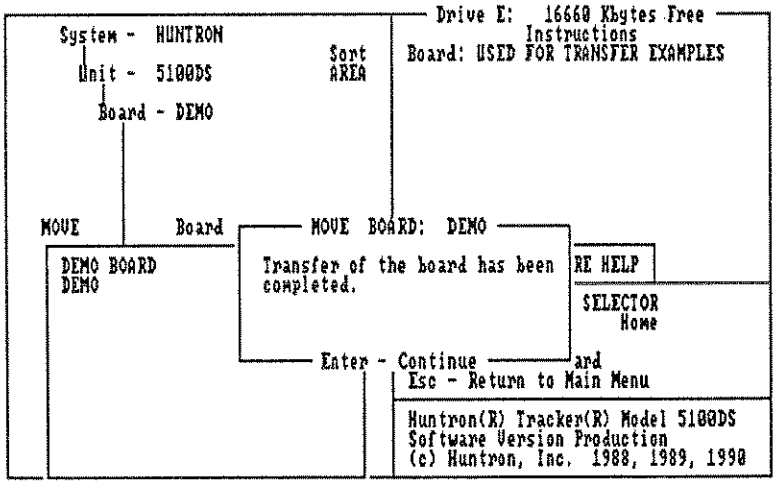


Figure 6-13. Transfer Completed.

Press ↵ to continue.

14. At this point, MOVE has transferred the data of the selected board to floppy disk and deleted it from the hard disk. The system tree will appear on the monitor. Note that the selected board is no longer listed.

Press Esc to go back to the Main menu or select another system to MOVE.

COPYING data from floppy disk(s) to hard disk.

1. Start up the 5100DS system: type "51DS".
2. Log on with user name and password.
3. At the 5100DS Main menu, select TRANSFER by pressing F and then press C for COPY.
4. You will see the following display:

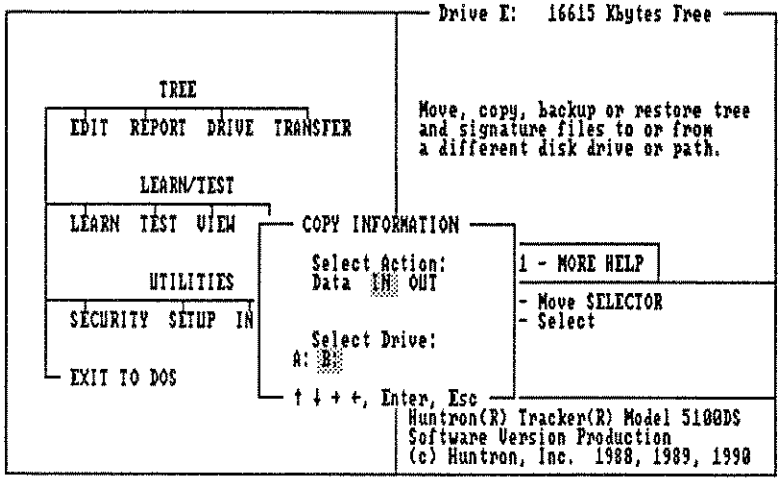


Figure 6-14. COPY Screen.

5. For the second example, we will COPY data from the floppy disk to the hard disk. Go to the next step since the cursor is already at IN.
6. Next, use the ↓ arrow key to move the cursor to SELECT DRIVE. Then use the ← or → arrow key to select the floppy drive that contains the 5100DS data. Press ↵ after selecting the floppy drive.

   The following pop-up window will be displayed:

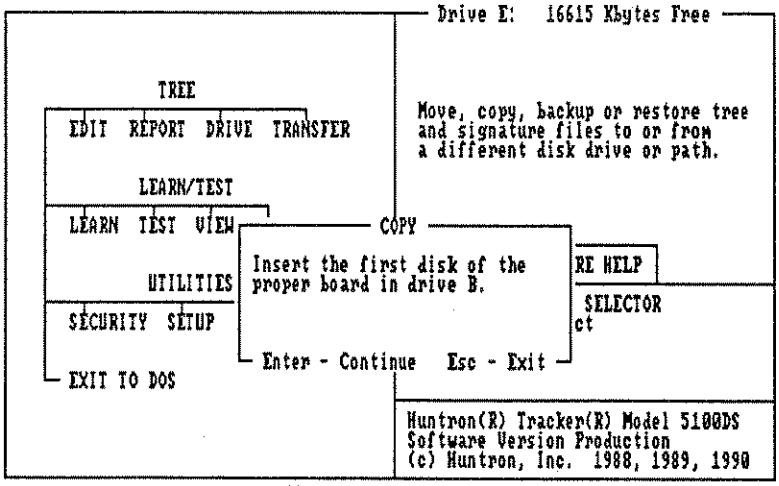


Figure 6-15. COPY In from Floppy to Hard Disk.

7. Put disk #1 (from our previous example which was a single floppy labeled "Demo/Demo" into the selected floppy drive, and press ↵.

The following pop-up window will be displayed:

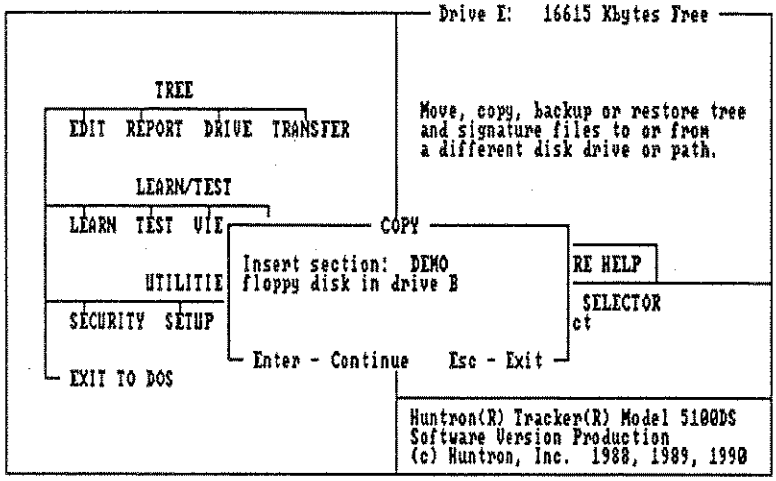


Figure 6-16. COPY Screen.

Press ↵ to proceed.

8. Watch the window on the display monitor for a status message "transferring data". When the program has completed transferring the data back to the hard disk, it will display:

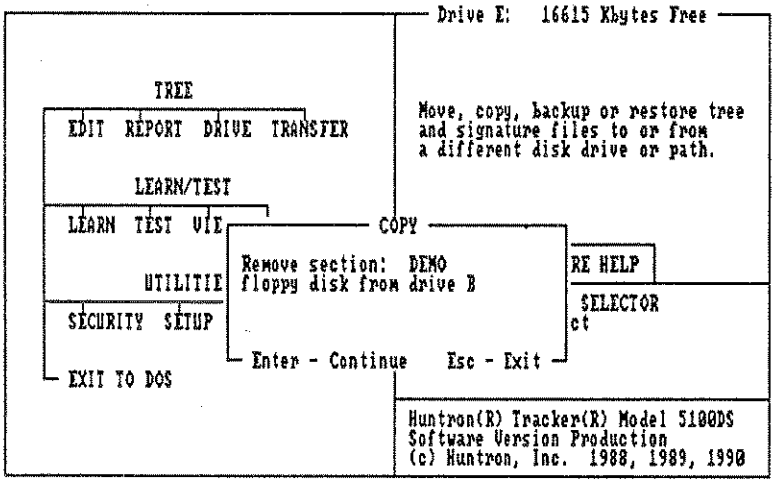


Figure 6-17. COPY In Completed Screen.

Take the floppy disk out of the PC and press ↵.

The COPY feature is very similar to MOVE. The difference is that the selected data is NOT DELETED from your hard or floppy disks.

BACKUP/RESTORE

BACKUP combines all files for a complete board into one file and creates a control file for the restore process. Backup and restore can use any valid drive path combination. The two files are created on any drive or path you select. You can also compress the files so that less disk space is used. When using backup with floppy disks, each disk will be completely filled and then you will be prompted for another disk until backup is completed. The source files are not effected by backup.

There are three levels of compression used in backup, NONE, FAST and MAXIMUM. NONE is the fastest, but requires the most disk space. FAST is slightly faster than MAXIMUM, but requires slightly more disk space. MAXIMUM takes the longest to compress, but requires the least amount of disk space.

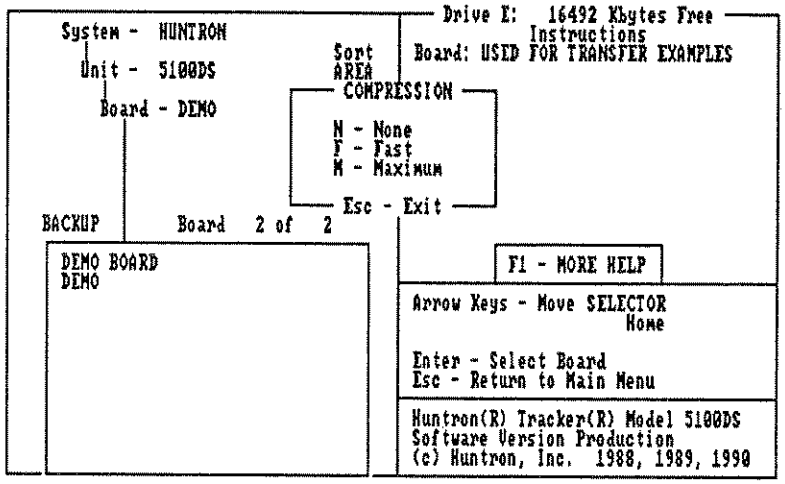


Figure 6-18. BACKUP Screen.

Restore reverses the backup process and recreates the original files. If you restore a board to a drive/path where a board with the same name exists, you will be prompted to rename the board being restored or overwrite the existing board.

The following is an example of using BACKUP and RESTORE.

BACKUP from hard disk to floppy disk(s).

1. Start up the 5100DS system by typing "51DS".
2. Log on with user name and password.

NOTE

Be sure to have supply of blank formatted floppy disks before starting the BACKUP to a floppy drive.

3. At the Main menu, select TRANSFER by pressing F. You will see the following screen:

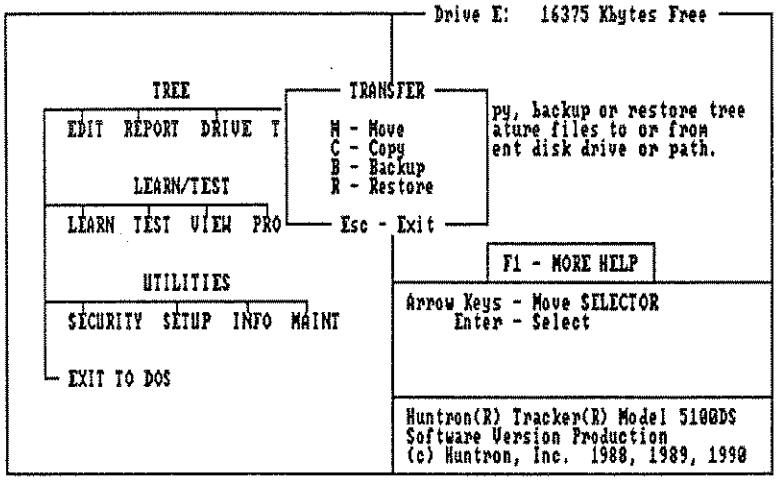


Figure 6-19. TRANSFER Screen.

4. Press B to access BACKUP. At the BACKUP board selection screen, select the DEMO board and press ↵.

5. For the first part of this example, we will BACKUP data from the hard disk to a floppy disk. Put a blank formated disk in floppy drive B. Type "B:\ ↵" for "Path:" at the BACKUP destination path pop-up window to select drive b: as the target.

6. The COMPRESSION pop-up window will appear as shown in the next figure. Press F ↵ to choose the fast compression option.

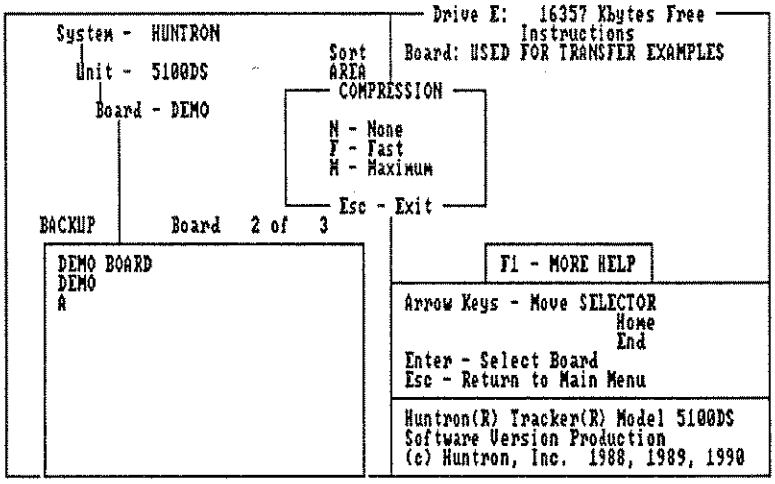


Figure 6-20. BACKUP Compression Options.

7. BACKUP will display a "Compressing Data" pop-up window as shown below.

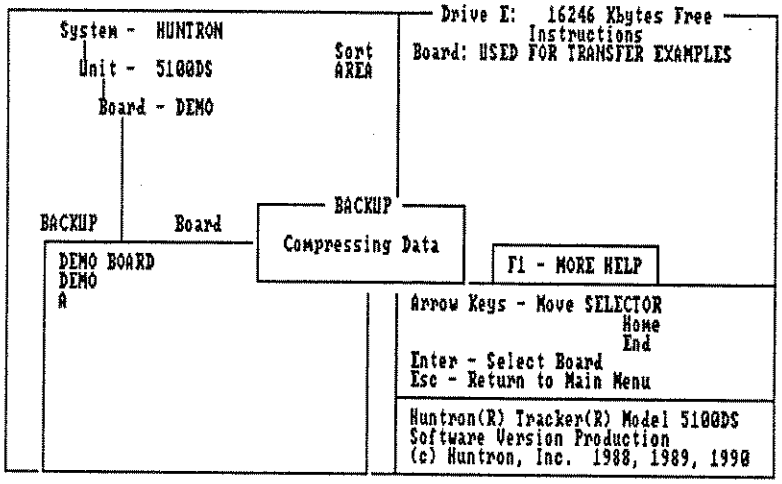


Figure 6-21. BACKUP Compressing Data Pop-up Window.

8. Next BACKUP displays the "insert disk" pop-up, however since there is already a disk in drive B, go on to the next step.

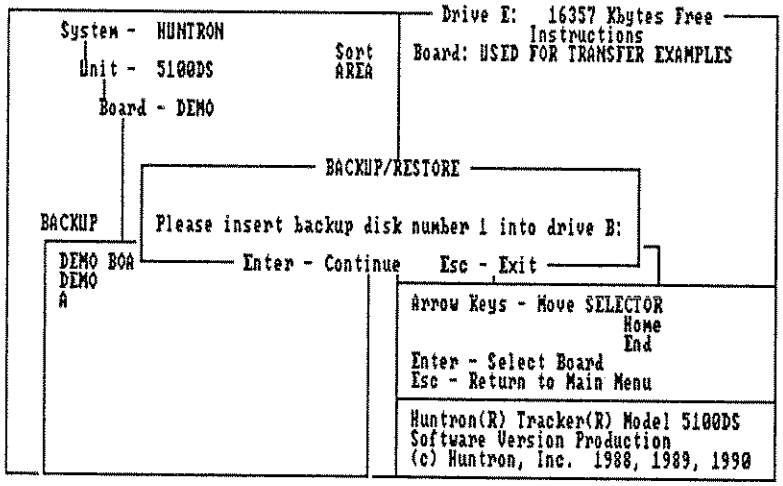


Figure 6-22. BACKUP Insert Disk Pop-up Window.

9. Press ↵ to continue. When BACKUP is done, the main BACKUP board selection screen will be displayed.

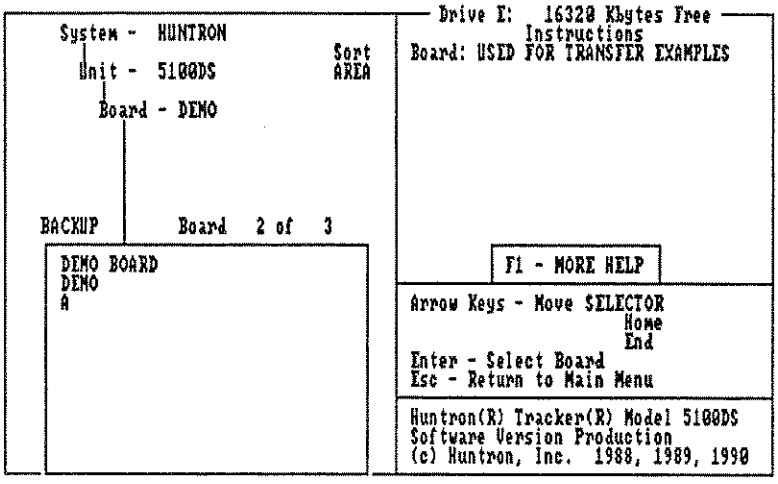


Figure 6-23. BACKUP Completed Screen.

Press Esc to return to the Main menu.

RESTORE from floppy disk to hard disk.

1. At the Main menu, press "F" to activate TRANSFER.
2. Press R for RESTORE. RESTORE will ask for the source path of the disk containing the data you wish to load. Type "B:\ ↵" for disk drive B.

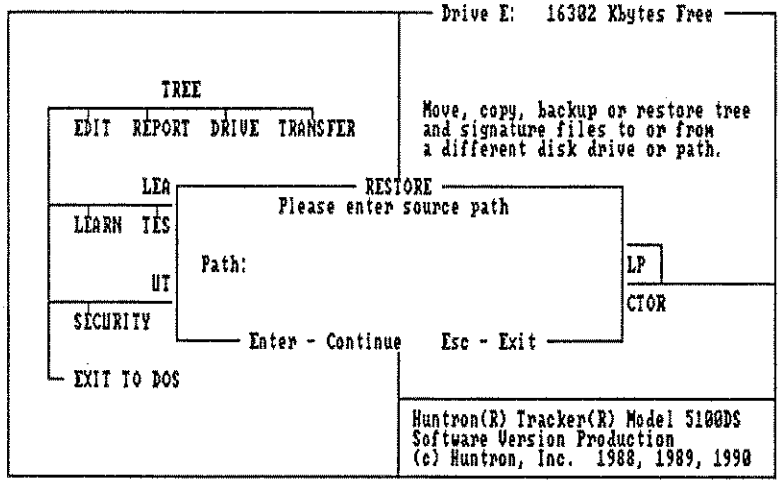


Figure 6-24. RESTORE Source Path Pop-up Window.

3. Next, the program will ask for the floppy disk that contains the board you wish to RESTORE. Insert this disk into the previously designated disk drive and press ↵.

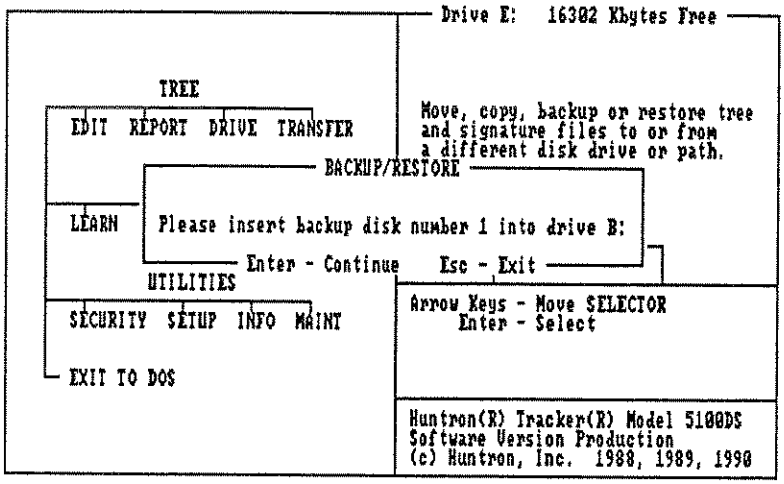


Figure 6-25. RESTORE Insert Disk Pop-up Window.

4. RESTORE will read the floppy disk and decompress the data if it was compressed in BACKUP. RESTORE writes the data back to the hard disk and returns to the Main menu when done.

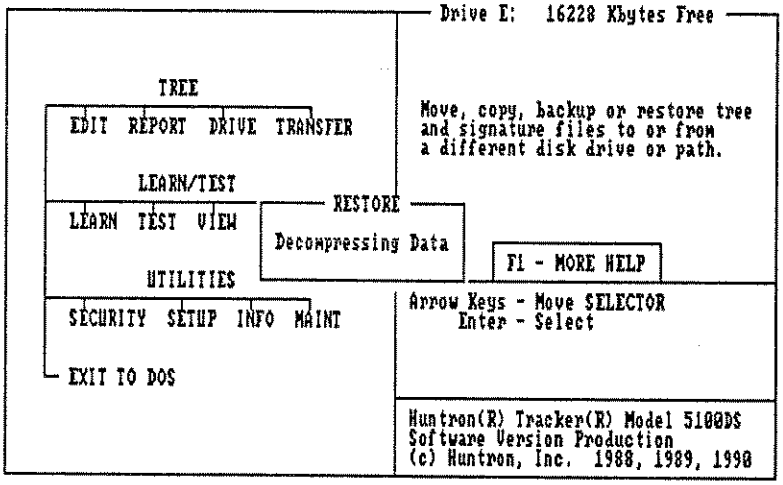


Figure 6-26. RESTORE Decompressing Data Pop-up Window.

NOTE

A warning message will be displayed if the current hard disk drive/path has a board with the same name as the board on the floppy disk. You can choose to either rename the selected board (on floppy disk) or replace the board on the hard disk. Exit RESTORE and use the DRIVE function to select another drive/path if you don't want to overwrite the existing board.

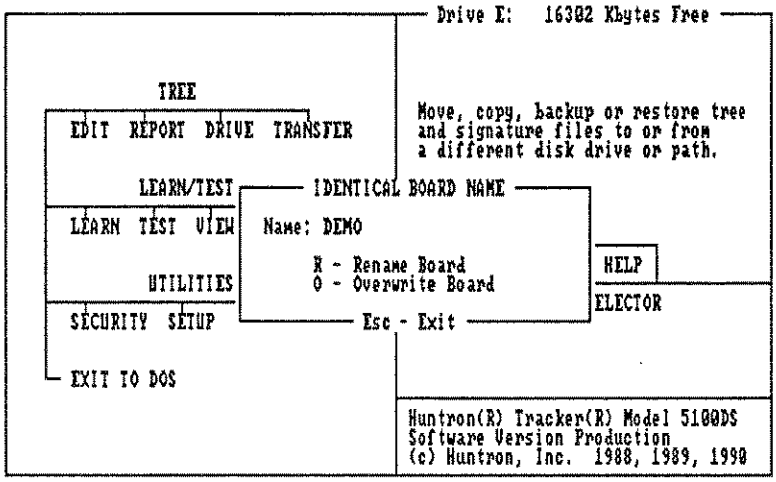


Figure 6-27. RESTORE Identical Board Name Warning.

6 - 6. PROBE MODE

The PROBE mode enables the 5100DS hardware while using test leads connected to the TEST and COMMON jacks on the front panel. Analog signatures of probed components can be directly observed on the 5100DS CRT. The user can select the ranges to be enabled for manual or automatic range scanning.

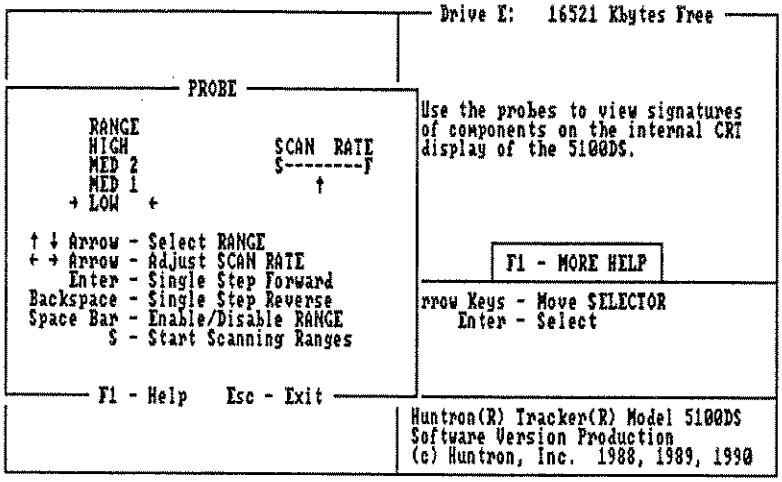


Figure 6-28. PROBE Mode Screen.

ACTIVE KEYS:	FUNCTION:
F1	Displays help information about using the PROBE mode.
↑ ↓ Arrows	Controls the range cursor (→ LOW ←) so that each range can be enabled or disabled in the scan sequence.
← → Arrows	Controls the SCAN RATE used for automatic scanning.
↵ ENTER	Performs a manual single step forward to the next range in the scan sequence.
Backspace	Performs a manual single step backward to the previous range in the scan sequence.
Space Bar	Enables or disables the range that is selected by the range cursor. Enabled ranges are highlighted in YELLOW and disabled ranges are in BLUE on your PC's display.
S	Toggles the action that starts or stops automatic range scanning. Once scanning is started the only active keys are: S to stop scanning; the ← and → arrows to change the scan rate; and F1 to display the help screen. Scanning will pause while the help screen is active.
Esc	Exits the PROBE mode and returns to Main menu.

For example, you can use PROBE before a LEARN to preview component signatures or to do a quick manual test of a component. Suppose you want to look at the signatures of R7 on the demo board in the LOW and MED 1 ranges. At the Main menu, select PROBE or press **P**. A pop-up window will appear displaying the keys that are active and the status of the hardware which has been activated.

To activate just the MED 1 and LOW ranges, you will need to disable the HIGH and MED 2 ranges. Press the ↑ arrow key twice and then the **Space Bar** to disable the MED 2 range. Press the ↑ arrow key once more and move to the HIGH range. Press the **Space Bar** to disable the HIGH range. Press the ↑ arrow to return to the LOW range.

NOTE

In PROBE when the cursor is at any range, the 5100DS is switched to that selected range even if this range is disabled.

Connect the red and black test leads to TEST and COMMON jacks on the 5100DS front panel. Place the black probe on one pin of R7. Place the red probe on the other pin of R7.

Observe that the signature of this resistor in the LOW range is displayed on the 5100DS CRT. While keeping the red probe on the component pin, press the S key to start scanning. Watch the 5100DS CRT to see the signature of the resistor change in different ranges. You can increase and decrease the scanning rate with the ← and → arrow keys. Press the S key to stop scanning. Use the ↵ to single step up through each of the enabled ranges. When you are finished looking at the signatures, press Esc to return to the Main menu screen.

NOTE

The PROBE mode can be accessed while in EDIT, LEARN, or TEST. The PROBE pop-up window will appear by pressing Alt+P. If you are at the component level in either EDIT, LEARN or TEST, the component ranges selected there will be used while in PROBE mode.

6 - 7. SECURITY MODE

The SECURITY mode is useful for controlling access to the valuable stored data when the system is used by more than one operator. Limiting access to some 5100DS functions also can minimize the amount of technical training needed for lesser skilled operators. As a result, simplified test procedures can be written . The SECURITY mode allows four different levels of operational access by users. Each user can have a unique password and must use it at the SECURITY screen before he is allowed to enter the software. Up to 25 users can be installed.

The following is a brief summary of the four access levels.

Access level 1: (lowest level)

Users are brought directly into the TEST mode and cannot access the Main menu. Once a board and section has been selected by the user, he is guided by the software through each component of the section. After testing each component, the user cannot view signatures.

Access level 2:

Users are brought directly into the TEST mode and cannot access the Main menu. Once a board and section has been selected by the user, he is guided by the software through each component of the section. After testing each component, the user can view signatures.

Access level 3:

Users have access to all software menus and modes, except SECURITY mode.

Access level 4:

Users can access all 5100DS functions, including the SECURITY mode. This mode allows a user, typically a supervisor or lead, to add, delete, and modify access levels and passwords for each user of the 5100DS.

The software is factory configured for a level 4 user with user name = ↵ and password = ↵.

To activate the SECURITY feature, use the following example as a guide.

Startup the 5100DS software and press ↵ at both user name and password on the SECURITY screen. Next, at the Main menu, select SECURITY or press S. A pop-up window will appear displaying the user name, password, access level, user number, and the active keys that are available.

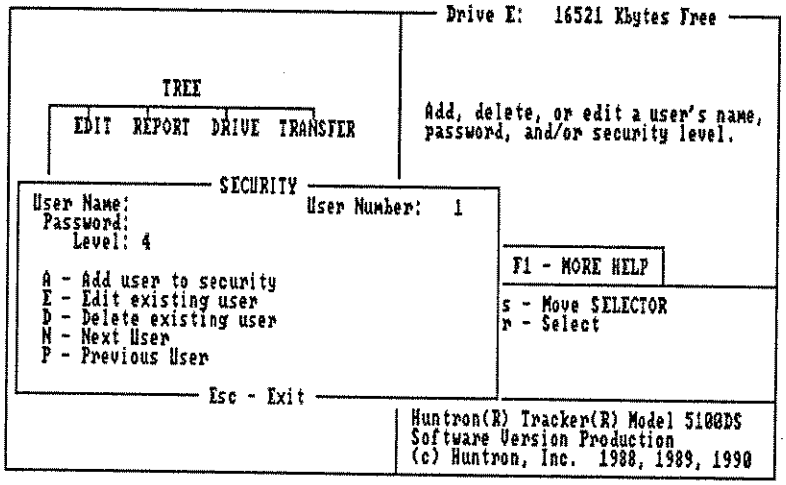


Figure 6-29. SECURITY Mode Screen.

Press E for EDIT and notice that the lower part of the window changes to show what operations are available in the EDIT mode.

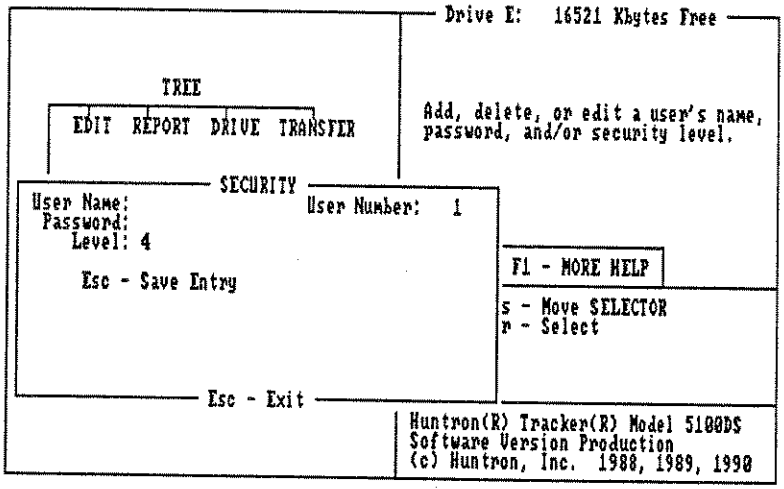


Figure 6-30. SECURITY Mode Level 4 Edit Screen.

Locate the cursor (it should be on the User Name line).

Type your name (10 characters maximum) on this line. Press the ↵ key to go to the next line.

Type your password (10 characters maximum) on this line. Press ↵ to go to next line.

CAUTION

It's a good idea to record your Level 4 user name and password and keep them in a safe but easily accessible place. If you lose or forget your user name and password, call Huntron Technical Support for assistance.

IMPORTANT NOTE:

The SECURITY level of user number 1 cannot be edited. The cursor will jump back to the Name line. This is to make sure that there is always at least one security level 4 user on the system.

Press Esc to save these settings. Your display should resemble the following figure when you are done:

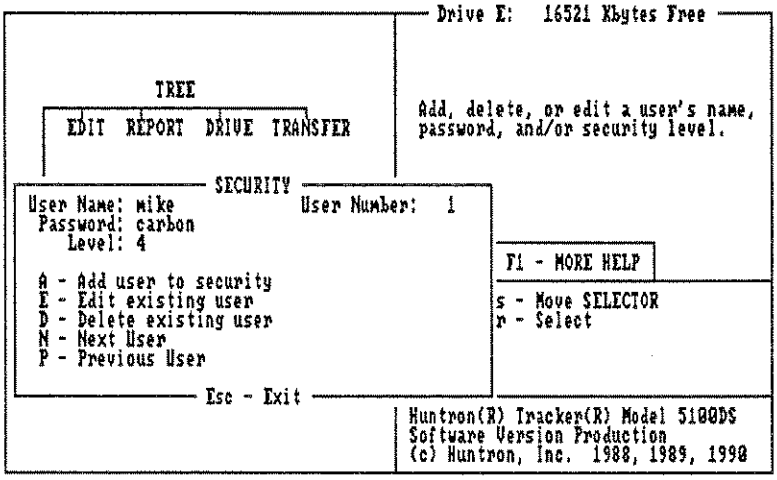


Figure 6-31. SECURITY Edit Level 4 User.

To add a user with level 3 access, do the following:

Press A and type in the name and password as in the previous example. At the SECURITY level line, set the access level to 3. A technician with access level 3 will be able to use all of the 5100DS functions except SECURITY. Your display should resemble the following figure when you're done. Press Esc to save these settings.

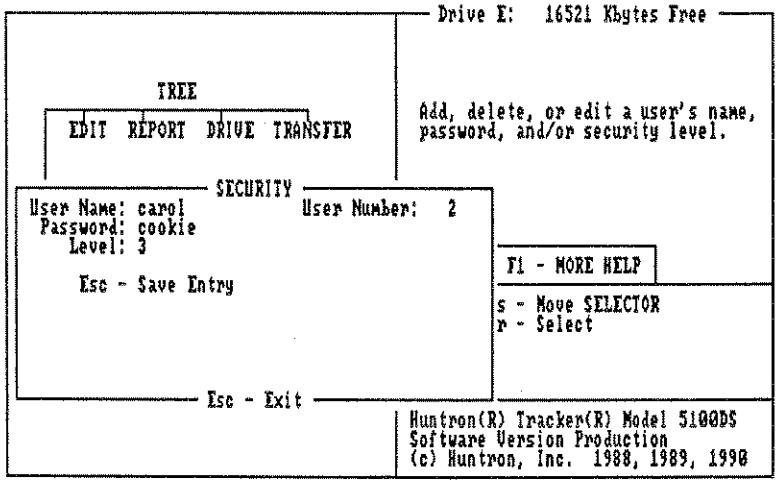


Figure 6-32. SECURITY Add Level 3 User.

To add a user with level 2 access, do the following:

Press A and type in the name and password as in the previous example. At the SECURITY level line, set the access level to 2. Press Esc to save these settings.

Your display should resemble the following figure when you're done:

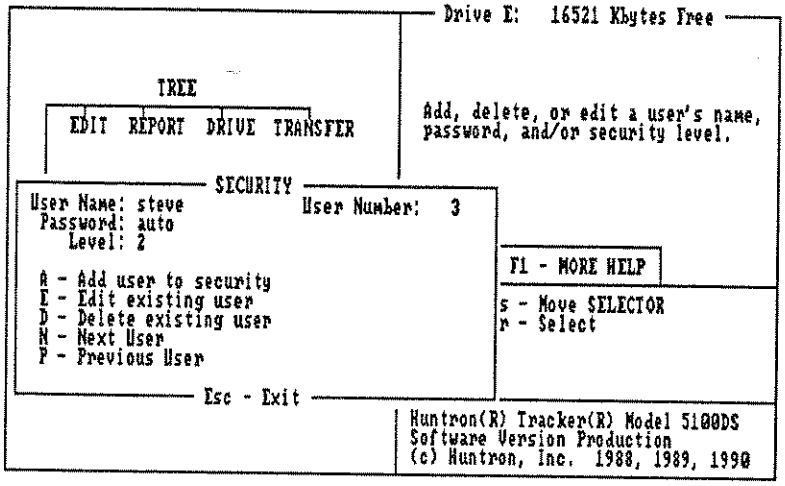


Figure 6-33. SECURITY Add Level 2 User.

An operator with access level 1 will only be allowed to use the TEST function without being able to look at signatures on the PC display.

NOTE:

Any number of users can have the same access level.

6 - 8. SETUP MODE

The SETUP mode from the UTILITIES function of the Main menu allows the user to set the visual characteristics including signature colors and operating defaults.

To activate this mode, press U or move the cursor to SETUP and press ↵. Observe that the SETUP screen appears on your monitor as follows:

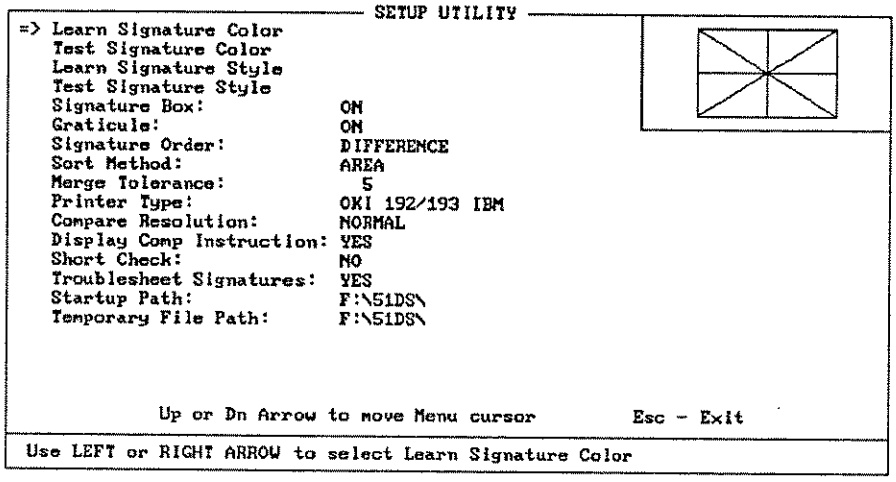


Figure 6-34. SETUP Screen.

LEARN SIGNATURE COLOR

On the left side of the SETUP screen, locate the small arrow shaped pointer. It is pointing to Learn Signature Color. The learn signature color can be changed by pressing the ← or → keys until the desired color is chosen.

TEST SIGNATURE COLOR

Press the ↓ key to move the pointer to Test Signature Color. The test signature color can be changed in a similar manner.

NOTE:

If you are using a PC with a LCD or gas plasma graphics display that is EGA color compatible, then selecting a dark color for one of the signatures and a lighter color for the other will give more distinct signatures from this type of monitor when using the 5100DS software.

LEARN SIGNATURE STYLE

Press the ↓ key to move the selection pointer to Learn Signature Style. The learn signature style can be changed between DOT and LINE mode by pressing the ← or → keys until the desired style is selected.

TEST SIGNATURE STYLE

Press the ↓ key to move the pointer to **Test Signature Style**. The test signature style can be changed between DOT and LINE mode by pressing the ← or → keys until the desired style is selected.

NOTE:
The signature dot style can be used to see the actual data points plotted. Also, signature style can be used for better contrast between LEARN and TEST signatures when the signatures are printed out.

SIGNATURE BOX

Press the ↓ key to move the selection pointer to **Signature Box**. The signature box can be turned ON or OFF by pressing the ← or → keys until the desired status is selected. The signature boxes can be turned off to speed up the drawing of the signature screens.

GRATICULE

Press the ↓ key to move the selection pointer to **Graticule**. The graticule can be turned ON or OFF by pressing the ← or → keys until the desired status is selected. The graticule can be turned off when printing out a hard copy and helps to see the signatures better. This feature can also be changed at the View Signatures screen with the Alt+G key combination.

SIGNATURE ORDER

Press the ↓ key to move the pointer to **Signature Order**. The signature order can be changed between DIFFERENCE and NUMERIC by pressing the ← or → keys. In View Signatures screens (except View stored), NUMERIC displays the TEST signatures in order by the pin number starting with pin 1. DIFFERENCE displays the signatures starting with the most different pin found when the current and stored signatures were compared (in its most different range). DIFFERENCE is recommended for normal troubleshooting use.

SORT METHOD

Press the ↓ key to move the pointer to **Sort Method**. The sort method can be changed between PEAK and AREA by pressing the ← or → keys.

Each analog signature consists of many discrete points. When differences are detected during testing, the PEAK sort method places the test component pins in order starting with the TEST signature that had the largest single point deviation from the corresponding stored LEARN signature. The AREA sort method places the test component pins in order starting with the TEST signature with the largest sum of all point deviations from the corresponding stored LEARN signature.

The benefit of using the AREA method is that a test signature that is really different overall is more likely to indicate a defective component. In PEAK, a test signature with a single point that falls outside the tolerance of the LEARN signature may not necessarily be the worst component on the board in many situations.

IMPORTANT NOTE:
Use the AREA sort method in general for most testing.

MERGE TOLERANCE

Press the ↓ key to move the selection pointer to Merge Tolerance. The merge tolerance can be changed between 0 and 100 in increments of 5 by pressing the ← or → keys.

Merge tolerance sets the allowable difference during comparison between a previously stored LEARN signature and another LEARN signature prior to storage. This allows the user to set the limit at which the two signatures will show as different.

PRINTER TYPE

Press the ↓ key to move the selection pointer to **Printer Type**. The printer type can be changed by pressing the ← or → keys until the desired printer is selected.

Printer type is used to select the model of printer you are using so that the signatures can be printed out properly. If your printer is not listed, try selecting either the Epson FX 80 or OKI 192/193 (IBM) printer.

NOTE

When printing reports or troublesheets, your printer must be configured with NO Automatic Line Feeds (this is usually the default setting). Consult your printer manual for setup information.

COMPARE RESOLUTION

Press the ↓ key to move the selection pointer to **Compare Resolution** . The compare resolution can be changed by pressing the ← or → keys to select NORMAL or HIGH. **Compare Resolution** controls the number of the 100 horizontal data points of the signature that are used during the comparison that determines the test results. The NORMAL setting compares 20 data points which is the same as the version 5.00 of the software. The HIGH setting compares all 100 points. This may allow for the detection of more subtle signature differences.

The HIGH setting will cause the Signature Area to be up to 5 times larger than with the NORMAL setting. The signature deviation will remain the same unless one of the 80 points not compared with the NORMAL setting has a greater deviation.

NOTE

The NORMAL setting is recommended for fastest testing speeds.

DISPLAY COMPONENT INSTRUCTIONS

Press the ↓ key to move the selection pointer to **Display Comp Instruction**. Use the ← or → keys to select YES or NO.

In LEARN and TEST, the display of the component instructions is selectable with this setting. YES results in displaying these instructions before each component is learned or tested. NO causes the 5100DS to start testing immediately. In either case the component instructions can always be viewed at the component level by pressing **F2**.

SHORT CHECK

Press the ↓ key to move the selection pointer to **Short Check**. Use the ← or → keys to select YES or NO.

When YES is selected, the **Short Check** feature checks for a short circuit signature between adjacent component pins. Components with a package type of "P" or ones that have only one pin are not checked. Components with no common pins specified are prompted with remove and then replace common lead prompts. After scanning the component for differences the component is scanned for shorts. The short scan sets the common pin to pin 1 and the test pin to pin 2. A signature is taken in the low range and compared to a short circuit signature. If the signatures match the pins are flagged as being shorted. Then the common is set to pin 2 and the test to pin 3. This activating of the pins is repeated until the entire component has been scanned. If there are any shorts, a window is displayed showing the shorted pin combinations. These pins can be selected by highlighting them with the arrow keys. When selected the common and test pins are set to the corresponding pins. This information is not stored in the troublesheet. If pin names have been specified with the **Pin Info** feature, the names will be displayed instead of the numbers. The short check finds pins that have ~ 1 Ω or less between them.

This is useful for two purposes:

1. Finding adjacent pins that are shorted on purpose either by PCB traces or internal device connections - these pins will always display the same signature since they are one node.
2. Finding adjacent pins that are shorted by a fault - the normal signature comparison will show the pins are different, but the Short Check will show that the difference is caused by a short. Ideally, this will reduce troubleshooting time.

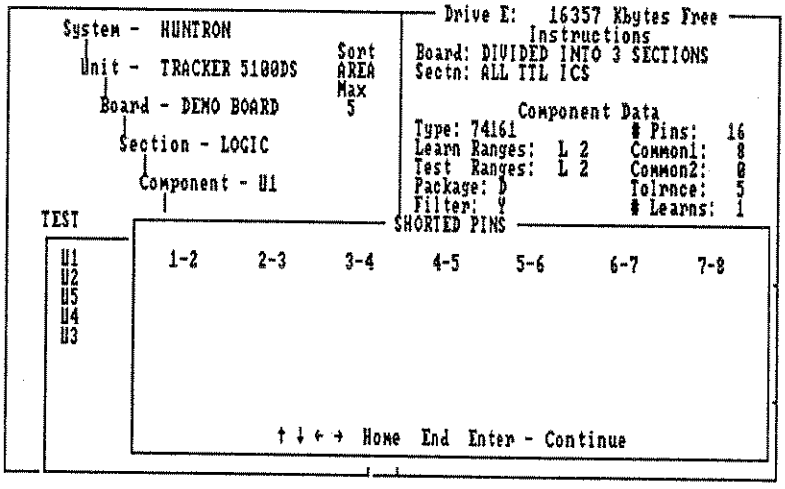


Figure 6-35. SHORT CHECK Screen.

TROUBLESHEET SIGNATURES

Press the ↓ key to move the selection pointer to **Troublesheet Signatures**. Use the ← or → keys to select YES or NO.

YES enables display of test signatures in the board or section Troublesheet View mode or when recalling the previous tested component. If your PC has limited storage space or you want to test at full system speed, then you should disable this option by choosing NO.

STARTUP PATH

Press the ↓ key to move the selection pointer to **Startup Path.** Then press **F1** to edit the drive and/or path. The edit line normally works in INSERT mode - press the **Insert** key to go to overwrite mode. Type in the desired path and press ↵ to save or press **Esc** to return to the original path.

The **Startup Path** is the default path which the program uses for board information and component signature database storage and recall when the 5100DS software is first started from DOS. This path can be changed temporarily using DRIVE to select different sets of boards. After exit to DOS, the default path will be used the next time the software is started.

TEMPORARY FILES PATH

Press the ↓ key to move the selection pointer to **Temporary Files Path.** Then press **F1** to edit the drive and/or path. The edit line normally works in INSERT mode - press the **Insert** key to go to overwrite mode. Type in the desired path and press ↵ to save or press **Esc** to return to the original path.

This setting is the location of the working files that the program uses internally. These files are deleted when the program has exited normally. The path can be set to a RAM disk drive to increase testing speed. Refer to Appendix F, Application Note 5 - Enhancing Your 5100DS Computer System for more details.

When you are finished with SETUP, press **Esc**, then **Y** (yes) to permanently save your settings.

If you do not want to save your SETUP changes, press **N** (no). You will return to the Main menu.

6 - 9. TOLERANCE

The component tolerance feature allows you to set the difference window on the stored LEARN signature. This tolerance value is factored into each of the digitized points that comprise the LEARN signature and will be used for comparison during testing. During testing, the comparison will be done on selected points between the stored signature with the factored tolerance value and the test signature. Refer to Appendix F - Application Note 2 for more details.

The 5100DS allows you to set the tolerance for each component in two different ways.

The first option sets the same tolerance value for all the pins of a particular component (e.g. for an 8 pin IC, all pins will have the same tolerance value). This is the most commonly used option.

The second option allows you to set different tolerances for each pin of a particular component. This option may be useful when some pins of a component may have a greater or lesser signature difference than the rest of the pins and are still considered acceptable. For complete details on this option refer to Section 6-2, COMPONENT PIN INFORMATION in this chapter.

6 - 10. SORT COMPONENTS

This feature can be used to sort the components of the current section alphanumerically. Activate the sort by pressing the Alt+O key combination at the component level of edit. Once sorted the components cannot be unsorted. This can be useful when building a library of out of circuit components. See example below:

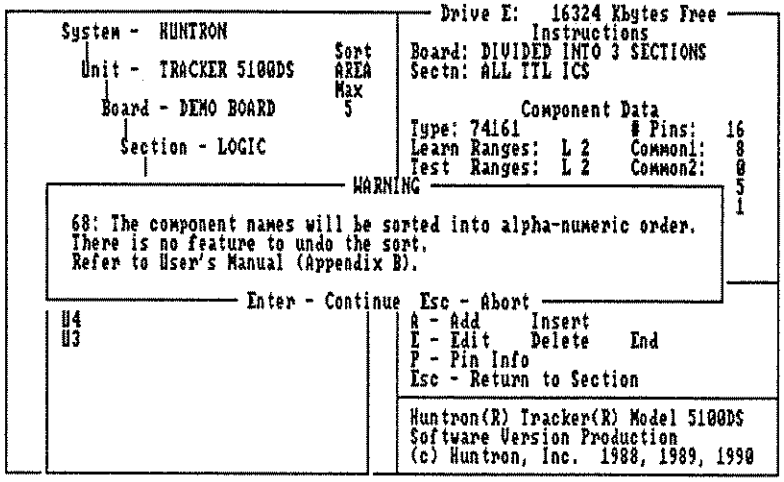


Figure 6-36. SORT Components Warning.

CURRENT	SORTED
7404	7400
7400	7402
7402	7404
U2	C01
U5	C02
U3	C1
C12	C12
C2	C2
C1	U2
C02	U3
C01	U5

6 - 11. TROUBLESHEET

A troublesheet is a collection of all of the difference and equivalent information on the components tested.

Troublesheet information is generated for each component as it is tested. The test signatures are stored if enabled in SETUP. The temporary files path in SETUP controls where the files of the troublesheet data and signatures are stored. The path can be set to a RAM disk drive to increase testing speed (see Appendix F, Application Note 5 - Enhancing Your 5100DS Computer System).

The troublesheet is different for each of the three levels of the tree. Activate in the TEST mode by pressing the T if at least one component has been tested. At the component level, the function is called T-Test Results and the component results window is displayed. At the section level a choice of viewing, printing or storing a troublesheet for the components of the current section is allowed. The same options are available at the board level for all the components of the current board.

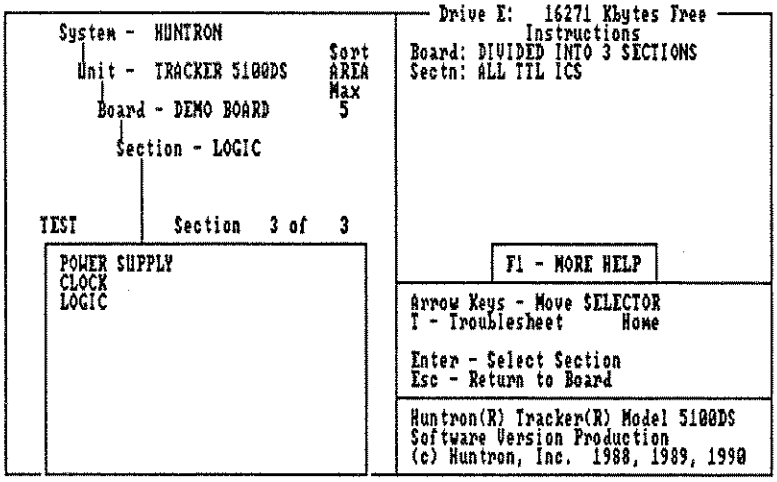


Figure 6-37. Troublesheet Selection Window.

The board serial number is entered to identify the troublesheet.

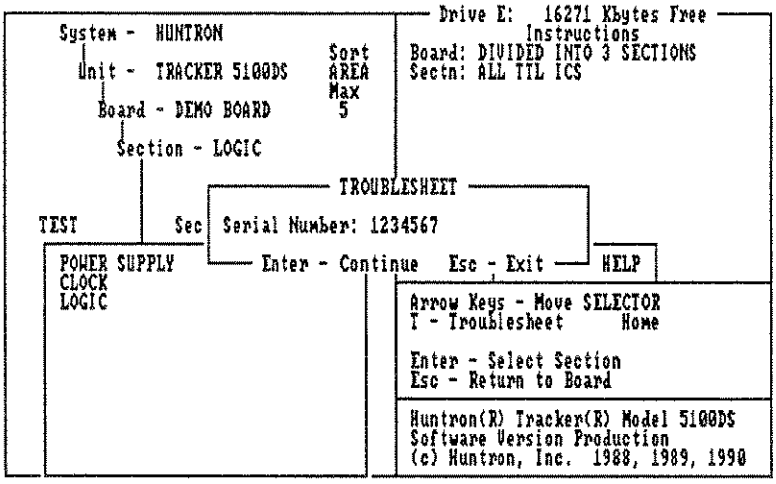


Figure 6-38. Troublesheet Board Serial Number Entry.

The display of the component results window shows the status of each component that has been tested in the current test session. If the component has different pins, viewing of the signatures or removing of the component from the troublesheet are allowed.

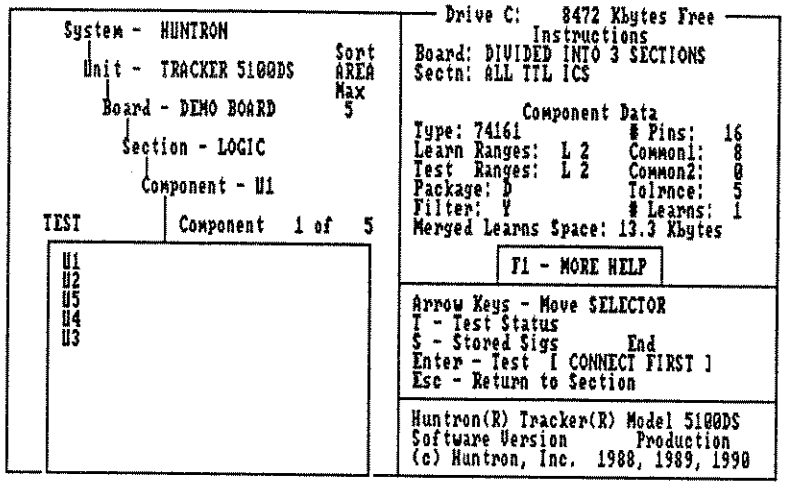


Figure 6-39. Select Troublesheet "T-Test Status" Screen.

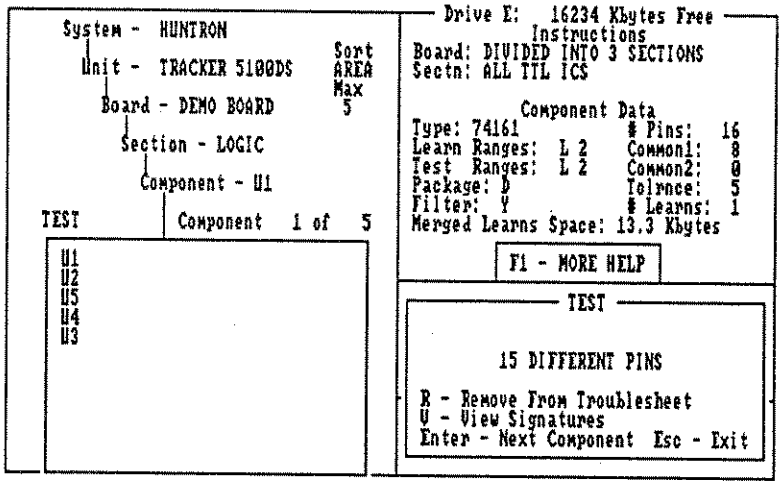


Figure 6-40. Troublesheet TEST Results Window.

Viewing of the troublesheet at the section and board level shows a difference order list of the components that failed. Each of the components can be made the current component by highlighting which is selectable. The current component can be removed from the troublesheet. The detailed pin difference information for the current component can be viewed in a pop-up window. The signatures for the current component can be viewed if enabled in SETUP. While viewing the signatures all of the signatures for the different components can be viewed by choosing the next, previous, first or last component options. A summary displaying the number of different, removed and equivalent components is available.

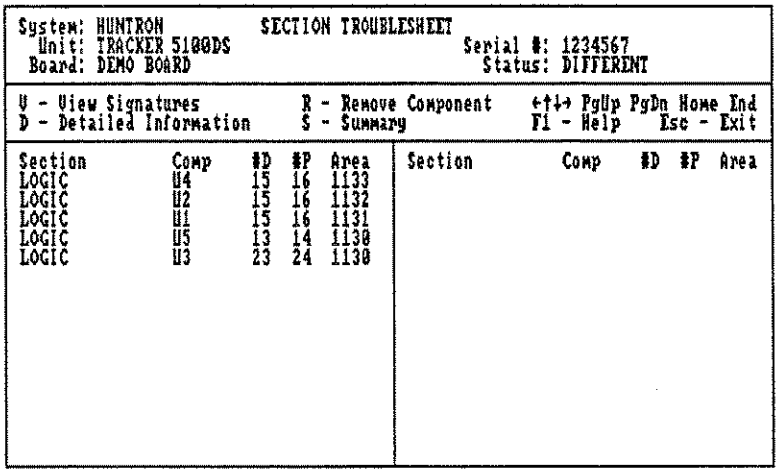


Figure 6-41. Troublesheet View Screen.

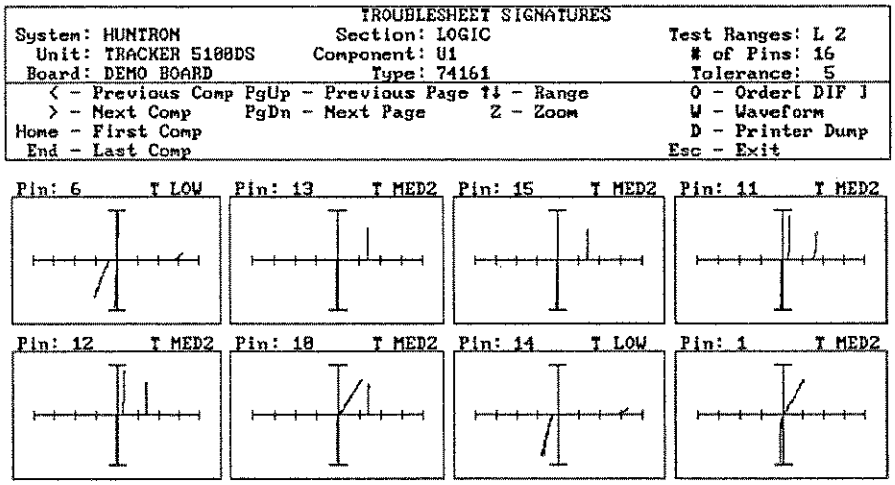


Figure 6-42. Troublesheet View Signatures Screen.

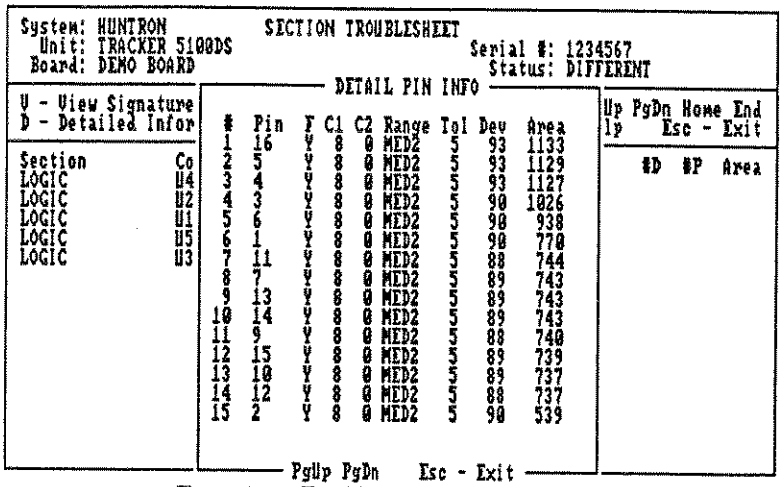


Figure 6-43. Troublesheet Detailed Window.

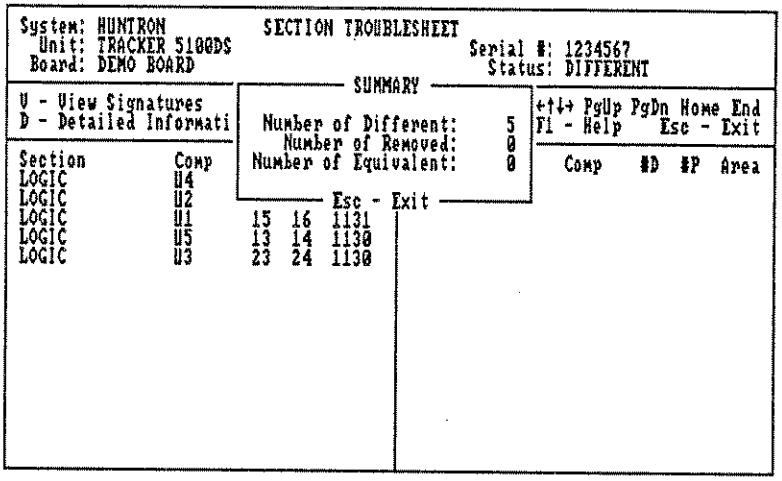


Figure 6-44. Troublesheet Summary Window.

Printing the troublesheet at the section and board levels allows the choice of either a simple or detailed report. The simple report lists the different components in difference order. The different pins are listed in difference order too. The detailed report also lists the different components in difference order. The different pins are listed in difference order with the most different range, tolerance, deviation and area.

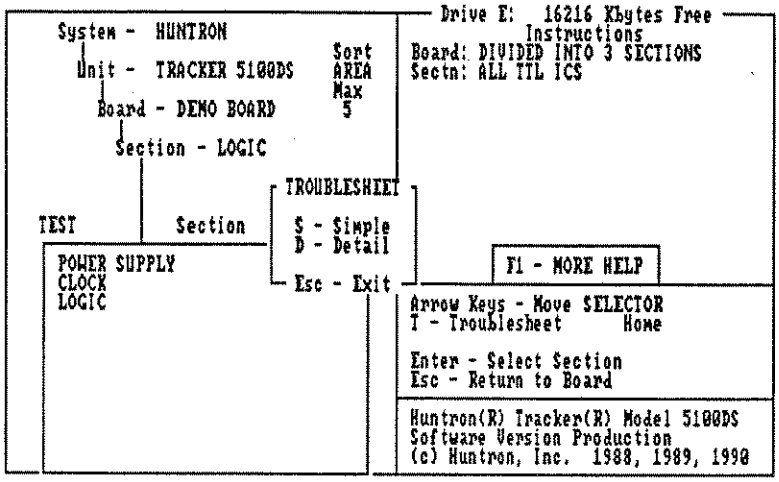


Figure 6-45. Troublesheet Print Selection Window.

Storing the troublesheet at the section and board levels allows the choice of either simple, detailed or ASCII delimited. All of the formats append to the file until it is deleted using DOS. The path for the troublesheet must be specified (see the Troublesheet path entry window figure). For the simple (SIMPLETS.ASC) and detailed (DETAILTS.ASC) troublesheets an ASCII file containing the text of the corresponding printed report is written to the specified path. The ASCII delimited (ASCIITS.ASC) troublesheet stores the information in a format readable by popular off-the-shelf database programs. These programs can allow repair tracking, fault analysis and other reports to be generated. The format of the file is as follows:

Board name [14 alphanumeric characters]

Serial number [20 alphanumeric characters]

Test date [8 alphanumeric characters]

Tech ID [10 alphanumeric characters]

Test time [10 alphanumeric characters]

Component Name [6 alphanumeric characters] (repeated)

Component Type [14 alphanumeric characters] (repeated)

The ASCII delimited troublesheet prompts for the entry of the Tech ID, Test time, Component limit and the delimiting character. The Tech ID defaults to the log on user name. The test time can be used to identify the amount of time used to test the board. The component limit sets the number of component name and component type combinations written to the file. If the number of different components is less than the limit the file is padded with delimiters to the specified limits. All the fields of the file are separated by the selected delimiting character. The separate troublesheets are separated by a carrage return/linefeed.

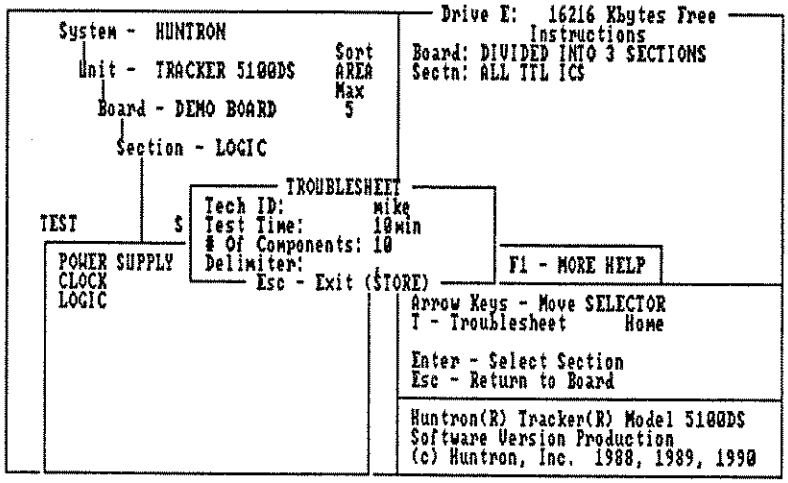


Figure 6-46. Troublesheet ASCII Delimited Entry Window.

The troublesheet can be initialized by using the Alt+I key combination. The troublesheet is also initialized by returning to the main menu or changing the current board. Initializing the troublesheet sets all of the components to untested and deletes all of the test signatures. This does not delete any stored files created with the store troublesheet options.

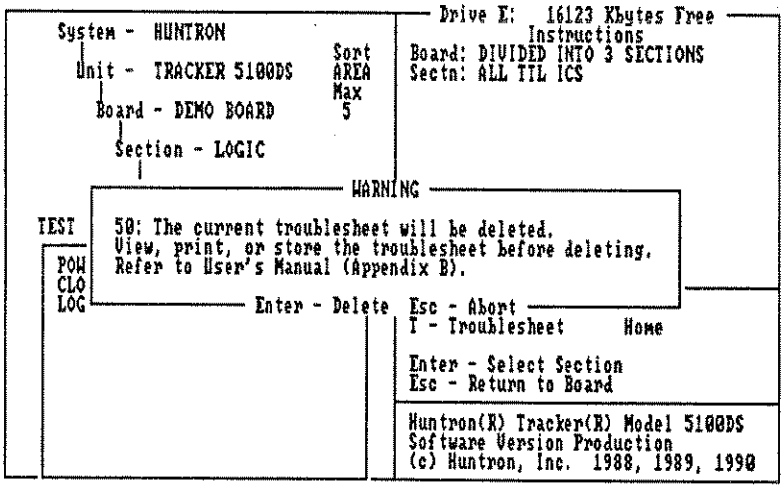


Figure 6-47. Troublesheet Alt+I Warning Window.

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6 - 12. VIEW MODE

The VIEW mode enables the 5100DS hardware so that signatures can be viewed on the CRT display of the 5100DS. It can be selected by pressing **V** at the Main menu or by selecting VIEW. The user can enable ranges for manual or automatic scanning of ranges and pins. Also, the user can edit the component data: number of pins, one or two common pins, and package type.

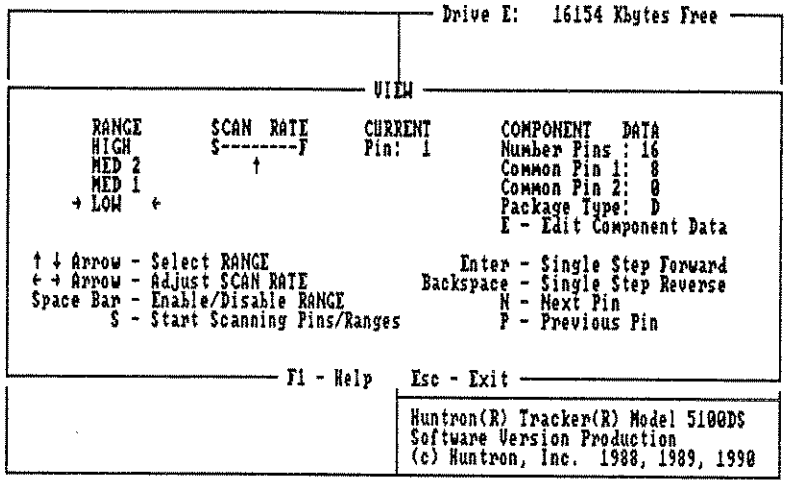


Figure 6-48. VIEW Mode.

ACTIVE KEYS:	FUNCTION:
F1	Displays information about using the VIEW mode.
↑ ↓ Arrows	Controls the range cursor (→ LOW ←) so that each range can be enabled or disabled in the scan sequence. The range is activated on the hardware whether or not the range is enabled.
← → Arrows	Controls the SCAN RATE used for automatic scanning.
↵ Enter	Performs a manual single step forward to the next range or pin in the scan sequence.
S	Toggles the action that starts or stops automatic range scanning. Once scanning is started, the only active keys are: S to stop scanning; the left and right arrows to change the scan rate; and F1 to display the help screen. Scanning will stop while the help screen is active.
E	Activates the EDIT mode which is indicated by flashing "Edit Component Data." The user can then enter the number of pins from 1 to 64, select one or two common pins, and select (D)IP or (S)IP for the package type. Common pins can be from 0 (= OFF) up to the highest pin number. At each entry field, the user types in the desired selection and then presses ↵ to go to the next field. If no new entry is typed in, pressing ↵ will select the previous entry unless that value is no longer valid.
Space Bar	Enables or disables the range that is selected by the range cursor. Enabled ranges are highlighted in YELLOW and disabled ranges are in BLUE on your PC's display.
Backspace	Performs a manual single step backward to the previous range or pin in the scan sequence.
N	Moves to the next pin in the scan sequence and leaves the range unchanged.
P	Moves to the previous pin in the scan sequence and leaves the range unchanged.

For example, you can use VIEW before a LEARN to preview component signatures or do a quick manual test of a component. Suppose you want to look at the signatures of U5 on the demo board in the LOW and MED 2 ranges. At the Main menu, select VIEW or press V. A pop-up window will appear displaying the keys that are active and the status of the hardware which has been activated.

Press the E key to start the EDIT mode which is indicated by flashing "Edit Component Data". Type the number of pins for U5 (i.e. 14), common pin 1 (i.e. 7), press ↵ to select common pin 2 = 0, press ↵ to select "D" (i.e. dual in-line package) for the package type.

To use only MED 2 and LOW ranges, you need to disable HIGH and MED 1 ranges. Press the ↑ arrow key and then the space bar to disable MED 1. Press the ↑ arrow key twice to move to the HIGH range. Press the space bar to deactivate the HIGH range. Press the ↑ arrow to return to the LOW range. When the cursor is at any range the hardware is switched to that range even if the range is deactivated.

Connect the 20 conductor flat ribbon cable to socket 4 on the 5100DS front panel. Make sure the colored stripe side of the cable is aligned with pin 1 of the socket. Attach a 14 pin IC clip to the cable. Make sure the colored stripe side of the cable is aligned with first pin of the IC clip. Connect the clip to U5 on the demo board. Make sure that pin 1 of the clip is located on pin 1 of U5.

The signature of pin 1 of U5 in LOW range is displayed on the 5100DS CRT. Press the S key to start scanning the pins and ranges of U5. Observe each pin's signature on the 5100DS CRT. Increase and decrease the scanning rate with the ← and → arrow keys. Press the S key to stop scanning. Use the ↵ to single step through the scanning sequence. To change the pin number without changing range, use the N and P keys. When you are finished looking at the signatures press Esc to return to the Main menu.

NOTE

VIEW mode can be accessed while in EDIT, LEARN, or TEST. The VIEW pop-up window will appear by pressing Alt+V. If you are at the component level in either EDIT, LEARN, or TEST, the component ranges selected there will be used while in VIEW mode.

APPENDIX A
RELATED DOS COMMANDS

To use the 5100DS software, you will find it necessary to use a few DOS commands. Further knowledge of DOS is highly recommended. For more information, refer to your PC operators manual.

COMMAND	SYNTAX	PURPOSE
cd	cd [*path*]	The **cd** command changes the working directory to the directory specified in *path*.

Examples: **cd\51DS** changes to your working directory, **cd** displays the name of the directory you are now in, and **cd** moves you back to your root directory.

dir	dir [*drive*] [*pathname*]	The **dir** command, typed by itself, lists all files in the working directory on the default drive. If you include a drive name, such as b:, with the **dir** command, all files in the root directory of the disk in the specified drive are listed, including sizes and modification dates.

Example: **dir c:\51DS** lists the files in the 5100DS working directory of your hard disk if you used the default settings during installation.

If your directory contains more files than you can see at one time, type **dir /p** to display one screen at a time. Pressing any key will advance the directory one screen.

format	format [*drive:*]	The **format** command creates the directory and the file allocation tables on a disk. You must use this command to format all new disks before MS-DOS can use them. Formatting is necessary before creating copies of learn data on floppy disks.

WARNING

Formatting destroys any previously existing data on a disk. Make sure your specified drive does not have an original file in it.

NOTES:

APPENDIX B
ERROR MESSAGES

Exiting Error Messages:

Esc - Abort

Esc aborts the current operation.

Enter - Continue Esc - Abort

Enter continues to execute the current operation.
Esc aborts the current operation.

Enter - Delete Esc - Abort

Enter deletes the current item.
Esc aborts the current operation, leaving the current item as it is.

CRITICAL ERROR Messages:

Please report errors of this type other than floppy drive errors to Huntron Technical Support.

LIST OF ERRORS:

1: GPIB communication failure

Check GPIB board installation.

Verify the installation of the GPIB board (See CHAPTER 2).

Check IBCONF.EXE configuration.

Verify the GPIB configuration by running the IBCONF.EXE program.

Check IBCONF.EXE configuration, cable, 5100DS power, 5100DS address.

Verify the GPIB configuration by running the IBCONF.EXE program. Verify the GPIB cable is screwed down on both ends. Verify the GPIB cable continuity. Verify the 5100DS is powered up. Verify the DIP switch settings for the base I/O address on the GPIB board match the settings in the IBCONF.EXE program.

Check the CONFIG.SYS, GPIB.COM and IBCONF.EXE files.

Verify the CONFIG.SYS file contains the GPIB.COM device driver and that the path matches the location of the GPIB.COM file. Verify that the GPIB.COM file exists in the appropriate directory. Verify the GPIB configuration by running the IBCONF.EXE program.

2: .25A signal fuse check failure

Check fuse continuity and voltage/amperage ratings.

This fuse is located on the front panel of the 5100DS. Use a screwdriver or thumbnail to press in and turn the holder in a counter-clockwise direction. Check fuse continuity and voltage/amperage ratings.

3: 1A common fuse check failure

Check fuse continuity and voltage/amperage ratings.

This fuse is located on the front panel of the 5100DS. Use a screwdriver or thumbnail to press in and turn the holder in a counter-clockwise direction. Check fuse continuity and voltage/amperage ratings.

4: The printer is off-line.

Set the printer on-line.

Consult the printer manual for on-line setting procedures.

5: The printer cable is disconnected.

Check the printer cable connections.

Make sure the printer cable is firmly connected at both ends. Verify the continuity of the printer cable.

6: The printer is out of paper.

Reload the printer with paper.

Consult the printer manual for paper loading procedures.

7: The printer is off.

Turn the printer power on.

Consult the printer manual for proper power up procedures.

8: Printer failure

Consult your printer manual.

The software cannot determine the problem with the printer. Check the printer manual for compatibility switch settings.

9: Open window failure

Please report errors of this type to Huntron Technical Support.

10: Close window failure

Please report errors of this type to Huntron Technical Support.

11: The maximum number of boards are already entered.

Transfer or delete an existing board.

The 5100DS system is limited to 110 boards per path. You can create a new path to store the boards, by using DRIVE, or you can make space in the current path by transferring and then deleting an existing board.

12: The maximum number of sections are already entered.

Delete an existing section or put in another board.

The 5100DS system is limited to 110 sections per board. Put the section in a different board or delete an existing section from the current board.

13: The maximum number of components are already entered.

Delete an existing component or put in another section.

The 5100DS system is limited to 330 components per section. Put the component in a different section or delete an existing component from the current section.

14: Not enough memory to create a board.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a board record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

15: Not enough memory to create a section.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a section record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

16: Not enough memory to create a component.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a component record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

17: Not enough memory to create pin information.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a pin record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

18: Not enough memory to create minimum signatures.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a signature record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

19: Not enough memory to create maximum signatures.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a signature record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

20: Not enough memory to create troublesheet signatures.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a signature record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

21: Not enough memory to create troublesheet.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a troublesheet record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

22: Not enough memory to create help.

Check available memory (INFO).

The software has run out of available RAM to allocate space for a help record. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

23: Out of memory

Check available memory (INFO).

The software has run out of available RAM. Activate INFO from the Main menu and check that available memory is greater than 190K. Remove memory resident programs and non-5100DS device drivers from memory.

24: A board name must be entered.

Enter a unique board name.

Each board in the 5100DS system must have a unique name.

25: Section name and max. must be entered.

Enter the appropriate fields.

The 5100DS system cannot store sections without a name. Components cannot be learned or tested without a Max.

26: Name, ranges, package, filter or # of pins are missing.

Enter the appropriate fields.

The 5100DS system cannot learn, test or store components without a name, learn ranges, test ranges, package, filter and a non-zero number of pins.

27: Pin name, test range and filter must be entered.

Enter the appropriate fields.

The 5100DS system cannot learn, test or store pins without a name, test range or filter.

28: The board name already exists.

Enter a unique name.

The name entered is the same as one of the other board names in this path. Names with the same characters, regardless of case (upper or lower), are considered the same.

Use ALT+R to create.

The name created by the BUILD function is the same as one of the other board names in this path. Names with the same characters, regardless of case (upper or lower), are considered the same. Use ALT+R to repeat the board and enter a new name.

29: The section name already exists.

Enter a unique name.

The name entered is the same as one of the other section names in this board. Names with the same characters, regardless of case (upper or lower), are considered the same.

Use ALT+R to create.

The name created by the BUILD function is the same as one of the other section names in this board. Names with the same characters, regardless of case (upper or lower), are considered the same. Use ALT+R to repeat the section and enter a new name.

30: The component name already exists.

Enter a unique name.

The name entered is the same as one of the other component names in this section. Names with the same characters, regardless of case (upper or lower), are considered the same.

Use ALT+R to create.

The name created by the BUILD function is the same as one of the other component names in this section. Names with the same characters, regardless of case (upper or lower), are considered the same. Use ALT+R to repeat the component and enter a new name.

31: The pin name already exists.

Enter a unique name.

The name entered is the same as one of the other pin names of this component. Names with the same characters, regardless of case (upper or lower), are considered the same.

32: The test ranges are not contained in the learn ranges.

The test ranges must be contained in the learn ranges.

The 5100DS system cannot test in ranges that have not been learned. Set the test ranges to ranges that are contained in the learn ranges or change the learn ranges.

33: A DIP package was entered with an odd number of pins.

A DIP package must have an even number of pins.

The 5100DS scans DIP packages by activating the relays. The first half of the pins are scanned from left to right on the front side of the front panel connectors. The second half of the pins are scanned from right to left on the back side of the front panel connectors. This algorithm will not work with an odd number of pins.

34: One of the common pins is larger than the number of pins.

The common pin(s) must be lower or equal to the number of pins.

The common pins cannot be specified outside of the size of the component.

35: Signature, pin and troublesheet information will be deleted.

The related component information has been changed.

The signature, pin, and troublesheet information must be deleted because they are affected by the LEARN ranges, package type, filter, number of pins, and common pins.

36: Signature and troublesheet information will be deleted.

The related pin information has been changed.

The signature and troublesheet information must be deleted because they are affected by the test range, filter, and common pins.

37: User name and password combination are not on file.

Enter a user name and password combination that is on file.

Consult a user with a security level high enough to access the security function to check your name and password. If you are the only user with this ability, contact Huntron Technical Support to gain access to the program.

38: There are no boards.

The current operation cannot be performed without any boards in the system.

Make sure the current drive/path setting is correct.

39: This board contains no sections.

The current operation cannot be performed without any sections in the board.

Make sure the proper board was selected.

40: This section contains no components.

The current operation cannot be performed without any components in the section.

Make sure the proper board and section were selected.

41: This board contains no components and/or pin information.

The current operation cannot be performed without any components or pin information in any of the sections of the board.

Make sure the proper board and section were selected.

42: The path entered is not valid.

The path entered is an invalid DOS path.

43: This component has not been learned.

The 5100DS system cannot test components that have not been learned.

Learn the current component on a known good board.

44: This component has not been tested.

The 5100DS system cannot show the test results of a component that has not been tested. Test the current component on the board currently being tested.

45: The current learn signatures have not been saved.

To save the signatures, store or merge before exiting.

This message appears as a safeguard to make sure that you really do not want to save the current learn signatures. You will always see this when you realize something was wrong with the current learn and you press Esc to relearn the component.

46: The current signatures will replace the stored signatures.

View signatures to verify.

The stored signatures will be lost.

47: The current signatures will replace the merged signatures.

View signatures to verify.

The merged signatures will be lost.

48: The current signatures will merge with stored signatures.

View signatures to verify.

The stored signatures will be converted to merged learns, doubling the amount of disk space used.

49: The current signatures will merge with merged signatures.

View signatures to verify.

The merged signatures will be modified to include the current signatures.

50: The current troublesheet will be deleted.

View, print, or store the troublesheet before deleting.

When changing boards or returning to the Main menu, the troublesheet temporary files will be deleted. This will not affect stored troublesheets.

51: Board directory failure

Make sure you have selected a valid drive/path.

Check to make sure the current drive is not full.

52: Board file failure

Make sure you have selected a valid drive/path.

Check the available space on the current drive.

53: Section file failure

Check the available space on the current drive.

54: Component file failure

Check the available space on the current drive.

55: Pin file failure

Check the available space on the current drive.

56: Signature file failure

Check the available space on the current drive.

57: Minimum signature file failure

Check the available space on the current drive.

58: Maximum signature file failure

Check the available space on the current drive.

59: Troublesheet signature file failure

Check the available space on the current drive. Make sure that the temporary files path is valid.

60: Troublesheet file failure

Check the available space on the current drive. Make sure that the temporary files path is valid.

61: Security file failure

Check the available space on the current drive. Security file is missing.

62: Setup file failure

Check the available space on the current drive.

63: Help file failure

Help files are missing or file error.

64: The current board will be deleted.

Sections and components will be lost. There is no "undelete" function available.

65: The current section will be deleted.

Components will be lost. There is no "undelete" function available.

66: The current component will be deleted.

Signatures and pin information will be lost. There is no "undelete" function available.

67: The current component pin information will be deleted.

Pin information will be lost. There is no "undelete" function available.

68: The component names will be sorted into alpha-numeric order.

There is no feature to undo the sort.

The learn/test order of the components will be altered. Once changed there is no way to change it back.

69: Illegal selection

Please report errors of this type to Huntron Technical Support.

70: Compression failure

Make sure PKZIP.EXE is in the current directory.

The PKZIP.EXE file should be in the same directory as the other program files.

71: Decompression failure

Make sure PKUNZIP.EXE is in the current directory.

The PKUNZIP.EXE file should be in the same directory as the other program files.

72: Backup file failure

Check the available space on the current drive.

73: Break key disable failure

Please report errors of this type to Huntron Technical Support.

74: Cannot delete with component ranges set to 'PIN' or '???'.

Change the component ranges and then delete.

A component with learn ranges settings of PIN or ??? requires pin information to be learned and tested. Change the component ranges and then delete the pin information.

75: No path specified

A path must be specified.

76: Invalid drive

The drive entered is not a valid drive on this computer.

77: Invalid directory

One of the directories in the path entered does not exist.

78: Invalid path or filename

The path must exist.

79: Invalid syntax

Please report errors of this type to Huntron Technical Support.

80: Invalid entry

Please report errors of this type to Huntron Technical Support.

81: Cannot change with learn and test ranges set to 'PIN'.

There is only one learn range per pin and the tolerance is specified per pin so changing is not allowed.

82: Cannot change with section learns or pin information.

One of the components in the current section has been learned or has pin information. Global changes cannot be made.

83: The current component troublesheet information will be deleted.

Troublesheet signatures and difference information will be lost.

The Troublesheet status of the current component is changed to REMOVED. The Troublesheet summary will be updated and the component will be removed from the list of different components.

APPENDIX C
TABLE OF SHORT CUT KEYS

This appendix lists the summary of the short cut keystrokes using the combination of the Alt key and another designated key to move quickly from mode or function to another.

KEY	MODE	LEVEL	ACTION
Alt+F1	All	All	Displays the list of Alt keys and their functions as a help screen.
Alt+B	EDIT	ALL	Builds a new component by incrementing the number at the end of the name of the current component. The component entry screen does not appear. (Refer to Chapter 5 for an example of this feature.)
Alt+C	EDIT	SECT	Changes LEARN and/or TEST ranges for all of the components in the section if none have been learned. Also allows changes to the tolerance for all the components in the section regardless of LEARN status if no components have pin information stored. (Refer to Chapter 6 for more information.)
Alt+E	LEARN	ALL	Changes to the EDIT mode.
	TEST	ALL	
Alt+G	LEARN	COMP	When viewing signatures, toggles the graticule on and off.
	TEST	COMP	
Alt+I	TEST	ALL	Initializes the data for the current troublesheet. All components are set to the untested condition. (Refer to Chapter 6 for more information.)
Alt+L	EDIT	ALL	Changes to the LEARN mode.
	TEST	ALL	
Alt+M	EDIT	ALL	Returns to the Main menu. Also works from the results window.
	REPORT	BOARD	
	BACKUP	BOARD	
	COPY	BOARD	
	MOVE	BOARD	
	LEARN	ALL	
	TEST	ALL	
Alt+N	EDIT	COMP	Displays section disk space needed pop-up window. This shows the amount of disk space required for merged learns of all components in the current section.
	LEARN	COMP	
	TEST	COMP	

Table C-1. Short Cut Keys.

KEY	MODE	LEVEL	ACTION
Alt+O	EDIT	COMP	Sorts component names in ascending alphanumeric order. (Refer to Chapter 6 for more information.)
Alt+P	EDIT	ALL	Activates the PROBE mode. If it is used at the component level or the results window, the active ranges will be set.
	REPORT	BOARD	
	BACKUP	BOARD	
	COPY	BOARD	
	MOVE	BOARD	
	LEARN	ALL	
	TEST	ALL	
Alt+Q	TEST	COMP	Quick change of the test ranges and / or tolerance for only the next test of the current component. (Refer to Chapter 6 for more information.)
Alt+R	EDIT	ALL	Repeats the current component entry screen with a blank name.
Alt+S	LEARN	COMP	When viewing signatures, toggles between DOT and LINE display modes.
	TEST	COMP	
Alt+T	EDIT	ALL	Changes to the TEST mode.
	LEARN	ALL	
Alt+V	EDIT	ALL	Activates the VIEW mode. If it is used at the component level or the results window, the component information will be set.
	REPORT	BOARD	
	BACKUP	BOARD	
	COPY	BOARD	
	MOVE	BOARD	
	LEARN	ALL	
	TEST	ALL	
Alt+#	LEARN	COMP	When viewing signatures, allows user to select one of the eight signatures to zoom in on (# = 1 - 8). Alt+1 is the same as pressing the Z key.
	TEST	COMP	

Table C - 1. Short Cut Keys. (cont)

NOTE: LEVEL refers to the BOARD, SECTION, or COMPONENT screen of the program.

APPENDIX D
EXAMPLES OF COMPONENT SIGNATURES

TESTING RESISTORS

If a resistance that is decreasing in magnitude, is applied across the Tracker 5100DS test probes, then the trace on the 5100DS CRT will rotate in a counterclockwise direction around its center axis from an open circuit position. The degree of rotation is a function of the resistance value and the test range selected.

THE LOW RANGE

The LOW range is designed to test resistance between 1Ω and 400Ω. Figure D-1a shows the effect of resistance on the angle of rotation in the LOW range. A 1Ω resistor causes almost 90 degrees of rotation, and a 50Ω resistor produces a 45 degree rotation. A 400Ω resistor causes a small rotation. Resistors lower than 1Ω appear as a short circuit (i.e. vertical trace) and resistance valúes above 400Ω look like open circuits (i.e. horizontal trace).

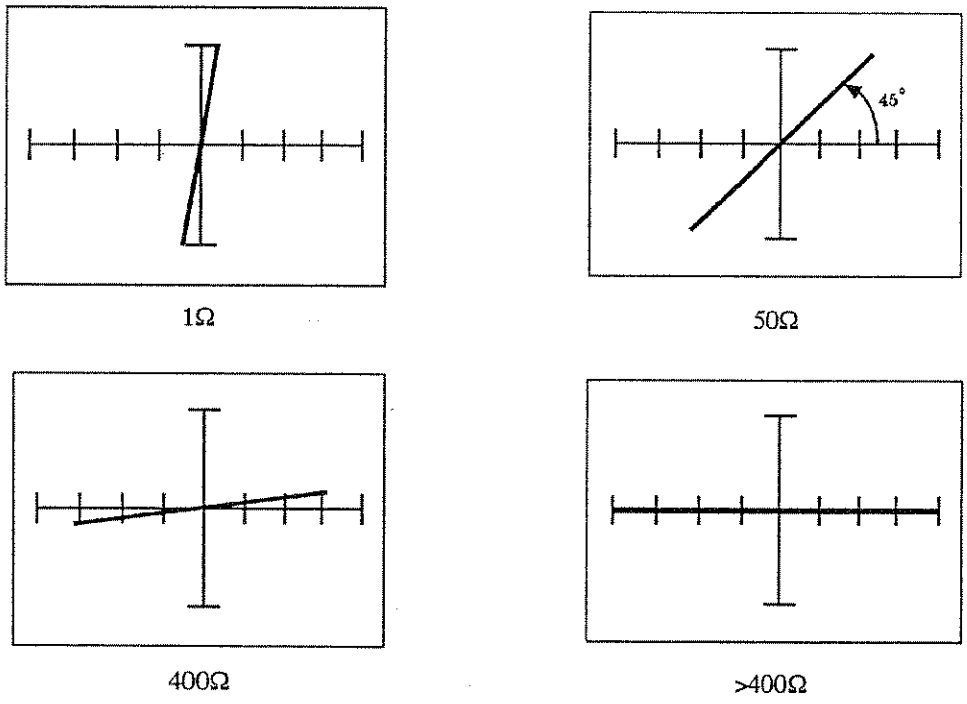


Figure D-1a. Effects of Resistance on the Rotation Angle in the LOW Range.

THE MEDIUM 1 RANGE

The MED 1 range is designed to test resistance between 50Ω and 10kΩ. Figure D-1b shows the signatures for a 50Ω resistor, a 1kΩ resistor, a 10kΩ resistor, and a >10kΩ resistor using the MED 1 range. Resistors that are smaller than 50Ω appear almost as a vertical line. A 1kΩ resistor causes an angle of rotation of 45 degrees, while the display for a 10kΩ resistor shows only slight rotation. Resistance values higher than 10kΩ produce such a small rotation angle that the trace appears almost like a horizontal line.

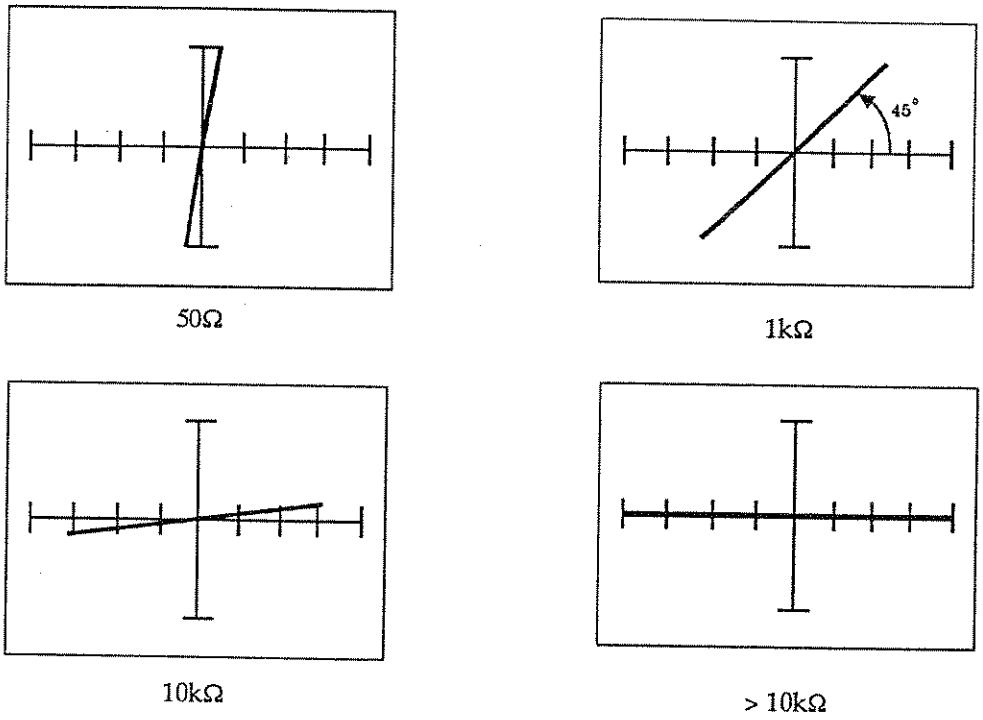


Figure D1 -b. Effects of Resistance on the Rotation Angle in the MED 1 Range.

THE MEDIUM 2 RANGE

The MED 2 range is designed to test resistance between 1kΩ and 200kΩ, as shown in Figure D-1c.

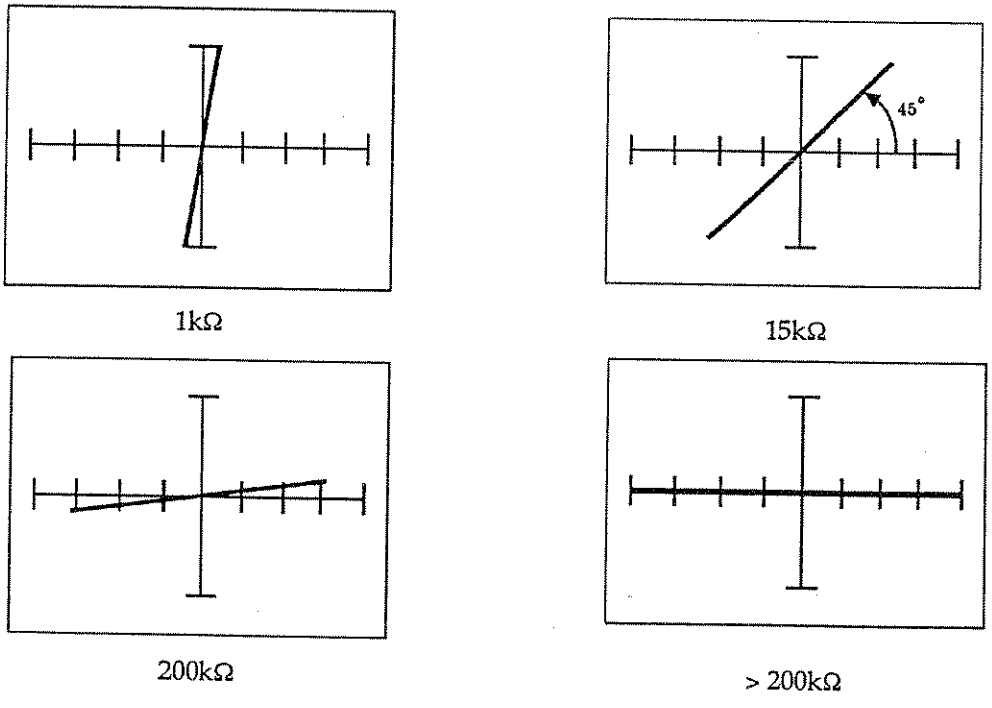


Figure D-1c. Effects of Resistance on the Rotation Angle in the MED 2 Range.

THE HIGH RANGE

The HIGH range is designed to test resistance between 3kΩ and 1MΩ, as shown in Figure D-1d.

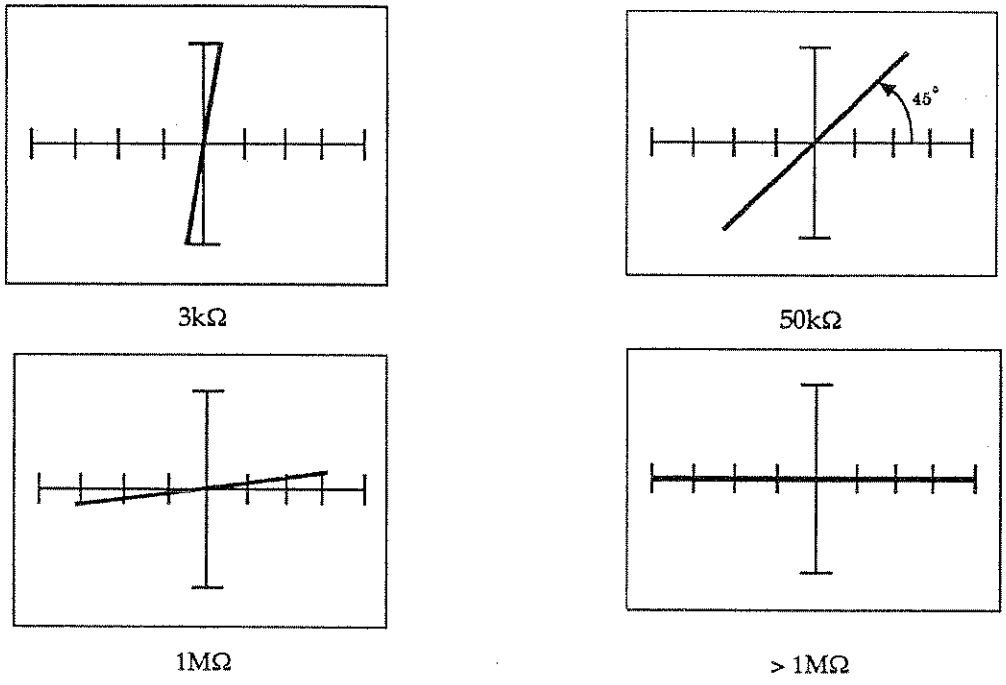


Figure D-1d. Effects of Resistance on the Rotation Angle in the High Range.

TESTING CAPACITORS

A capacitor produces an elliptical signature on the 5100DS. In the lower ranges, this ellipse approaches a open circuit. In the higher ranges it approaches a short circuit. If this signature becomes irregular or broken, the component may be defective.

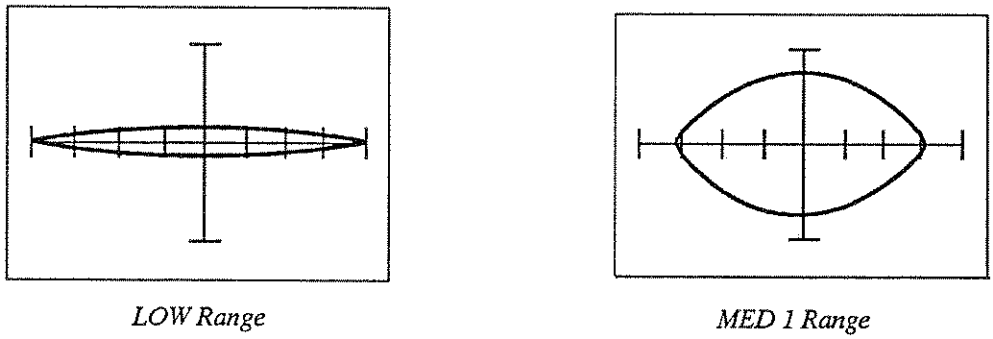
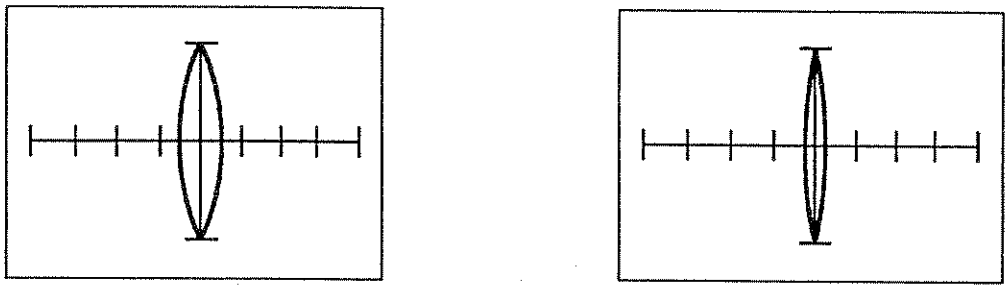


Figure D-2. Signatures of a 0.22 uF Capacitor at 200 Hz.



MED 2 Range *HIGH Range*

Figure D-2 (cont.). Signatures of a 0.22uF Capacitor at 200 Hz.

TESTING DIODES

SIGNATURES OF GOOD DIODES

The volt-ampere characteristics of a good diode are shown in Figure D-3. For the sake of clarity, the output current (I_o) has been greatly exaggerated in magnitude. The dashed portion of the curve indicates that, at a certain reverse voltage (V_{br}), the diode signature abruptly changes direction. At this critical voltage, a large reverse current flows and the diode is said to be in the breakdown region.

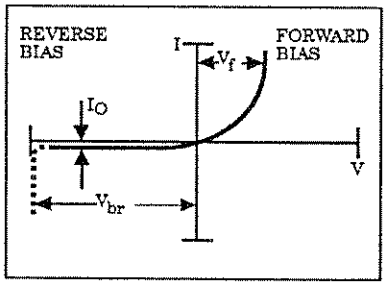
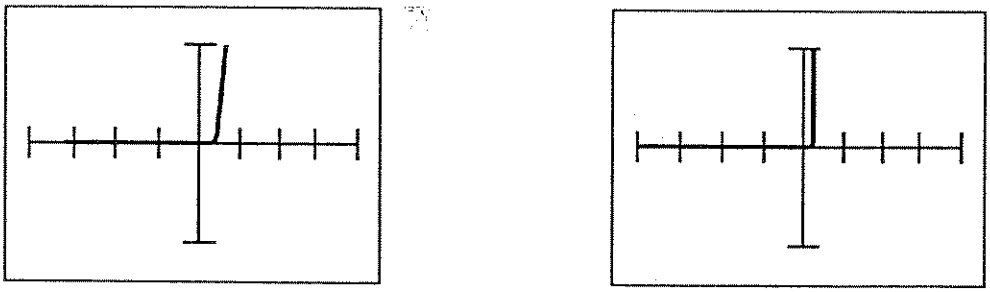


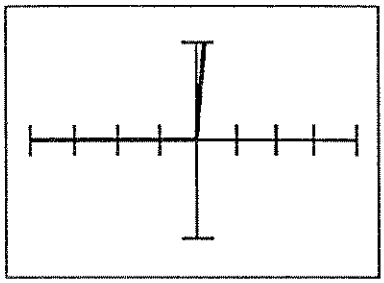
Figure D-3. Volt-Ampere Characteristics of a Diode.

A good diode has very large reverse-biased resistance and small forward-biased resistance. The forward junction voltage drop (V_f) is between 0.5 volts and 2.8 volts depending on the semiconductor material. For example, V_f is 0.6 volts for a silicon diode, whereas V_f is 1.5 volts for a typical light emitting diode. The 5100DS can visually display all these parameters.

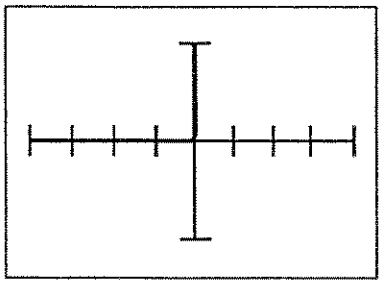


LOW Range *MED 1 Range*

Figure D-4. Signatures of a Silicon Diode at 200Hz.



MED 2 Range



HIGH Range

Figure D-4 (cont). Signatures of a Silicon Diode at 200Hz.

SIGNATURES OF DEFECTIVE DIODES

A diode is defective if it is open, is shorted (low impedance), has high internal forward impedance, or has leakage. Figure D-5 shows the signatures of an open diode in all ranges.

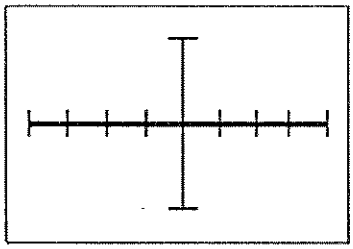


Figure D-5. Signature of an Open Diode.

The 5100DS is capable, in the LOW range, of detecting resistance higher than 1Ω, and this resistance causes the vertical line to rotate in a clockwise direction. The angle of rotation is a function of the resistance magnitude. Figure D-6 shows the effect of circuit resistances on the trace rotation while in the LOW range. These small resistances cause short circuit signatures in the MED 1, MED 2, and HIGH ranges.

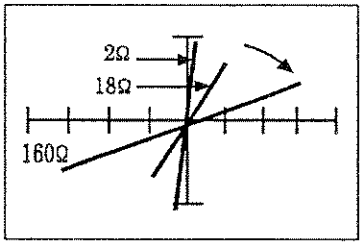
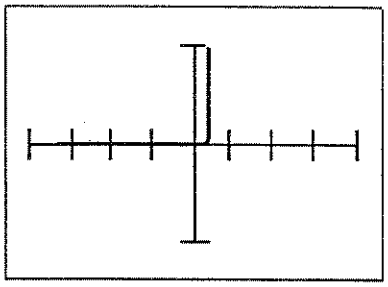


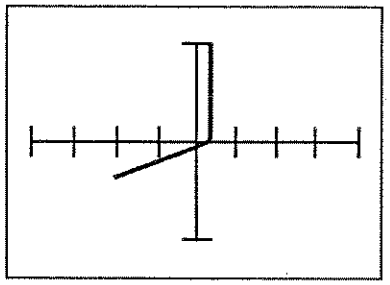
Figure D-6. Effect of Resistance on a Signature in the LOW Range at 200 Hz.

The resistance will alter a diode's signature by rotating a section of it. Nonlinear resistance in series with the diode junction appears as a rotation of the forward bias portion. This resistance affects the ability of the diode to turn on at the proper voltage, and can cause excessive heat dissipation. Figure D-13 illustrates this condition.

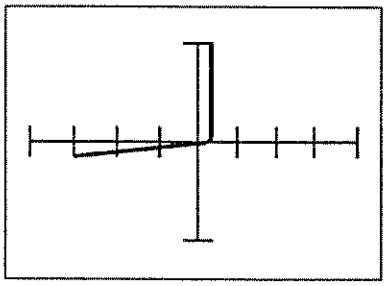
Another diode failure is leakage resistance, which can be modeled as resistance in parallel with a perfect diode. This resistance affects the ability of the diode to provide maximum output for a given input.



No leakage

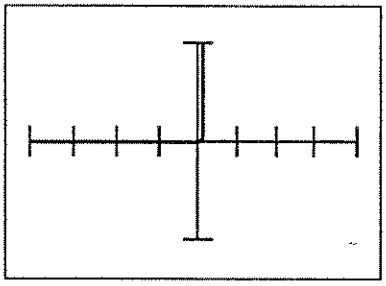


100Ω

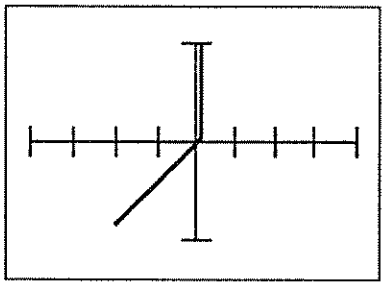


1kΩ

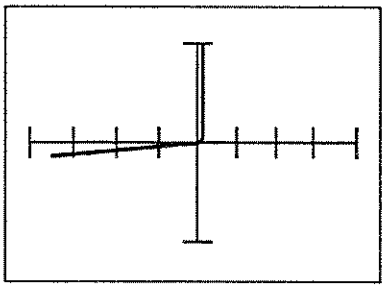
Figure D-7a. Influence of Leakage Resistance in the LOW Range at 200Hz.



No leakage

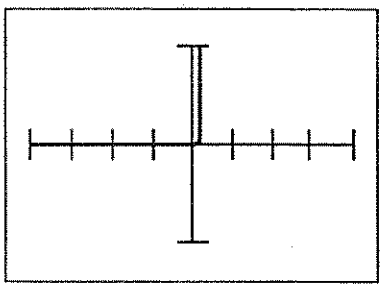


1kΩ

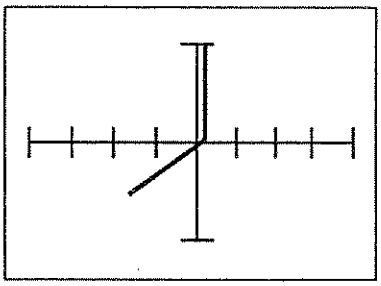


10kΩ

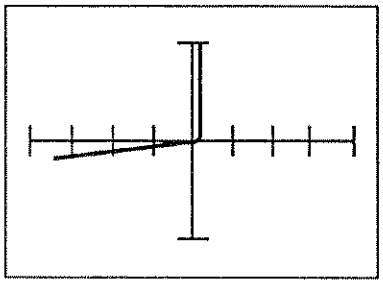
Figure D-7b. Influence of Leakage Resistance in the MED 1 Range at 200Hz.



No leakage

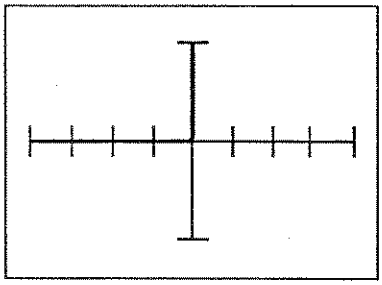


10kΩ

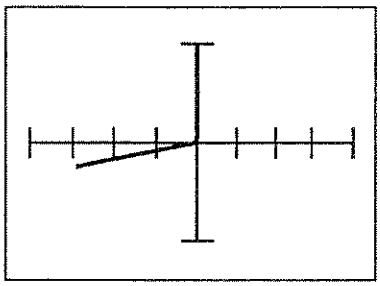


100kΩ

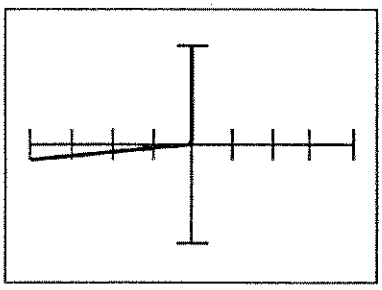
Figure D-7c. Influence of Leakage Resistance in the MED 2 Range at 200Hz.



No leakage



100kΩ



1MΩ

Figure D-7d. Influence of Leakage Resistance in the HIGH Range at 200Hz.

TESTING ZENER DIODES

The zener diode is unique among the semiconductor family of devices in that its electrical properties are derived from a rectifying junction which operates in the reverse bias region. Figure D-8 shows the volt-ampere characteristics of a typical 30 Volt zener diode.

The zener diode conducts current in both directions, with the forward current being a function of the forward voltage. Note that the forward current is small until the forward voltage is approximately 0.6V, then the forward current increases rapidly. When the forward voltage is greater than 0.6V, the forward current is limited primarily by the circuit resistance external to the diode. This is essentially equivalent to a regular silicon diode for current flow in the forward direction.

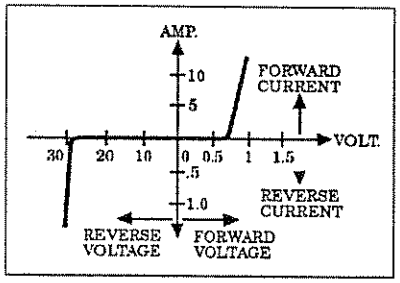
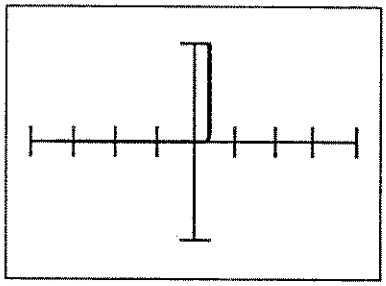
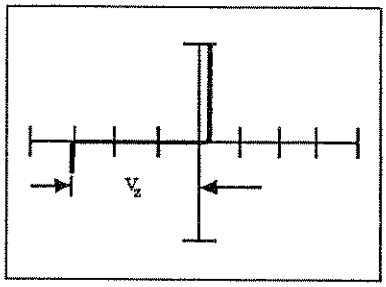


Figure D-8. Characteristics of a Typical 30V Zener Diode.

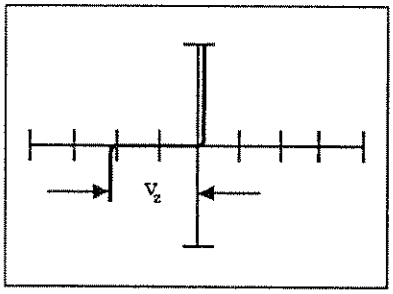
The reverse current is a function of the reverse voltage and, for most practical purposes, is zero until the reverse voltage equals the junction breakdown voltage. At this point, the reverse current increases rapidly. The junction breakdown voltage (V_z in Figure D-9) is usually called the zener voltage.



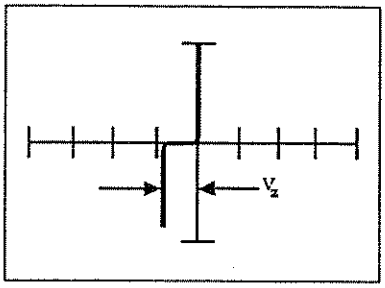
LOW Range
Test signal ($10V_{peak}$) is not high enough to cause zener breakdown.



MED 1 Range
Test signal ($15V_{peak}$) allows zener breakdown to occur.



MED 2 Range
Test signal ($20V_{peak}$)



HIGH Range
Test signal ($60V_{peak}$)

Figure D-9. 12V Zener Diode in All Ranges at 200Hz.

In the low range, the 5100DS test signal at the probes is insufficient to cause zener breakdown. As a result, the signature looks identical to that of a general purpose diode. However, in the MED 1 range, the test signal is greater and the zener voltage can be seen.

A good zener diode gives a sharp, well-defined signature of zener breakdown voltage, such as Figure D-10a, while a marginal zener gives a signature with a rounded corner, as in Figure D-10b.

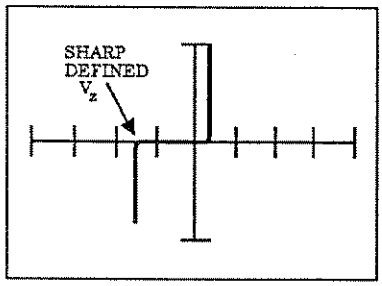


Figure D-10a. Signature of a good Zener Diode in the MED 1 Range at 200Hz.

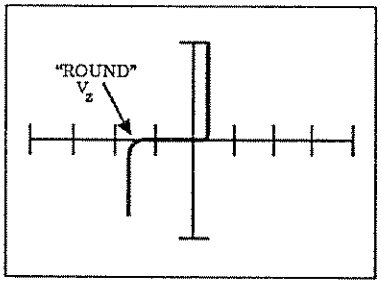


Figure D-10b. Signature of a marginal Zener Diode in the MED 1 Range at 200Hz.

TESTING TRANSISTORS

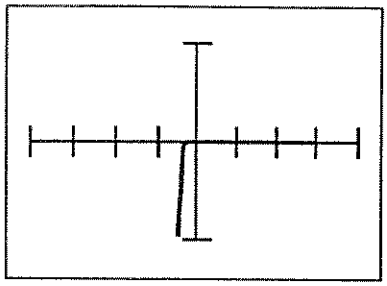
Use of the 5100DS may alter the current gain of a bipolar transistor whenever the emitter is tested. Either the base-emitter or collector-emitter test circuits satisfy this criterion. While heating of the device due to the current produced by the 5100DS may produce a temporary change in the current gain (most noticeable in the low range), a permanent shift in the current gain may occur whenever the base-emitter junction is forced into reverse breakdown. The magnitude of the shift depends on the duration of the test and the range selected. MED2 and HIGH produce the smallest changes.

Most bipolar transistor circuit designers take into account a wide variation in current gain as a normal occurrence and design the related circuitry to function properly over the expected range of the current gain. The effects mentioned above are for the most part smaller than the normal device variation so that the use of the 5100DS will have no effect on the functionality of good devices and can fulfill its intended purpose as a means to locate faulty components.

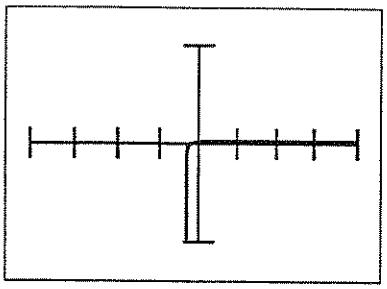
However, some circuits may depend on the current gain of the particular part in use (such as instrumentation that is calibrated to a certain current gain value, or precision differential amplifiers with matched transistors). In such instances, the 5100DS should not be used, since its use may cause the current gain to shift outside the limited range where calibration can correct for any change. Refer to Figure D-11 for an example of transistor signatures.

Suggestions to minimize effects on bipolar transistors:

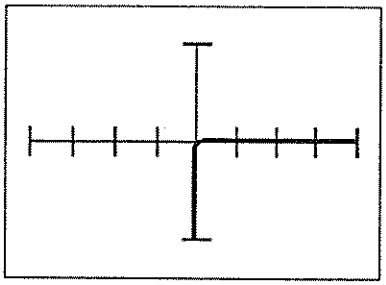
- Keep the duration of the test as short as possible, less than 3 seconds in the LOW range.
- Use the MED 2 or HIGH ranges as much as possible.



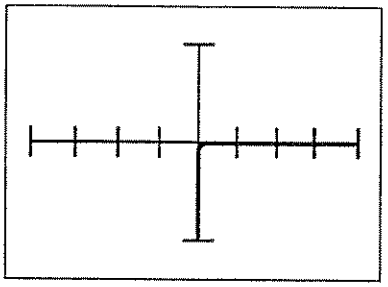
LOW Range



MED 1 Range



MED 2 Range



HIGH Range

Figure D-11. Signatures of the Collector of an NPN Transistor at 200Hz with Base as Common.

TESTING MULTIPLE COMPONENTS

The preceding pages have discussed the signatures for resistors, capacitors, diodes and transistors. This section examines circuits formed by multiple components, such as diodes in series or in parallel with a resistor. It is very important for users to understand composite circuit signatures prior to printed circuit board level troubleshooting. Based on the information contained in the previous sections, the following diagnostics are presented in Table D-1.

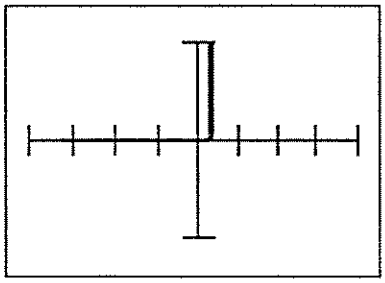
COMPONENTS	RANGE	SIGNATURE DESCRIPTION
Open circuit	All	Horizontal line
Short circuit	All	Vertical line
Resistor	All	Straight diagonal line
Diode	All	L shape
Zener Diode	All	Chair shape
Capacitor	All	Ellipse or circle

Table D-1. Component Signatures Diagnostic Table.

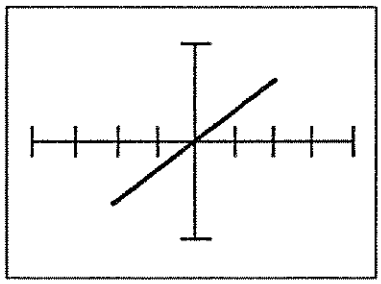
Good signatures for multiple components on the 5100DS depend on a number of variables, such as whether the components are in series or in parallel, the value of the components, and the selected test and learn ranges.

DIODE AND RESISTOR IN PARALLEL

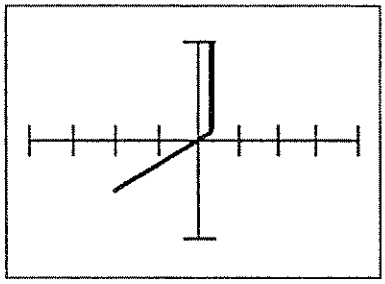
Figure D-12 shows the effect of a resistor on a diode signature. The resulting multiple signature is a composite of the two, with the diode dominating the vertical section of the signature, and the resistor dominating the horizontal section.



Diode Only



50Ω Resistor Only

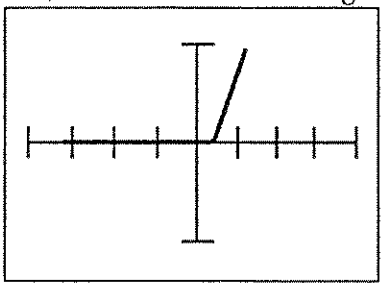


Combined

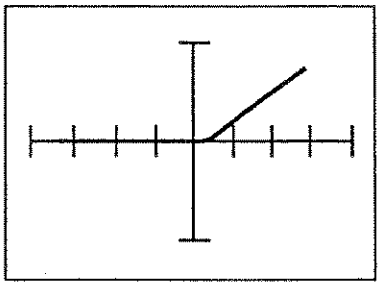
Figure D-12. Parallel Diode/Resistor Signature in the LOW Range.

DIODE AND RESISTOR IN SERIES

Figure D-13 shows the effect of a resistor on a diode signature. In this case, the diode dominates the horizontal section of the signature, and the resistor dominates the vertical section. As the value of the resistor increases, the slant of the diode signature approximates a horizontal line.

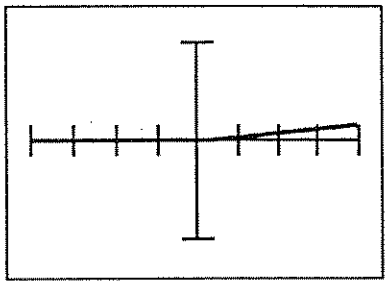


10Ω



50Ω

Figure D-13. Series Diode/Resistor Signature in the LOW Range.



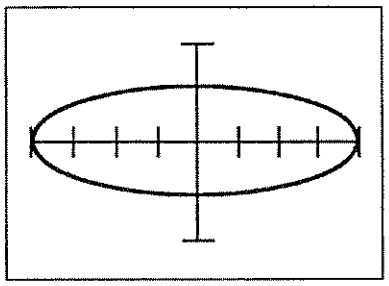
500Ω

Figure D-13 (cont.). Series Diode/Resistor Signature in the LOW Range.

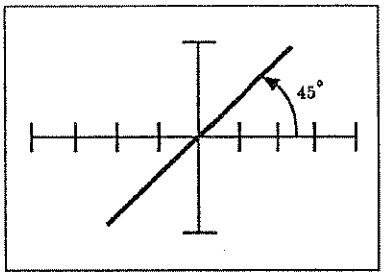
CAPACITOR AND RESISTOR IN PARALLEL

As previously discussed, a capacitor produces an ellipse, and a resistor produces a rotated straight line. Consequently, a resistor in parallel with a capacitor reduces the size of the ellipse and causes its major axis to rotate. The magnitude of the angle is determined by the value of the resistor and the range selected on the 5100DS.

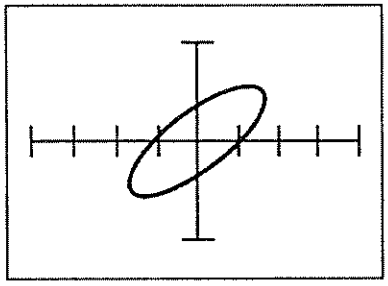
Figure D-14 shows the effect of a 50kΩ resistor on a 0.1μF capacitor (rotation and shrinking of the ellipse) in the HIGH range.



0.1μF Capacitor Only



50kΩ Resistor Only

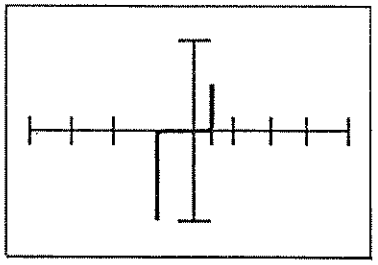


Combined

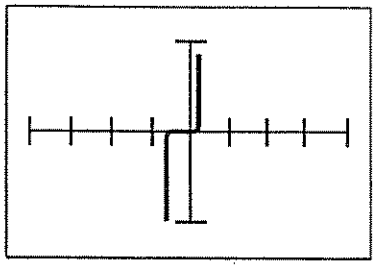
Figure D-14. Parallel Capacitor/Resistor Signature in the HIGH Range.

TESTING INTEGRATED CIRCUITS

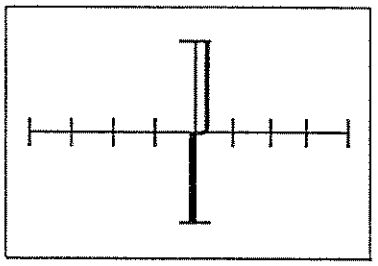
This manual has discussed the techniques of testing resistors, capacitors, diodes and transistors. All of these techniques can be applied to test integrated circuits. The signature produced across any two pins of an integrated circuit is the resultant effect of resistors, diodes, transistors and capacitors. The clips on the 5100DS test an IC pin by pin with respect to a common pin, obtaining a complete picture of the status of that component.



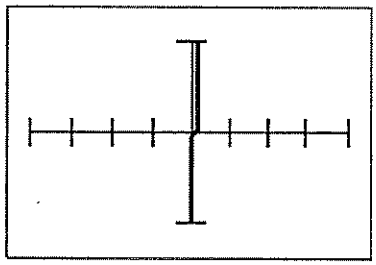
LOW Range



MED 1 Range

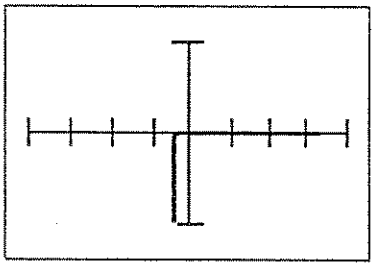


MED 2 Range

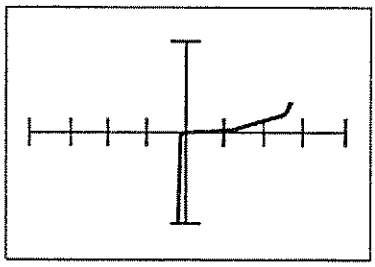


HIGH Range

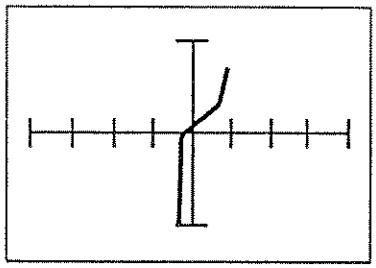
Figure D-15. Signatures between the Input and Output pins of a Good 7805 IC.



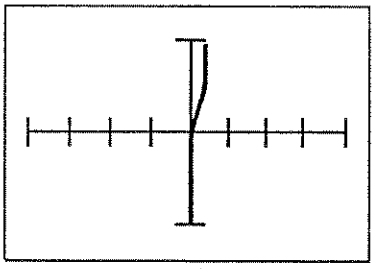
LOW Range



MED 1 Range



MED 2 Range



HIGH Range

Figure D-16. Signatures between the Input and Output pins of a Defective 7805 IC.

Note the differences in the LOW and MED 1 ranges. The defective 7805 is missing the clearly defined breakdown voltage that is apparent in the signature from a good IC.

NOTES:

APPENDIX E
TESTING CMOS DEVICES

CMOS

There is a basic assumption made when performing comparison testing using Trackers in general and the Tracker 5100DS in particular. The assumption is that two pins on a given board will always produce the same signature given the same stimulus (i.e., a certain range).

When testing boards that contain CMOS ICs (particularly metal gate CMOS, like the 4000 series), there are certain effects which make the above assumption invalid.

Therefore, to test CMOS devices with the 5100DS, you must use special techniques to minimize those effects. The following information describes the problems that are often encountered with CMOS and a recommended procedure for dealing with them.

IDENTIFYING A CMOS DEVICE

CMOS devices are generally identifiable by their number codes. Look for a 4000 series in the number, such as CD4040BN, or a number that starts with 74 and is followed by a C, such as 74C138 or 74HC138.

CMOS EFFECTS

A normal practice in electronic design is to put capacitors across the power supplies of ICs to prevent undesired signals or noise from being distributed via the power bus. On a typical 5 Volt power supply board, there might be one capacitor with a value of 0.01μF to 0.1μF for every five ICs, plus a 10μF capacitor across the supply right at the point where it comes onto the board. These capacitors are usually called *decoupling* or *bypass* capacitors.

When this typical board is tested with a 5100DS, there are two effects that can occur due to the capacitance on the power supply pins of an IC. First, signatures will be slow in settling to their steady state. If you go to the VIEW SIGNATURES mode and scan a CMOS IC, this slow signature time can be observed visually: after a pin is selected, the signature will move for a moment and then stop. Figure E-1 shows the initial signatures as dotted lines and the final stable signature as a solid line.

The second effect is that the horizontal portion of a normal "chair" signature (see Figure E-2) can move upwards until the signature looks like Figure E-3. The total value of power supply capacitance will affect which TEST ranges produce these effects.

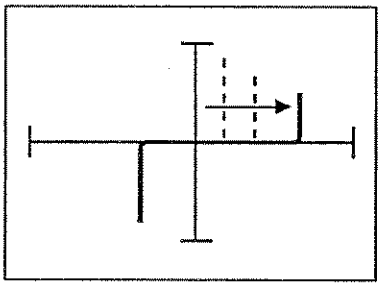


Figure E-1. Slow Settling CMOS Signatures

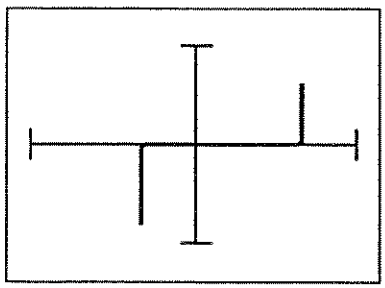


Figure E-2. Normal CMOS "chair" Signature

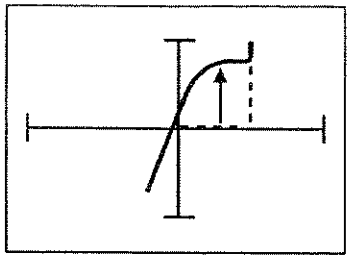


Figure E-3. CMOS Charging Effect Signature

The main problem with testing CMOS is the second one mentioned above: the *charging effect*. This is because the effect is not repeatable. Keeping all conditions the same (test pin, common pin, range, device under test) can result in either Figure E-2 or Figure E-3. The 5100DS cannot work under those conditions: if the signature of Figure E-2 is learned and the signature of Figure E-3 shows up during TEST, the difference will be caught, even if you test the same IC that was learned.

To deal with these effects requires two steps which are covered in detail in the following section:

- Match the testing time to the settling time.
- Eliminate the charging effect by putting a suitable resistance across the power supply.

TESTING PROCEDURE

This information concerns how to set up the TREE and learn a CMOS board. To eliminate the charging effect, first try using a 10kΩ resistor clip (supplied with the 5100DS) across the power supply of the board to be learned while using the VIEW mode to observe a signature like Figure E-3. If that resistance is sufficient, the horizontal portion of the signature should move down and become like Figure E-2. Then, with the resistor still in place, check several other ICs on the board to make sure that no signatures like Figure E-3 are present (be sure to check all ranges).

Starting at 10kΩ (because any resistance above that will have no effect), you should use the highest resistance that eliminates the charging effect. Therefore, if the 10kΩ resistor does not totally eliminate the charging effect, try a 1kΩ resistor clip (also supplied with the 5100DS) and then repeat the tests above. If the 1kΩ resistor does not work, then use a jumper wire (zero resistance) across the supply. A short across the supply will eliminate the charging effect because the capacitance is shorted out and no longer affects the signatures; however, it also tends to mask out subtle differences in the signatures that will lower the troubleshooting efficiency of the 5100DS. Therefore, a short should be used only as a last resort.

One tip that can enable the use of a higher resistance is to desolder large capacitors on the power supply (e.g. the 10μF capacitor on the typical board mentioned above) if there are few of them. It is not practical to remove the smaller power supply capacitors which are usually quite numerous, but removing the larger capacitors can substantially reduce the total power supply capacitance, making a board much easier to test.

This technique, as discussed so far, has mentioned only single supply boards. If there are multiple supplies, each one must be controlled with an appropriate resistance until the charging effect is gone.

Once the charging effect is eliminated, the slow settling time will probably still be present (refer again to Figure E-1 for a typical example). The second step takes care of this by introducing a delay before the data of each pin is read by the 5100DS hardware.

The parameter that controls the timing is called the Max. # of Samples (referred to as Max. in the following text).

MAX. # OF SAMPLES

You enter a value for Max. in the EDIT mode when entering the section information. After that, both learning and testing take place using Max. as an upper limit in order to obtain consistent data.

Start with Max.=10 and modify Max. depending on the consistency of results. After setting Max., do a trial LEARN and watch the signatures on the CRT to see if they stop moving before the next signature appears. If signatures have stabilized, then the value selected for Max. is fine. If not, use a higher value for Max. until they do stabilize. To change Max., go into the EDIT mode, select the section being learned, and change the Max. value.

In general, if Max. is too small, then test results will be erratic and marked UNSTABLE, since signatures have not stabilized. Experiment with different values of Max. to find an optimum value for a particular section or device. Once that good LEARN data is obtained, the same conditions of power supply resistance must be repeated while testing.

MORE INFORMATION ON MAX. # OF SAMPLES

You can enter a Max. value from 1 to 99 in the TREE for each section of a board. The Max. variable is used when 5100DS signatures do not stabilize immediately after relay closure. The 5100DS will keep trying to obtain a stable sample up to the Max. value, if needed. A signature will be marked unstable in the Status Pop-up Window by "UNSTABLE", if Max was exceeded and a stable sample was not aquired. The component will also be marked unstable in the VIEW SIGNATURES SCREEN by "US" appearing at the unstable pins.

Time for Max. = 1 is about 100ms per pin of a device.

Worst case testing time for a given number of pins will increase in direct proportion to the Max. variable.

NOTES:

APPENDIX F
APPLICATIONS AND TECHNICAL NOTES

This appendix is intended to provide you with practical information about the Tracker 5100DS and its application.

The information is in the form of Application Notes and will be added to on an infrequent basis. In order to receive the latest notes, you must be a registered user by sending in your Huntron Warranty card or contacting Huntron Technical Support.

Number	Title
AN1	Using the Front End Adapter Board.
AN2	A Detailed Look at the 5100DS.
AN2A	More on Tolerance and Related Topics.
AN3	5100DS Data Storage Requirements.
AN4	Using the Universal Edge Connector Adaptor with a Tracker 5100DS.
AN5	Enhancing the 5100DS Computer System for Maximum Throughput.

NOTES:

APPLICATION NOTE 1
USING THE FRONT END ADAPTER BOARD

The Huntron Front End Adapter board (FEA board) included with your 5100DS, is used to customize connections between the 5100DS and the board under test. The FEA board is divided into five different sections:

1. Cable connectors to connect to the 5100DS.
2. 10 holes tied directly to each CABLE CONNECTOR pin.
3. 0.10 inch spaced hole grid.
4. 0.156 inch spaced hole grid.
5. Grid for D-sub pc mounted connectors.

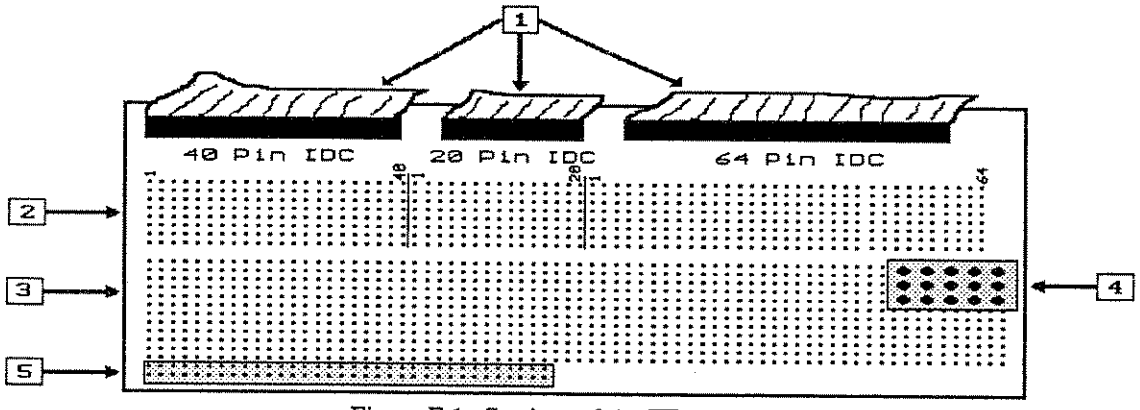


Figure F-1. Sections of the FEA board.

The cable connectors on the 5100DS are all wired in parallel. Thus, when pin 1 of connector 1 is active, so is pin 1 of the connector 2, connector 3, and connector 4. So even though you could connect all the cables up at the same time, only one cable should be used at a time.

The 3 cable connectors are used for interfacing to the 5100DS.

The 10 wiring holes, connected to each pin of each CABLE CONNECTOR are used for interfacing the cable connectors to the outside world. These holes can be used to wire other sections of the FEA board to the cable connectors.

The .10 inch spaced hole grid is used for mounting .10 inch spaced connectors (e.g. DIN connectors or ZIF sockets) on the FEA board. These connectors must then be tied to the wiring holes.

The .156 inch spaced holes are for mounting .156 inch spaced connectors. These connectors are generally used for larger pins or components.

The D-sub compatible grid is used to mount pc-mounted D-sub style connectors on the FEA board.

FIXTURING TO AN EDGE CONNECTOR OF A BOARD

A large majority of faults can be detected at the edge connector pins of a PCB. When a questionable signature is located, use a schematic or the board trace to locate the components on that node.

Mount an appropriate edge connector on the FEA board for the board to be tested. Wire the pins of the edge connector to the wiring holes in sequence.

When setting up a tree for an edge connector on the FEA board, you should follow these guidelines:

The package should be set to "D" (DIP mode).

Each connector added to the FEA board may be considered as a single component, if it has 64 pins or less. If the connector has more than 64 pins, you will need to divide the connector into multiple components using different cable connectors. For example, if you were testing a 96 pin DIN connector, you would set up a component with 64 pins and another component with 22 pins. You must take care in setting up the second component and use the same common pin(s) as with the 64 pin connector. Also, when using the 40 pin test socket as a 22 pin, the 5100DS will count down the first 11 pins and will then jump to pin 30 and count up to pin 40.

CABLE TESTING

The 5100DS can be used to verify cable integrity. Cables can be tested for opens, shorts and continuity. The maximum number of wires in a cable that can be tested at a time is 64.

Mount a 1/4 watt 68 ohm resistor for each wire and a connector for both ends of the cable on the FEA board. Wire one of the connectors to the wiring holes in sequence. Wire the other connector's pins to the 68Ω resistors. Connect the other ends of the resistors to a common point. Connect this common point to the common jack of the 5100DS.

When setting up a tree for cable testing on the FEA board, you should follow these guidelines:

The package should be set to "D" (DIP mode).

Both common pins should be set to 0.

Each connector added to the FEA board should be considered as a single component.

5100DS PIN LAYOUTS

The 5100DS has two methods of scanning the test connector pins. The first method is the DIP mode, which scans, starting with pin 1, from left to right down the front of the test connector, until half of the pins have been scanned, then jumps to the back of the test connector and scans from right to left up the back of the connector. The second method is the SIP mode, which starts with pin 1 and then jumps to the back of the test connector to the highest numbered pin and then back to the next pin on the front of the test connector and so on until the number of pins is reached. The FEA board is wired straight through from the test connectors so these modes also apply to the cable connectors of the FEA board. Several examples are shown in Tables F-1 and F-2.

TEST CONNECTOR OR FEA BOARD CABLE.	PIN Numbers																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DIP PACKAGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SIP PACKAGE	1	3	5	7	9	11	13	15	17	19	20	18	16	14	12	10	8	6	4	2

Table F-1. Pinout Configuration 20 Pin

TEST CONNECTOR OR FEA BOARD CABLE.	PIN Numbers																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DIP PACKAGE	1	2	3	4	5	6	7	8					9	10	11	12	13	14	15	16
SIP PACKAGE	1	3	5	7	9	11	13	15					16	14	12	10	8	6	4	2

Table F-2. Pinout Configuration 16 Pin

APPLICATION NOTE 2
A DETAILED LOOK AT THE 5100DS

1. Basic Tracker Principles of Operation

A Tracker can be modeled as a voltage source $V_S(t)$ and a series resistance R_S connected to the test terminals TEST and COMMON. Figure 1a shows the equivalent circuit of a Tracker connected to a diode. The voltage across the diode is v(t) and the current flowing through the diode is i(t). The waveforms of v(t) and i(t) are shown in Figures 1b and 1c, respectively.

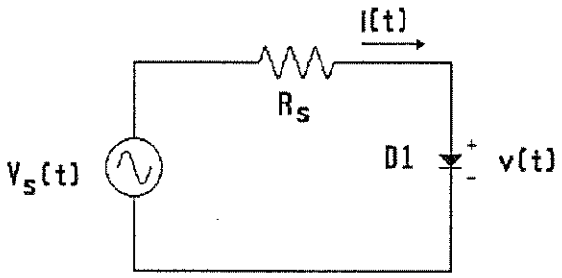


Figure 1a.

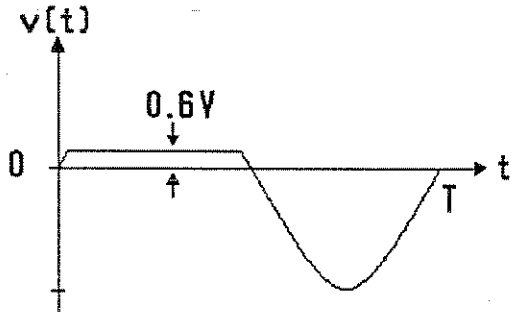


Figure 1b.

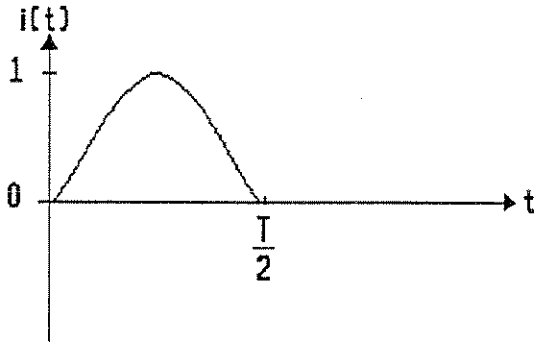


Figure 1c.

If we plot v(t) versus i(t) then we obtain the VI characteristic of the diode (see Figure 1d) which is called an ANALOG SIGNATURE.

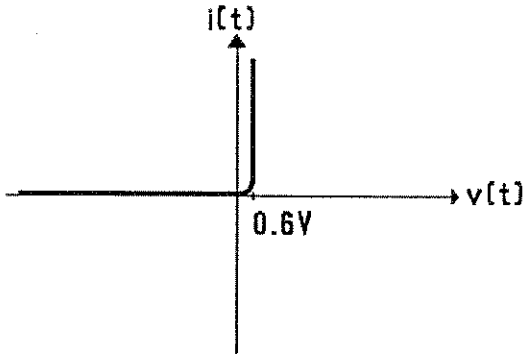


Figure 1d.

The signature of a known good device can be compared to that of a Device Under Test (DUT). In general, defective devices give signatures which are substantially different from the reference device signature. This technique constitutes the TRACKER method of electronic troubleshooting which is also referred to as "ANALOG SIGNATURE ANALYSIS."

2. Tracker 5100DS Principles of Operation

A. Discrete Digital Signatures:

The Huntron Tracker 1000 and 2000 require a technician to visually compare the analog signatures of a reference device with those of a test device. This comparison interpretation sometimes varies from person to person.

The 5100DS digitizes signatures and stores them on magnetic media in a IBM PC environment. Signatures from a test device are compared to the stored signatures in a consistent manner by the 5100DS software. The software then presents the signatures in order from most different to least different so that faults can be quickly located.

In the 5100DS, the device voltage v(t) and current i(t) are sampled and digitized at 100 equally-spaced points during each cycle of the test signal. The points $v(t_1)$, $v(t_2)$... $v(t_{100})$ are plotted against $i(t_1)$, $i(t_2)$... $i(t_{100})$. Figures 2a, 2b, and 2c depict v(t), i(t), and the signature in discrete format.

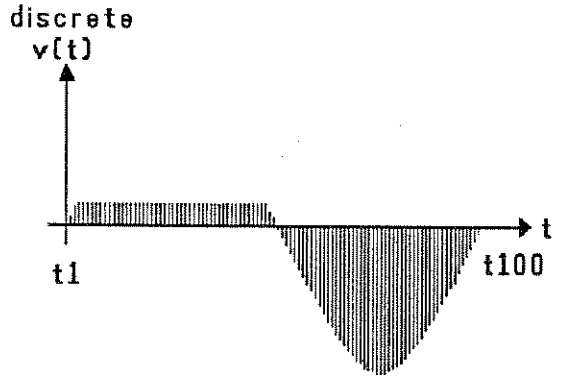


Figure 2a.

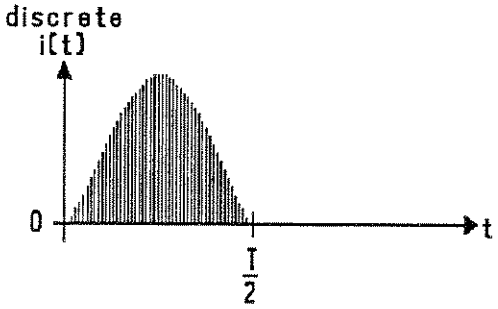


Figure 2b.

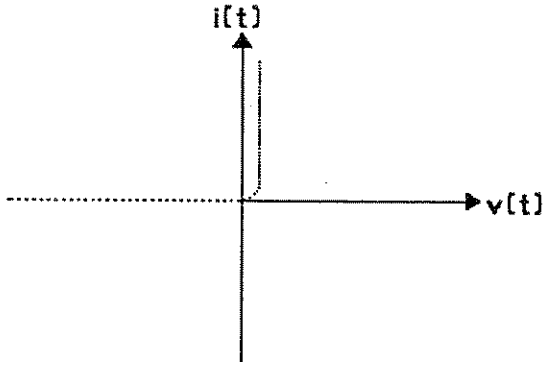


Figure 2c.

B. Digital Signature Comparisions:

For simplicity of illustration, only the voltage component v(t) will be considered, as the current component i(t) can be similarly explained. Let $v_r(t)$ and $v_t(t)$ be the voltages developed across a reference device and a

test device, respectively. The discrete waveforms for these voltages are shown in Figure 3a. In this example, the data values at points t_1, t_2, t_3... t_{100} are different and the software can detect this condition with the compare resolution set to HIGH. The NORMAL setting uses 20 data points for comparison. HIGH allows for detection of more subtle differences at the cost of an increase in test time. NORMAL is usually adequate to find most common failures in the least amount of time.

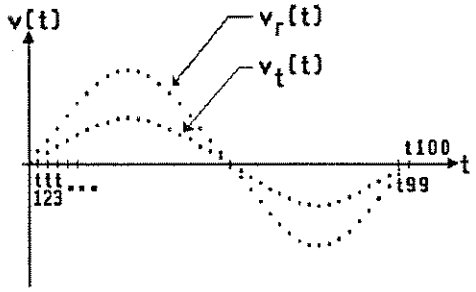


Figure 3a. Signature Comparison.

C. Tolerance:

In the 5100DS software, "tolerance" is defined as the number of units added and subtracted from the reference signal at all points to define an acceptable band of values. This tolerance is not a percentage of the reference signal.

Adding the tolerance to v(t) for all points gives the upper bound; subtracting the tolerance from v(t) for all points gives the lower bound. This is shown in Figure 3b.

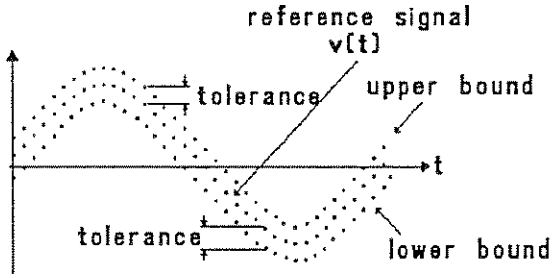


Figure 3b. Tolerance Bounds.

D. Test Tolerance:

Let TEST_TOL be the test tolerance which is defined as the tolerance used to compare the values $v_r(t)$ with $v_t(t)$ at points t_1, t_2... t_N. A device is classified as EQUIVALENT if

$$|v_r(t) - v_t(t)| < \text{TEST\_TOL for all points } t_1, t_2 \ldots t_N.$$

In other words, a DUT is considered EQUIVALENT to the reference device if the magnitude of the difference between $v_r(t)$ and $v_t(t)$ is less than or equal to TEST_TOL for all N points. If the above condition is not met at any one point, the test device is DIFFERENT.

Note: The above sections have discussed a single learn only (# Learns = 1).

E. Learning, Merging and the Merge Tolerance:

The normal way of using the 5100DS to troubleshoot a particular type of board is to follow these steps:

- obtain a known-good board and learn the reference signatures
- receive a board of the same type for repair
- test the defective board against the learned signatures
- troubleshoot the defective board based on the signature differences

Unfortunately, a problem arises with this method because the signatures of a given semiconductor device (e.g. a 7400) can vary widely from one manufacturer to another. Even devices made by one manufacturer can vary from one production lot to another. These "manufacturing differences" from good devices will be all mixed in with the "real" differences.

To solve this problem, the 5100DS Operating Software allows signatures of various known-good devices to be merged together. As an example of this feature, Figure 4a shows the signatures of two individual devices and their merged signature. During TEST, a signature is compared to the merged signatures instead of a single signature. If the test signature is between the limits of the merged signature and the test tolerance, it is EQUIVALENT; if not, it is DIFFERENT. Figure 4b shows how this works for the merged signature of Figure 4a. Signature A is EQUIVALENT and signature B is DIFFERENT.

To create merged signatures, you first learn the signatures of a known-good board 1 and store that data (# Learns = 1). Then do a second learn with known-good board 2. As you learn each device on board 2, the program will compare the new signatures to the stored learn data using the MERGE TOLERANCE. This tolerance is controlled by SETUP and can be set to these values: 0, 5, 10, 15, ... 95, 100. The MERGE TOLERANCE is used to alert you when the new learn data differs by a certain amount from the old data. Next, since this is a second learn, you are given two options: S - Store or M - Merge. The Store option is used to store the second learn, which replaces the first learn. The number of learns will still be one. The Merge option is what is normally used here to merge the two sets of signatures. After the merge is complete, the number of learns will be two.

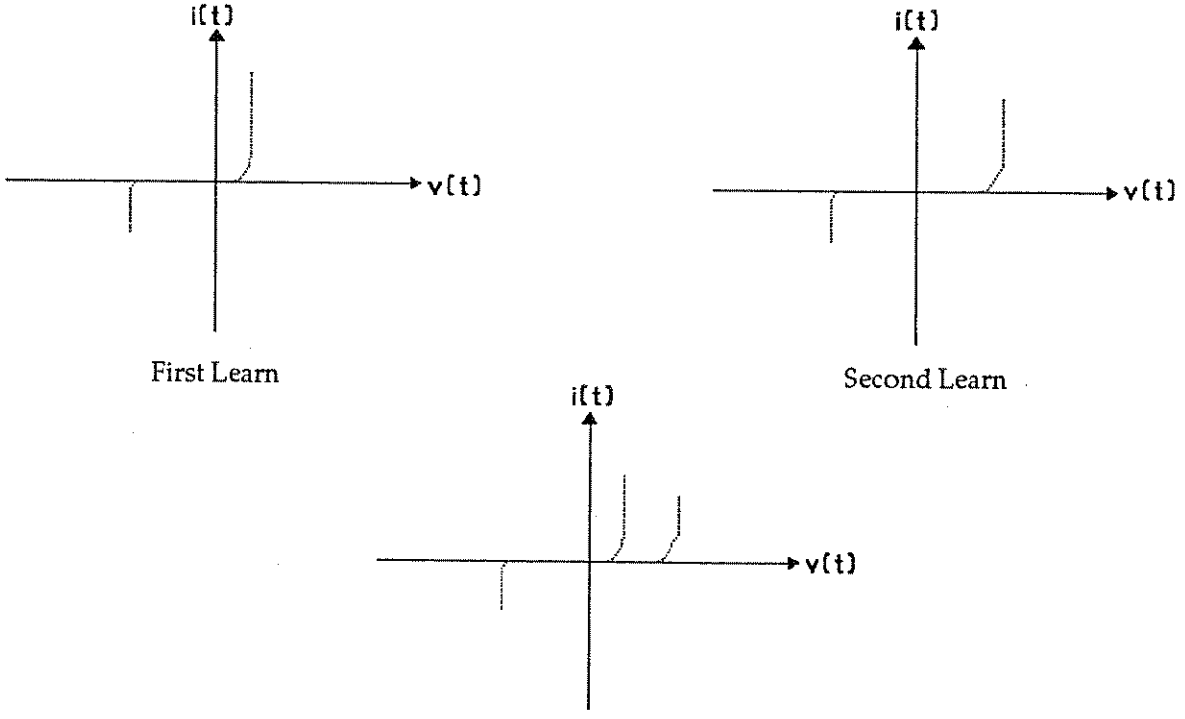


Figure 4a. Merged Signatures.

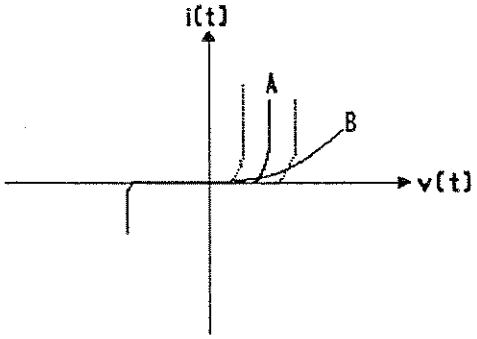


Figure 4b. Equivalent (A) and Different (B) Signatures.

3. Principles of Filtering

A. Oscillating Components:

Certain types of solid state devices exhibit parasitic oscillation when tested with a Tracker in certain TEST ranges. This oscillation phenomenon is intrinsic to the properties of the solid state device under test and causes the VI signature to move back and forth. This type of signature is flagged as UNSTABLE if the FILTER mode is disabled. Figure 5a, 5b, and 5c show the parasitic oscillation, VI signature, and discrete signature of an oscillating device, respectively.

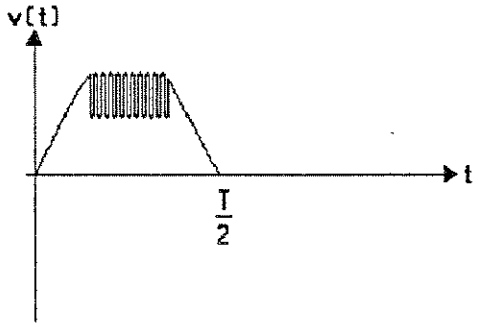


Figure 5a. Oscillation superimposed on v(t).

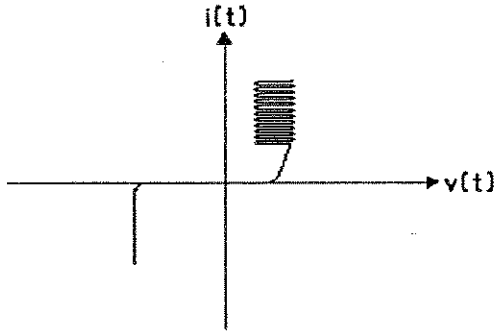


Figure 5b. Oscillating Signature observed on the 5100DS CRT.

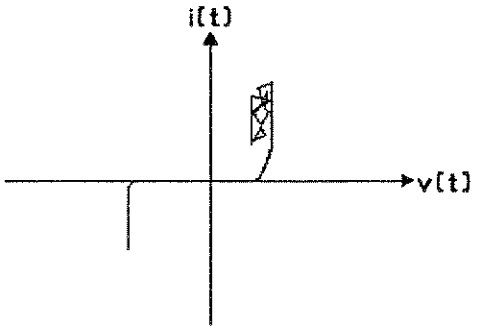


Figure 5c. "Spider Web" Signature observed on the PC monitor.

B. Filtering:

The "parasitic oscillation" presents an operational problem to the 5100DS, as the "spider-web" signatures are not comparable and are time-variant. A "software filter" algorithm has been devised and implemented to suppress the unwanted oscillations. The filtering can be explained as follows. The signal v(t) is first digitized over a complete signal cycle. The digitized signal is then examined for existence of oscillations which are then removed by the software filter. The FILTER mode should be enabled for components which exhibit oscillations. Figure 6a and 6b show the signal with oscillation and the signal with oscillation removed, respectively.

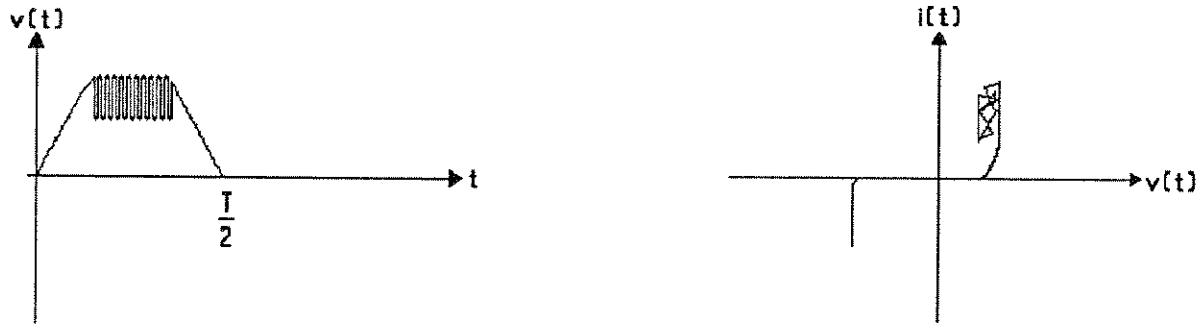


Figure 6a. The Parasitic Oscillation and its Discrete Signature.

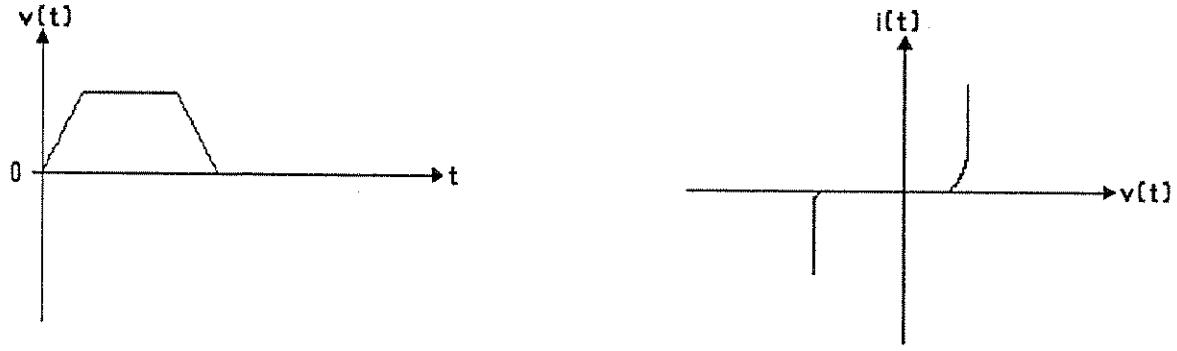


Figure 6b. The Parasitic Oscillation Removed by the FILTER Routine, and its Discrete Signature.

4. Number of Samples and Unstable Signatures

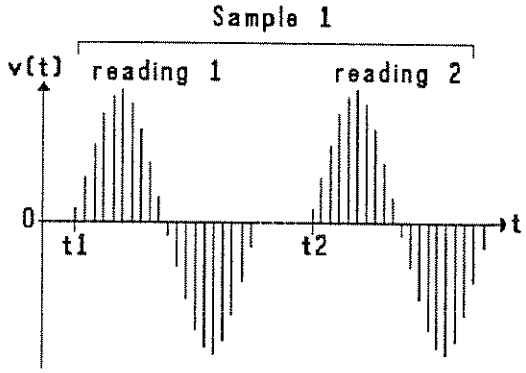


Figure 7. V(t) read at t1 and at t2.

The 5100DS needs stable signatures to work properly i.e. signatures that do not change with time. Certain devices do not always meet this requirement. For example, CMOS ICs with capacitors across their power supply connections will take time to settle into a steady state condition. To handle this situation, the software takes a "sample" of each signature that consists of two "readings" of the data (see Figure 7).

At time t_1 the first reading is taken. Then after a short delay, another reading is taken at t_2. The two readings are then compared to each other to see if they are the same. If they are equal then that sample is good and no more samples of that signature are taken. However, if the readings do not match, the data is ignored and a new sample is taken to see if the signature has stabilized. This process of sampling continues until ended by one of two events:

1. a match is obtained for a sample

2. the "maximum # of samples" (MAX) is reached

If event 2 occurs, then the signature did not have stable data and it is flagged as "UNSTABLE" which is abbreviated "US" on the VIEW SIGNATURES screen. You are still allowed to store and use unstable signatures but they may always be different during TEST because the signatures do not settle. When you get the "US" condition you should always try to eliminate this by increasing MAX or by using a resistor jumper across the device (see APPENDIX E). MAX should normally be kept in the range from 1 to 20 and although it can be set to 99, this is not recommended.

5. Sort Methods

In the 5100DS software, the discrete signature of a reference component is compared with that of the Device Under Test using a particular test tolerance. The pins of a device or components of a section that are DIFFERENT can be sorted by two SORT methods: PEAK or AREA.

Let us define the following nomenclature:

dif = the difference between the reference and test signals

= magnitude of [$v_r(t) - v_t(t)$]

dif_1 = magnitude of [$v_r(T_1) - v_t(T_1)$]

.

.

dif_N = magnitude of [$v_r(T_N) - v_t(T_N)$]

TEST_TOL = test tolerance

dev = deviation

= dif - [test tolerance]

= dif - [TEST_TOL]

$dev_1 = dif_1$ - [TEST_TOL]

.

.

$dev_5 = dif_5$ - [TEST_TOL]

PEAK dev is the largest of $dev_1 ... dev_N$ for a pin or device.

A. PEAK Method:

The PEAK method is a process to sort out the DIFFERENT pins or devices in descending order of PEAK dev.

B. AREA Method:

Consider the signals $v_r(t)$ and $v_t(t)$ across a reference zener diode(Z_r) and a zener diode under test(Z_t) , respectively.

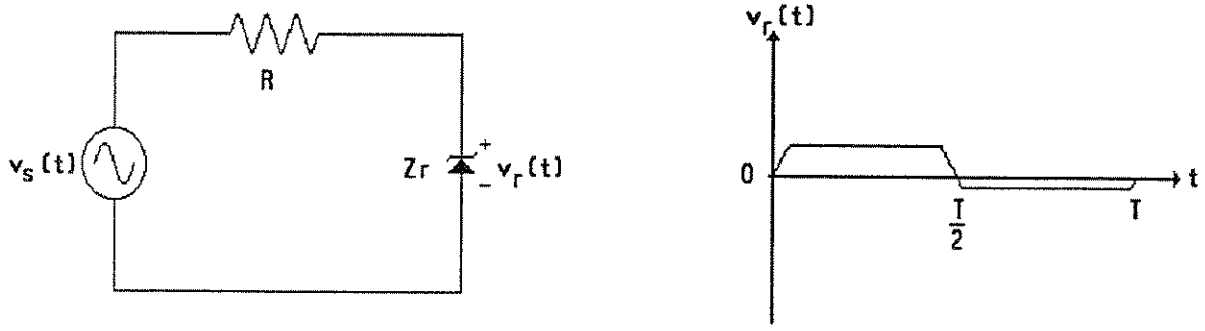


Figure 8a. Tracker signal on a Reference Zener Diode Z_r.

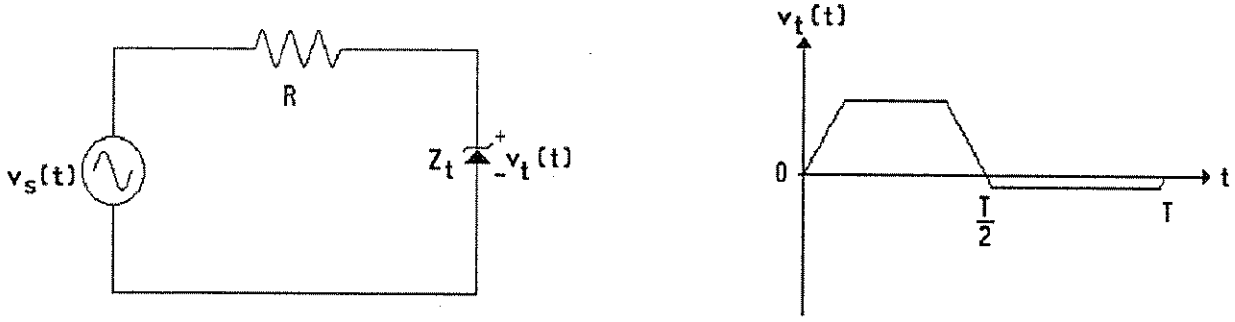


Figure 8b. Tracker signal on a Zener Diode Under Test Z_t.

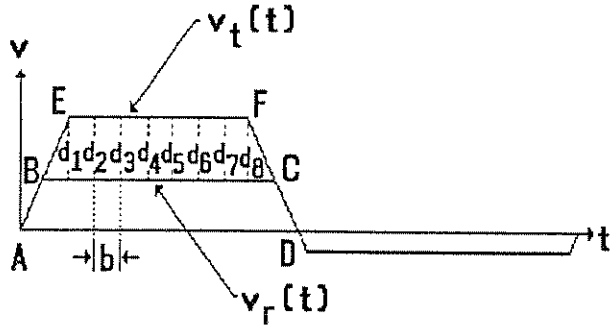


Figure 8c. Signals $V_r(t)$ and $V_t(t)$ superimposed on a 2 times scale.

The difference between $V_r(t)$ and $V_t(t)$ is the area enclosed by BEFC and is given as:

Area BEFC $= bd_1/2 + bd_2 + bd_3 ... + d_8b/2$

$= b[d_1/2 + d_2 + d_3 ... + d_8/2]$

= constant * (SUM of d_1, $d_2 ... d_8$)

= constant * (SUM of deviations)

where d_1, $d_2 ... d_8$ are the deviations between $V_r(t)$ and $V_t(t)$ for points 1, 2... 8.

In the AREA method, the deviations between $V_r(t)$ and $V_t(t)$ are summed and used as a parameter for sorting. Since all deviations are summed, both positive and negative portions of the signal are taken into account. Because of this fact, the AREA method is a more accurate method than the PEAK method. In the PEAK method, only the single largest deviation is the basis for sorting. If that peak deviation is in the positive portion of the signal, then ANY deviations in the negative portion are ignored during sorting. The AREA method is recommended.

6. Glitches

Occasionally, unwanted electrical spikes (glitches) appear in the signal v(t). Refer to Figure 9a.

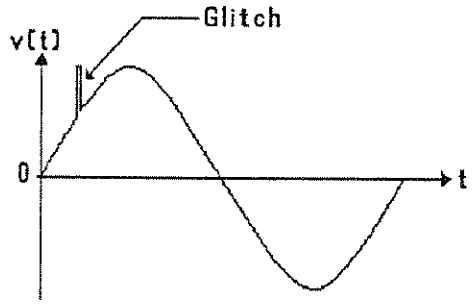
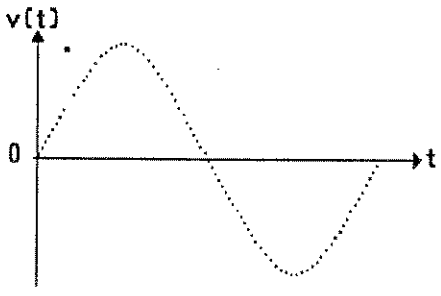
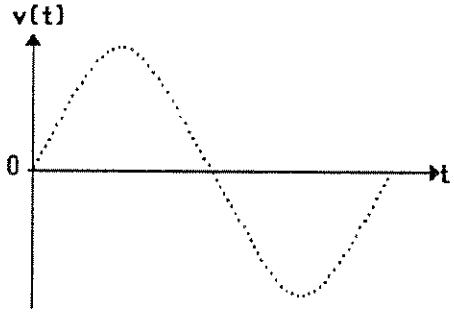


Figure 9a. An electrical spike (glitch) appearing in the continuous time signal.

The 5100DS has the ability to detect the occurence of glitches and to remove them from the signal (see Figure 9b). If glitch removal is not possible and the FILTER mode is disabled, the software will take another sample. If the next sample has glitches that cannot be removed, another sample will be taken. This continues until MAX is reached and then the signature is marked "UNSTABLE". This is an unlikely scenario because glitches are random events and if one sample has unremoveable glitches the next one will probably be OK.



discrete signature with glitch



discrete signature with glitch removed.

Figure 9b.

7. ZOOM Screen Data Interpretation

Figure 10 shows a typical ZOOM screen. The data to the left and right of the signature box is explained below.

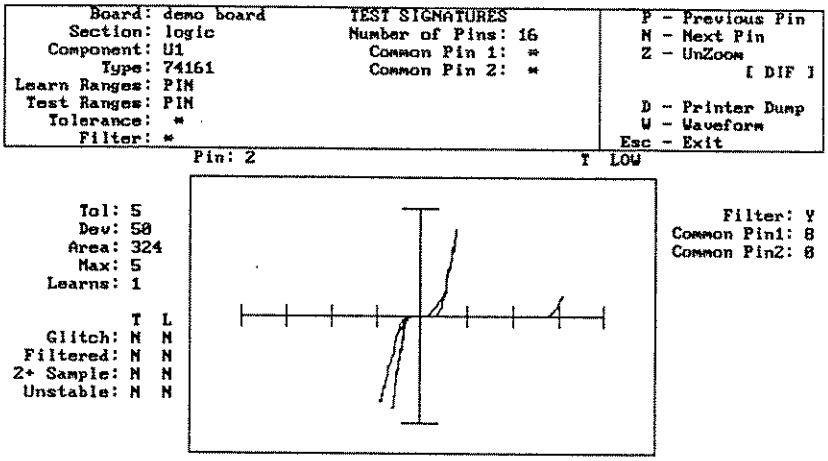


Figure 10. A typical Zoom Screen.

Tol: 5 — The test tolerance for pin 2 is 5. This is the same as "Tolerance: 5" in the upper box. If "Tolerance: *" is used, then the "Tol:" indicator shows the test tolerance for each individual pin. On the LEARN SIGNATURES screen, this indicator shows the MERGE TOLERANCE instead of the test tolerance.

Dev: 50 — The peak deviation between test and learn signatures is 50. On the LEARN SIGNATURES screen, this indicator is blanked out for the first learn since there is nothing to compare the learn to.

Area: 324 — The sum of the deviations between the test and learn signatures is 324. Like "Dev" above, this indicator is blanked out for the first learn.

Max: 5 — The maximum number of samples is 5. If the fifth sample does not have good data, the pin will be marked UNSTABLE.

Learns: 1 — The number of learns is 1. This will be the same data as "# Learns" on the component selection screen.

When looking at the following indicators the "T" column refers to the current Test or Learn signature and the "L" column refers to previously stored signatures. All indicators can be a "Y" for YES or an "N" for NO plus the "L" column indicators can be a "B" for BOTH since a Y and N indicator can be merged together. Also the "L" column is blanked for a first learn.

Glitch: "Y" indicates a glitch was detected.
"N" means no glitch was found.

Filtered: "Y" means that the signature was processed by the filter algorithm. This can only occur when the FILTER mode is enabled as indicated by the "FILTER: Y" in the upper box or on the other side of the signature box.
"N" means the signature was not filtered because either no oscillations were detected or the FILTER mode was turned off.

2+ Sample: "Y" means that two or more samples were taken.
"N" indicates that the first sample was stable.

Unstable: "Y" means that the software took MAX samples of the signature and the last sample was not stable.
"N" means that the last sample was stable.

For example, "2+ Sample: N" and "Unstable: N" means that only one sample was taken and the sample was stable.

Filter: "Y" means that the filter has been activated for the current pin

"N" means that the filter has been deactivated for the current pin.

Common Pin 1: The common pin 1 set for the current pin.

Common Pin 2: The common pin 2 set for the current pin.

NOTES:

APPLICATION NOTE 2A
MORE ON TOLERANCE AND RELATED TOPICS

OVERVIEW

This application note further expands on the discussion of TOLERANCE found in Application Note 2. The signatures of known-good components are digitized and stored in LEARN mode for comparison with signatures of the same or similar devices at a later date in TEST mode. The digitized data points of both signatures are compared and any difference is processed to determine whether the device is EQUIVALENT or DIFFERENT.

TOLERANCE

The amount of difference allowable before the software decides the two signatures are DIFFERENT is determined by the TOLERANCE setting.

TOLERANCE is a numeric value between 0 and 99 assigned to each component (or each pin) in EDIT mode. The TEST signature is EQUIVALENT if all differences are less than or equal to the TOLERANCE. The TEST signature is DIFFERENT if any differences are greater than the TOLERANCE.

DEVIATION

DEVIATION is the amount the digitized TEST signature data points differ from the digitized LEARN signature data points minus the TOLERANCE. The larger the DEVIATION number, the more likely the TEST SIGNATURE is indicating a defect. When a device is EQUIVALENT, the DEVIATION will always be zero because the TEST signature is within the band allowed by the TOLERANCE. When a device is DIFFERENT, the DEVIATION will be one or more for at least one data point. The "Dev" shown on the ZOOM signature screen corresponds to the data point that was most different. The deviations or the sum of the deviations (known as AREA) are used to sort out signatures when displaying them in DIFFERENCE sort mode (see Chapter 6, section 6-8 in this manual for information on Signature Order and Sort Mode).

The TOLERANCE setting can have a tremendous effect on test results. If set too high, faults may be missed while if set too low, minor differences of little or no consequence can cause the signatures to be classified as different and complicate the question of determining exactly which part or parts should be replaced.

Tolerance Example:

TOLERANCE is set to 15

- the software calculates the maximum difference between TEST and LEARN data points is 35.
- 35 is greater than 15 (TOL), so the pin is marked DIFFERENT.
- DEVIATION = 35 - 15 = 20

In this example, the maximum difference would have to be 15 or less to have the pin be EQUIVALENT.

i.e.	max. diff. = 17 → DIFFERENT	Dev = 2
	max. diff. = 16 → DIFFERENT	Dev = 1
	max. diff. = 15 → EQUIVALENT	Dev = 0
	max. diff. = 14 → EQUIVALENT	Dev = 0
	max. diff. = 13 → EQUIVALENT	Dev = 0

HOW SHOULD YOU SET THE TOLERANCE?

There is no single easy answer to the question of setting TOLERANCE and there is no such thing as an "ideal" setting. A number of factors must be taken into consideration and a number of questions should be asked, and answered, before deciding what value to use.

QUESTION:

If the TOLERANCE determines how much difference will be allowed before the system decides the TEST signature is DIFFERENT from the LEARN signature, how does the operator decide what setting is best?

ANSWER:

It depends on the nature and purpose of the test. Here are the major factors.

1. If the 5100DS is being used in a quality assurance application in a production facility, lab, or maintenance shop to screen new parts before they are taken into stock, the TOLERANCE should be set to a low number (1-5). This also applies in cases where libraries of good parts have been established and the user wishes to check a part against the library.

   Separate libraries may have to be established for different manufacturers because of the differences in signatures from one to another. Texas Instrument chips may look very different from Motorola or National, etc.

   Several samples should be examined to determine what represents a "good" signature, or, a range of "good" signatures. The "good" signatures should then be learned or if a range is acceptable, they can be merged to produce a "window of acceptance." Tight TOLERANCE will catch any that vary greatly from the samples. Settings of 1-3 mean the part tested will be almost exactly like the learned sample(s), while settings of 4-6 allow a little more leeway. Obviously higher numbers allow even more leeway. Components from different manufacturers or even the same components from the same manufacturer but different production runs or different production facilities can exhibit different signatures. Examination and comparison of the LEARN and TEST signatures will indicate when this is the case.

2. When testing circuit boards, the ideal way to use the 5100DS is to learn and catalog individual boards, keeping the learned data against the day when THAT board fails. In this case, after the failure, the 5100DS is testing the same parts it learned while the board was working. Tight TOLERANCE settings of 1-3 will most certainly locate the problem.

3. When testing boards that are similiar to the learned board, a TOLERANCE setting of 10-15 will usually produce the best results when testing TTL ICs, bipolar transistors, diodes, resistors, capacitors and inductors. Through experimentation with a large number of TTL ICs it has been found that in most cases a setting of 15 will catch major faults while ignoring minor manufacturing differences. Most solid faults on circuit boards caused by failed ICs will produce signatures that are so dramatically different from the learned ones there will be no doubt which pins are bad.

4. Due to the effect of the Tracker 5100DS's AC test signal, some ICs will oscillate in high or medium ranges. This does not normally create a problem since the filter algorithm will usually eliminate it. In cases where the oscillation is not completely gone, several learns may have to be merged to get a reliable signature. There are times when the action of the filter will mask leakage if the leakage only starts to appear in the HIGH range. If oscillation is also present, both the leakage and oscillation are cut off by the filter and do not appear in the signature. Several other bad pins usually show up on the same IC so that it is seldom overlooked.

   Increasing the TOLERANCE to 20, 30, 40 or more is not the way to overcome instability or oscillation because all that will happen is the system will probably fail to report any faulty parts. It would be much better to take a close look at the signatures in these instances to determine if a fault really exists or is it just oscillation or manufacturing differences. If the same IC can be found elsewhere on the board, check it in VIEW or PROBE mode to see if it has similar signatures. If so, this is a good indication the part is not faulty.

5. The only time that the TOLERANCE should be set higher than about 20 is when the Tolerance per pin feature is in use (see Chapter 6, section 6-2) and you have signatures on some pins of a device that will not stabilize no matter what is tried. In this case you can set the TOLERANCE for those pins to 99 which will mean any signature will be EQUIVALENT. This effectively "turns off" the troublesome pins and allows the 5100DS to work correctly with the remaining stable pins.

NOTES:

APPLICATION NOTE 3
5100DS DATA STORAGE REQUIREMENTS

A. Files

The SYSTEM.IDX file holds the indexes to the board data in the SYSTEM.HII file. These files support up to 110 boards. For each board the system creates a subdirectory of the form BOARD#, where the symbol '#' represents the number 1 to 110.

The BOARD.IDX file holds the indexes to the section data (BOARD.HII).

The SEC1C.IDX file holds the indexes to the component data (SEC#C.HII), pin information (SEC#P.HII), minimum or stored signatures (SEC#N.HII), and the maximum signatures (SEC#X.HII). The symbol '#' represents the number 1 to 110.

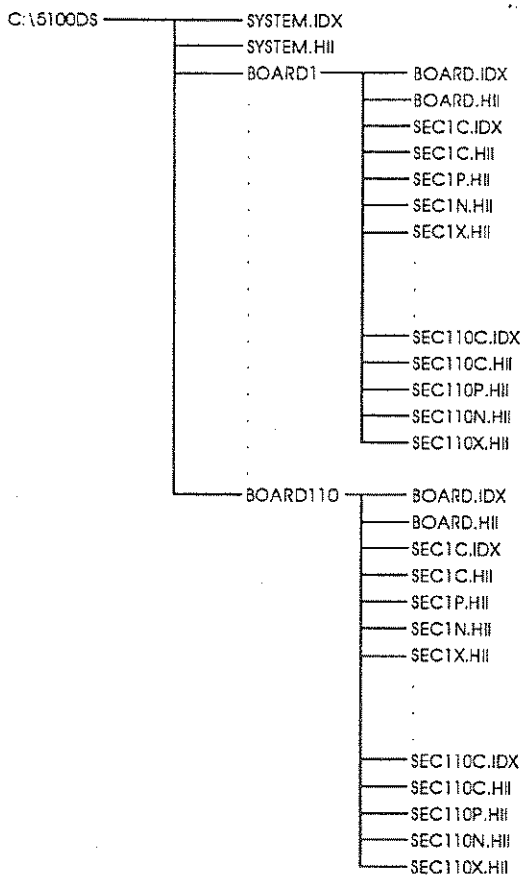


Figure AN3-1. 5100DS File Structure.

B. Calculating the disk requirements for a board under test:

Table 1. 5100DS File Sizes.

FILE	SIZE IN BYTES
SYSTEM.IDX	22 * NUMBER OF BOARDS
SYSTEM.HII	61 * NUMBER OF BOARDS
BOARD.IDX	22 * NUMBER OF SECTIONS
BOARD.HII	64 * NUMBER OF SECTIONS
SEC#C.IDX	32 * NUMBER OF COMPONENTS
SEC#C.HII	222 * NUMBER OF COMPONENTS
SEC#P.HII	26 * (NUMBER OF PINS PER COMPONENT WITH PIN INFORMATION)
SEC#N.HII	201 * NS (if learned)
SEC#X.HII	201 * NS (if merged)

The number 201 shown above is the number of bytes required to represent the signature for one pin in a particular range.

NS = Number of total signatures stored for a board

= Sum of signatures for each component on the board

* stands for multiplication operator.

EXAMPLE:

Table 2. Determining NS.

Component	Pins	No. Learn Ranges	No Merge	Merge	Pin Info	Size
U1	14	2	2*14=28	2*28	Yes	14*26=364
U2	16	4	4*16=64	2*64	No	16*0=0
U3	20	3	3*20=60	2*60	Yes	20*26=520
Total (NS)			152	304	Total	884

Total disk space required is:

=1.05 * (22 + 61 + size of files in BOARD#)

Where 1.05 is the factor used to compensate for disk space occupied by small files and other overhead.

With No Merging: = 1.05 * (22 + 61 + 22 + 64 + 96 + 666 +884+ (201 * 152)) = 33,986

With Merging: = 1.05 * (22 + 61 + 22 + 64 + 96 + 666 +884+ (201 * 304)) = 66,065

This example of a board with 3 components (U1, U2, U3) can be used as a guide to caluculate the disk size required for any board.

NOTES:

APPLICATION NOTE 4
USING THE UNIVERSAL EDGE CONNECTOR ADAPTOR WITH A TRACKER 5100DS

INTRODUCTION

The Universal Edge Connector Adaptor (UECA) makes edge connector testing using a Tracker 5100DS quick and easy. The UECA was designed to simplify the interfacing of printed circuit board (PCB) edge connectors to the 5100DS. This has proved to be a fast and efficient test technique for many circuit boards. The UECA interfaces to the 5100DS through the 64 pin flat cable. The UECA has four open ended, standard edge connector sockets with the following pin spacings: 0.156", 0.150", 0.125", and 0.100". The open ends allow for easy insertion of any length edge connector. Four convenient templates are provided on the UECA to help you determine the spacing of your PCB edge connector. Just match your test PCB edge connector to the appropriate pattern.

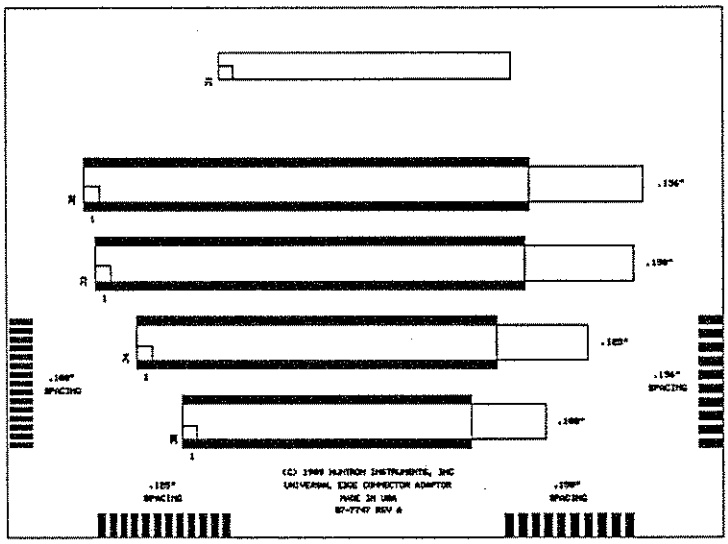


Figure 1. Universal Edge Connector Adaptor.

GENERAL INSTRUCTIONS

1. Attach the UECA to the 5100DS's 64 pin IDC connector using the 64 pin flat cable (Huntron part #98-0072) included with your 5100DS.
2. Determine the proper card edge spacing for the Unit Under Test (UUT) using the template on the UECA , if needed.
3. Plug the UUT into the correct edge connector socket on the UECA. Make sure to check that the UUT edge connector is aligned properly with the UECA socket.
4. Start the 5100DS software and select EDIT mode. Create a component in the TREE (EDIT mode) with the same number of pins that are on the UUT.

5. If there are more than 64 pins on the card edge, then create another component to accommodate the remaining pins. When testing a larger than 64 pin connector, test the first group of 64 pins, then simply move the UUT card edge so that the second group of pins are aligned to pin 1 on the UECA edge connector socket.

NOTE

The UECA's edge connector sockets consist of 80 pins but only the first 64 pins are used. The used pins are highlighted by yellow bars on each side of the connectors. The remaining 16 pins of each connector are not used and left open.

6. There are two component package configurations in the COMPONENT ENTRY screen (EDIT mode) that defines the testing sequence of the UUT's card edge pins.

Package type "D" selects DIP mode which tests pins in a counterclockwise order starting from one side down the row of pins to the end and then over to the other side of the card edge pins and back around ending immediately opposite from the starting pin (e.g. just like an DIP IC).

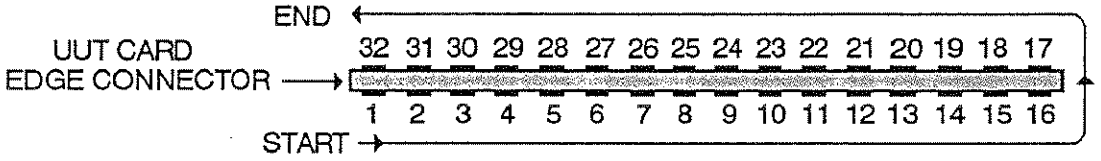


Figure 2. UUT 32 Pin Card Edge-DIP Mode Pin Testing Order.

Package type "S" selects SIP mode, a staggered pin configuration. Testing sequence starts at pin 1 (lower left corner), then pin 2 which is directly opposite pin 1 on the other side, then back to pin 3 which is on the same side as pin 1, etc.

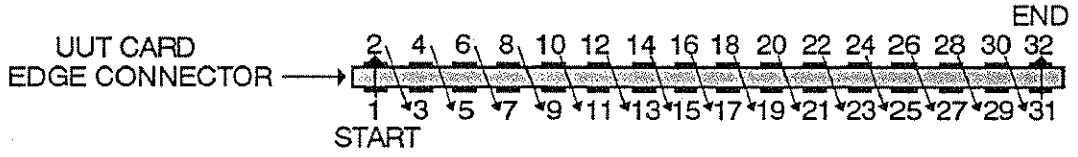


Figure 3. UUT 32 Pin Card Edge-SIP Mode Pin Testing Order.

Use the package type that best matches your UUT's edge connector numbering scheme. You can also assign a unique name for each pin of the connector. For details, refer to the Component Pin Information section in Chapter 6 of the User's manual.

7. You can select a COMMON pin on the UUT edge connector. Or you can set CP1 and CP2 to 0 in the COMPONENT ENTRY screen and establish a COMMON on your UUT with a separate test lead. Use the black common lead (supplied with your 5100DS) from the COMMON jack on the front panel of the 5100DS and hook it to an appropriate COMMON node on the UUT.

8. After completing the component information in the EDIT mode, go to the LEARN mode and learn the UUT.

NOTE

If you want to quickly verify the UUT edge connector pin position at any time, select VIEW mode, select the LOW range, and set the component pin you wish to check. Connect the black microprobe (supplied with the 5100DS) to the COMMON jack on the 5100DS and probe the UUT edge connector with it. The 5100DS CRT displays a "short" (vertical) signature when there is a match.

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NOTES:

APPLICATION NOTE 5
ENHANCING THE 5100DS COMPUTER SYSTEM FOR MAXIMUM THROUGHPUT

Here are some suggestions that will help your system run faster and reduce test times.

A. PROCESSOR:

- Use a PC with a faster CPU to increase the overall system performance. A 286, 10Mhz or faster, 386 or 486 machine will give a notable performance increase.

- Install a math coprocessor in the PC to increase the display speed. A 287 (for a 286 PC) or a 387 (for a 386 PC) will enhance performance. The 486 PC has a built-in math coprocessor.

B. DISK:

- Keep board directories close to the root directory (one level below) to shorten the file access time. Use DRIVE or Startup path in SETUP to set the path for the board directories.

- Use a hard disk with a faster average seek time (28ms or less) to increase the file access speed.

- Use a hard disk and controller that is set up to a 1:1 interleave to maximize performance.

C. MEMORY:

- Use extended or expanded PC memory and memory utility software to create a RAM disk. This RAM disk can be used in the Temporary Files path in SETUP to speed up the troublesheet file access and increase testing speed. You can also RESTORE boards to a RAM disk for testing (if there is enough space) for faster testing speed.

- Use extended or expanded PC memory and utility software to create a hard disk cache. This will speed up access to the hard disk.

NOTES:

APPENDIX G
INDEPENDENT TEST RESULTS

The following section is from an independent test lab of electronic components. Their report was obtained as unbiased evidence of the Huntron Trackers ability to test CMOS and TTL integrated circuits without altering them in any way.

Huntron Tracker TTL and CMOS Tests

Component Concepts
Everett, WA 98201

OBJECT

To determine the effect of the testing signals from a Huntron Tracker in-circuit component tester on performance of CMOS and TTL integrated circuits.

COMPONENTS TESTED

- Motorola MC4011B
- TI 74LS11

TEST REPORT

Component Concepts, Inc., an independent test lab for active electronic components, performed testing on the effect of part exposure to the Huntron Tracker. The Huntron Tracker is an in-circuit stand-alone component tester. Two types of components were tested and pertinent data recorded prior to test with the Tracker. The components were then tested and data logged after the Tracker test. The two sets of data, pre- and post-, were then compared for any possible effect that the Tracker might have upon the components. Seventy-five 74LS11s and seventy-five 4011s were tested. All components passed after testing with the Tracker. The data logged parameters were input and operating current, and output voltage. No discernable effects were observed upon analysis of the pre- and post data logs.

The exact test is as follows:

1. All components before testing were subjected to 48 hours burn-in at 125 degrees Celsius.

2. 74LS11 and 4011 tested for pass/fail operation at 125 degrees Celsius.

3. 75 of each component tested for propagation delay, pass/fail.

4. Components data logged for specific parameters.

5. Components subjected to test by the Tracker.

6. Propagation delay tested.

7. Post-test data log performed, same parameters recorded.

8. Data logs analyzed to determine any effects of Huntron Tracker upon components.

TEST DISCUSSION

The testing procedures used can only validate the externally measurable parameters of the component and its function. The internal functioning of the component can be assumed to follow with the externally measurable parameters.

The lot of components received from Huntron were uniform in date code and manufacture. All components were 100% functional after a static burn-in of 48 hours.

The TTL and CMOS components were tested on an HP 5045 IC Tester (Ser. #1712A00222). The data was recorded on a companion HP 9825 Calculator. Huntron provided a Tracker (Ser. #21F01001), which was connected to the sequence unit that, according to Huntron, automatically connected the leads of the component to the tester one lead at a time. The actual functioning of the sequencer and the two test units are not the responsibility of Component Concepts other than the following of instructions provided by Huntron for proper operation.

After burn-in, the components were tested pass/fail for propagation delay in a bench set-up using a pulse generator and a 100MHz HP oscilloscope. The components were also data logged. They were then tested on the sequencer with the two testers attached. After being tested with the sequencer, the components were again tested for propagation delay and data logged. At all times, attention was paid to ESD precautions.

TEST RESULTS

At pre-test, after burn-in, all components were functional for DC and AC parameters, and seventy five components were data logged from each type, 74LS11 and 4011 BC. A comparison of data after testing showed no significant change in either input current or output voltage under load. The data printed out by the HP 9825 Calculator was reduced to a more readable format which clearly shows the value recorded before and after testing and the differences between the two values.

The majority of differences between values are within the accuracy limits of the HP 5045 Tester. Points where there are differences greater than that value are not significant in number to produce any possible negative conclusions on tester interaction with the tested components. Based on the collected data, the Huntron Tracker had no discernable impact on the components it tested.

SPECIFIC TESTING SEQUENCE

(1) Burn-in (100%) 180 pieces at 125 degrees Celsius = 48 hours

(2) Electrical (100%) to obtain 150 units to be labeled as follows:

- Label 25 units as HH1, HH2, HH3.....HH25
- Label 25 units as HM1, HM2, HM3.....HM25
- Label 25 units as HL1, HL2, HL3.....HL25
- Label 25 units as VH1, VH2, VH3.....VH25
- Label 25 units as VM1, VM2, VM3.....VM25
- Label 25 units as VL1, VL2, VL3.....VL25

(3) Electrical (100%) in the following sequence:

(a) HH1, HH2.....HH25

(b) HM1, HM2.....HM25

(c) HL1, HL2.....HL25

(d) VH1, VH2.....VH25

(e) VM1, VM2.....VM25

(f) VL1, VL2.....VL25

For DC parametrics and function per the manufacturers specifications, T_A = 25 degrees Celsius. They are to be tested on an HP5054 digital IC tester. All parameters data logged. Propagation delay tested per specification for pass/fail only.

(4) Connect Huntron Tracker to sequencer (sequencer is a piece of equipment supplied by Huntron Instruments, Inc. which applies testing signals from Tracker and tester to device under test) to each piece of equipment and turn on power.

(5) (a) Set Tracker range to HIGH.

(b) Set Tester range to HIGH.

(c) Insert HH1 in zero-insertion force socket markedHuntron Tracker located on top of sequencer.

(d) Activate start button on sequencer. The red LED will come on when sequencing is completed (it takes 90 seconds).

(e) Remove devices under test.

(f) Repeat steps (c), (d), (e), (f) for HH2, HH3...HH25.

(6) Set Tracker and tester range to medium and repeat steps (c), (d), (e) and (f) described in (5) for HM1,HM2...HM25, and VM1, VM2...VM25.

(7) Set Tracker and tester range to medium and repeat steps (c), (d), (e) and (f) described in (5) for HL1,HL2...HL25, and VL1, VL2...VL25.

(8) Electric test (100%) in the following sequence:

- HH1, HH2.....HH25
- HM1, HM2.....HM25
- HL1, HL2.....HL25
- VH1, VH2.....VH25
- VM1, VM2.....VM25
- VL1, VL2.....VL25

For DC parametrics and function, T_A = 25 degrees Celsius. Propagation delay tested per specification for pass/fail only. All parameters data logged on HP5054 digital tester.

NOTES:

APPENDIX H
GLOSSARY OF TERMS

2+ Sample	The number of samples taken when attempting to stabilize a signature. An 'N' indicates only one sample was taken. A 'Y' indicates that more than one sample was taken (See Max and Unstable).
Alphanumeric	Refers to letters, numbers or both.
Area	The sum of all the deviations (see Deviation).
AREA	When signature order is set to DIFFERENCE, this is one of the two sort methods (see PEAK). This method is based on the sum of all the deviation numbers (see Deviation).
Analog Signature Analysis	A unique, power-off troubleshooting technique that uses a sinewave stimulus to generate the current (I) vs. voltage (V) characteristics of an unpowered device. The IV charcteristic is called an analog signature.
ASA	An abreviation for Analog Signature Analysis.
Banana Jack	Either one of two probe jacks on the upper right side of the 5100DS front panel.
Board	Any electronic circuit board.
Capacitor	An electrical component designed to store electricity. Capacitors are widely used in circuits for producing time delays and filtering electrical signals.
Character	A letter, digit, or other graphic symbol.
Circuit	An arrangement of components connected together in such a way that a useful function is performed.
CMOS	Complementary Metal-Oxide Semiconductor. A wide range of ICs are CMOS. They are characterized by low power consumption, making them useful in low-power, battery-operated devices. Their main disadvantage is that they are susceptible to damage caused by static electricity.
Common Fuse	The 1 Amp 250V fuse accessible from the front panel of the 5100DS. It protects the 5100DS from external voltages that exist with respect to earth ground.
Common Jack	The black banana jack on the front panel of the 5100DS.
Common Lead	The black lead with a banana plug and a clip used to connect common when both common pins are set to zero.
Common Pin	The reference pin for the component. Typically, the common pin is the negative power supply pin or the ground pin.
Component	Any piece of electronic hardware having a particular purpose, such as an integrated circuit (IC), transistor, or resistor.
Component Name	Unique identifier for the component under test (such as U1), to indicate its location on the board.

Component Type — The part number (not the date code) on the IC (e.g. LM340, 74161, CD4011, etc.). For resistors with nothing printed on them, the component type is determined by the order and color of the bands.

CONNECT FIRST — This warns the user that when learning or testing a DIP or SIP component, it must be connected to the 5100DS before pressing ↵.

Coprocessor — A math coprocessor IC optionally installed in a computer system to enhance the speed of math and graphics functions. It is highly recommended when using the 5100DS.

CRT — Cathode Ray Tube-specifically, in this manual, the screen on the Tracker 5100DS.

Demo Board — The electronic circuit board supplied with the Tracker 5100DS to be used with the tutorial section of this manual.

Dev — An abbreviation for Deviation.

Deviation — The amount that the value of one signature data point exceeds the value of the learn signature data point plus or minus the tolerance.

DIF — Abbreviation for DIFFERENCE.

DIFFERENCE — This is one of the two signature orders. When in this mode, signatures are displayed from the most to least different pin in the most to least different range (also see NUMERIC).

DIFFERENT — This indicates that some of the signatures of the component exceeded the tolerance.

Digit — Any of the ten numbers 0 to 9.

Diode — A component which allows current to flow through it in one direction only. Diodes are used in power supplies to convert alternating current to direct current.

DIP — Dual In-line Package. An IC package having terminal pins in two parallel rows, one along each side of the package.

Discrete Component — A component that is a single device with a single purpose, such as a resistor, capacitor or diode.

Disk Space Needed — A feature for displaying needed disk space for storing merged learns of an entire section.

Display — The computer monitor connected to your computer that displays the software screens.

DOS Prompt — The prompt of your computer system, when the 5100DS software is not running. Frequently C:> or similar in nature.

DOT — This is one of the two signature styles. This mode displays only the actual data points of the signature (also see LINE).

DUT — Device Under Test

EQUIVALENT — This indicates that none of the signatures of the component exceeded the tolerance.

EGA — Enhanced Graphics Adapter. A type of video card and monitor capable of displaying graphics in 16 colors at a resolution of 640 by 350 pixels.

FEA Board — Front End Adapter Board. This board allows users to build a custom test fixture.

Filter — This algorithm removes oscillations (spider webbing) from certain types of signatures. An 'N' disables the algorithm and a 'Y' enables it.

Filtered — This indicates whether or not the current signature was filtered or not. An 'N' indicates that it was not filtered and a 'Y' indicates that it was.

Glitch — This indicates that the filter algorithm found signature glitches and removed them. An 'N' indicates that no glitches were found and a 'Y' indicates that at least one glitch was found and removed.

GPIB — General Purpose Interface Bus, that conforms to the IEEE-488 standard. A standardized method for connecting instrument controllers or computers to peripherals such as test equipment.

Graticule — The set of horizontal and vertical axes behind the signatures used to approximate turn-on voltages and aid in the comparison of signatures with the signatures of other pins. There is a permanent graticule for the 5100DS CRT and a software-controlled graticule in the VIEW SIGNATURES screens.

High Range — This range is used most often for high impedance components and high voltage zener diodes. It has a resistance range of 3kΩ to 1MΩ and a capacitance range of 500pF to .2μF.

IC — Integrated Circuit. An electrical circuit consisting of transistors, resistors, diodes, and sometimes capacitors formed and connected together on a single chip of silicon.

IC Clip — The clips with 8 to 64 pins used to attach ICs to the IC clip cables.

IC Clip Cable — The cables used to attach the IC clips to the 5100DS test sockets.

Keypad — The cluster of special keys to one side of the computer keyboard.

Learns — This indicates the number of times the current component has been learned.

LINE — This is one of the two signature styles. When in this mode, all of the signature data points are displayed and connected with lines (also see DOT).

Low Range — This range is used most often for discrete components and determining shorts. It has a resistance range of 1Ω to 400Ω and a capacitance range of 1μF to 450μF.

Max — This indicates the maximum number of samples allowed before marking the signature as unstable.

Max # of Samples — At the Section Entry screen, this allows entry of the maximum number of samples allowed before marking the signature as unstable.

Medium 1 Range — This range is most often used for analog ICs. It has a resistance range of 50Ω to 10kΩ and a capacitance range of .05μF to 15μF.

Medium 2 Range — This range is most often used for digital ICs. It has a resistance range of 1kΩ to 200kΩ and a capacitance range of .0025μF to .5μF.

Merge Tolerance — This is the tolerance setting that alerts the user when learning a component after the first time.

Merged Learns — After signatures for a component have been stored, the component may be learned again and again on different known-good boards and merged to create MIN/MAX signatures.

MIN/MAX Signatures — When signatures are merged together the minimum value for each data point of the different learns is used to create the MIN signature. The maximum value for each data point of the different learns is used to create the MAX signature. When comparing to MIN/MAX signatures the tolerance is subtracted from the MIN and added to the MAX to create the EQUIVALENT limits.

NUM — Abbreviation for NUMERIC.

NUMERIC — This is one of the two signature orders. When in this mode the signatures are displayed sequentially by their pin number and from the highest to the lowest range (also see DIFFERENCE).

Order — The current signature order setting (DIF or NUM).

Package — This can be D (DIP), S (SIP), or P (Probe).

PEAK — When signature order is set to DIFFERENCE, this is one of the two sort methods (also see AREA). This method orders the signatures based on their largest single deviation outside of the tolerance.

Pop-up Window — A bordered block of information that overlays a rectangular portion of the screen.

Probe — Probe (P) is an option for the component package type that disables all relays and instead steps through a multi-pin device pin by pin allowing the user to use probes to get signatures. This is especially useful for devices that are spaced too close together for use of the DIP clips or that are non-DIP package types.

Probes — The red and black test leads with adjustable tips and banana plugs that connect to the banana jacks of the 5100DS. They are used to connect to components when IC clips are not feasible.

RAM — Random Access Memory. The memory of the computer in which the 5100DS software resides when it is running.

Range — The impedance range applied to the component under test, such as LOW, MED 1, MED 2 or HIGH.

REMOVED — This indicates that a component that was DIFFERENT no longer affects the troublesheet.

Resistor — A component in a circuit which offers resistance to the flow of electrical current to create a difference in potential. Resistors can usually be recognized by their banded color coding system which gives their value in ohms.

Resistor Jumpers — The 1kΩ and 10kΩ resistors with clips on both ends used to stabilize CMOS components.

Sample — A sample consists of a double reading of each signature. After processing for glitches and oscillations (if FILTER = Y), the two readings are compared and must be OK or that sample is unstable, and another sample is taken.

Scan Rate — The pace at which the manual scanning modes change signatures on the CRT.

Screen	The software information that is presented on the display.
Section	A group of components on a circuit board.
Sectn	An abbreviation for section.
SELECTOR	The highlighted area of the screen that changes position to choose the current item.
Signal Fuse	The .25A 250V fuse accessible from the front panel of the 5100DS. It protects the 5100DS from voltages on a component that occur between the test pin and the common pin.
Signature Order	The sequence in which the signatures are arranged on the display.
Signature Style	The way signatures are presented on the screen or the printer (see DOT and LINE).
SIP	Single In-line Package. A component package having a single line of pins, such as a connector or resistor pack.
Sort	At the selection screen this indicates the current sort method.
Sort Method	The algorithm used to put the signatures in DIFFERENCE order (see PEAK and AREA).
SUB	System, Unit, Board.
System	All the parts making up a working device, such as a computer, monitor and printer.
Test Pin	The current pin under test on a component.
Test Socket	One of the four numbered connectors on the front shelf of the 5100DS.
TOL	The current tolerance setting.
Tolerance	The margin within which a component is still equivalent when being tested.
Tolrnce	An abbreviation for tolerance.
Tree	A structured group of Systems, Units, Boards, Sections and Components used to store all the information about a board that is to be learned and tested.
Troublesheet	A report showing all of the DIFFERENT pins and components of the current TEST.
Troublesheet Summary	A report showing the number of EQUIVALENT, REMOVED, and DIFFERENT components of the current TEST.
Unit	A group of one or more boards in a single enclosure.
Unstable	A signature that required the maximum number of samples and still did not compare correctly (see Sample).
US	An abbreviation for Unstable.
VGA	Video Graphics Array. A type of video card and monitor capable of displaying graphics in 16 colors at a resolution of 640 by 480 pixels.

NOTES:

Documentation Feedback - Huntron Tracker 5100DS

Please help us improve future documentation by completing and returning this form. Comments and suggestions become the property of Huntron Instruments, Inc.

Name

Address

City/State/Zip

Phone

Operating system _____ Version no. _____

Computer: Brand _____ Model no. _____ Memory _____ (Kbytes)

Hard disk ❑ Yes ❑ No If yes, what size _____ (Mbytes)

Computer use experience _____ (years)

How long have you had this product? _____ (months)

Please rate the quality of the following documentation features on a scale from 1(poor) to 5(excellent):

Rating	Item	Comments
	Organization	
	Accessibility of information	
	Installation instructions	
	Tutorial	
	Binding	
	Overall impression	

If you found errors in the documentation, please give manual name, page number, and description:

Was it easy to understand the documentation?

❑ Easy ❑ Somewhat difficult ❑ Diffucult

Comments:

Rate how often you use the following documentation features?

Rating	Item	Comments
	Manual	
	On-line help (F1)	

How useful are the examples in the Tutorial?

❑ Useful ❑ Somewhat useful ❑ Not useful

Comments:

Rate the usefulness of the on-line help (F1 key) feature:

❑ Useful ❑ Somewhat useful ❑ Not useful

Comments:

Additional Comments:

Thank You

Please Mail to: Huntron Instruments, Inc.
15720 Mill Creek Blvd.
Mill Creek, WA 98012

or FAX: 425-743-1360