HUNTRON INSTRUMENTS, INC.

TRACKER 5100DS
and
PROBER RP388

USER'S MANUAL

December 1991
P/ N 21-1119
Rev. 3, 4/94

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CHANGE INFORMATION
P/N: 21-1262
ISSUE NO: 5 4/98

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

Title:	**Huntron 5100DS/RP388 User's Manual**
Print date:	**October 1995**
P/N:	**21-1119**
Revision:	**3**
Revision Date:	**4/94**

CHANGE #1

EFFECTIVITY:

RP388	- S/N 400-01326
5500	- S/N 410-01021
5300	- S/N 420-01014

Changes to Page 3-2 & ADDM-3

CHANGE:

FROM:	1	98-0128	Trackball Package
TO:	1	98-0246	Trackball (Serial)

CHANGE #2

EFFECTIVITY: ALL UNITS.

THE OPERATOR SHOULD USE A WRIST STRAP AT ALL TIMES.

CHANGE #3

EFFECTIVITY: ALL UNITS.

IMPORTANT

OPEN AND CLOSING INSTRUCTIONS FOR MODELS WITH DUST COVERS.

To Open: Grasp handle or front edge of cover lifting to its FULL OPEN POSITION, engaging shocks to hold open.

To Close: Grasp handle or front edge of cover lowering cover to its FULLY CLOSED POSITION.

CHANGE #4

EFFECTIVITY: ALL UNITS.

On Page 2-7:

Add the following note after "Reboot your computer..." in Section 2-7:
Note: Make sure your system has been warmed up for one hour.

CHANGE #5

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

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HUNTRON INSTRUMENTS, INC.

LIMITED WARRANTY

Huntron Instruments, Inc. believes in the quality of its products. Accordingly, Huntron provides the following non-transferable warranties for the benefit of the original end-use purchaser of the Huntron Tracker 5100DS / Prober RP388 instrument.

Huntron warrants that the Huntron Tracker 5100DS/Prober RP388 hardware shall be free from defects in material and workmanship for one (1) year from the date of purchase.

Huntron warrants that the diskette(s) containing the Huntron 5100DS/RP388 software shall be free from defects in material and workmanship for one (1) year from the date of purchase. Huntron further warrants that the Huntron 5100DS/RP388 software will perform in substantial conformance with the system specifications of the Huntron Tracker 5100DS/Prober RP388 at the time of purchase and for the period of one (1) year thereafter.

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Written notice of, and an explanation of the circumstances of, any defect believed to be covered by this agreement shall be provided promptly to Huntron by the customer following discovery of the defect. In satisfaction of its warranty liability, Huntron agrees to take reasonable and prompt action to correct the defect, either by repair or replacement, at its option.

LICENSE

Huntron hereby grants the customer a non-transferable, non-exclusive license to use the Huntron 5100DS/RP388 software provided with the Huntron Tracker 5100/Prober RP388 instrument. The license is perpetual as long as the customer abides by the terms and conditions of this agreement. The purchase price of the Huntron Tracker 5100DS/Prober RP388 instrument includes the fee for the license set forth herein.

The Huntron software may be used only with one particular Huntron Tracker 5100DS/Prober RP388 instrument which it accompanies at the time of purchase and may not be used with any other Huntron Tracker 5100DS/Prober RP388 instrument, without the written permission of Huntron. The customer shall not, without the specific written consent of Huntron, copy, in whole or in part, the Huntron software for any purpose, except to make one copy for backup purposes.

The customer shall not remove or obscure any copyright notice or notices included on or as part of the Huntron software.

The customer shall not recompile, decompile, disassemble or modify the Huntron software in any way, nor produce any derivative work thereof.

CONTACTING HUNTRON

For technical support or to obtain information about service, accessories, and other products contact:

Huntron Instruments, Inc.
15720 Mill Creek Blvd.
Mill Creek, WA 98012
U.S.A.

In North America, call 800-426-9265 or 206-743-3171.

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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 5100DS/RP388 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 moveable 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/RP388 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 "↵".

1-4. WHAT IS ANALOG SIGNATURE ANALYSIS?

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 component is limited, this technique is non-destructive, and should 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 component 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 analog signature across two terminals of a component, whether it is a passive component like a resistor, capacitor, or inductor, or a solid state component like a diode, transistor, SCR, digital, analog, or mixed-signal IC. 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 which components are faulty.

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

1-5. EXAMPLES OF ANALOG SIGNATURES

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 1-1.

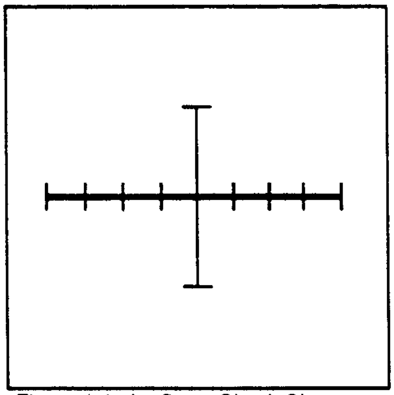


Figure 1-1. An Open Circuit Signature.

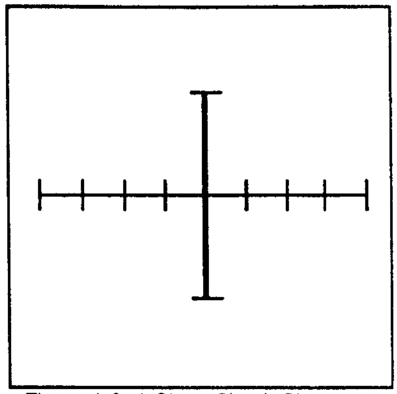


Figure 1-2. A Short Circuit Signature.

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 1-2.

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

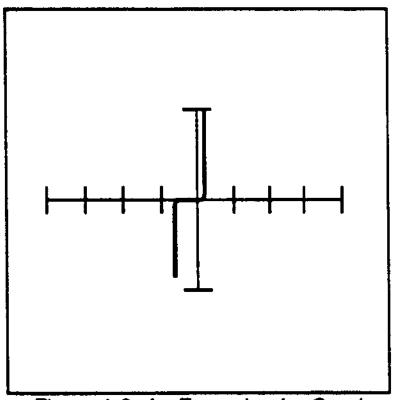


Figure 1-3. An Example of a Good Component's Analog Signature.

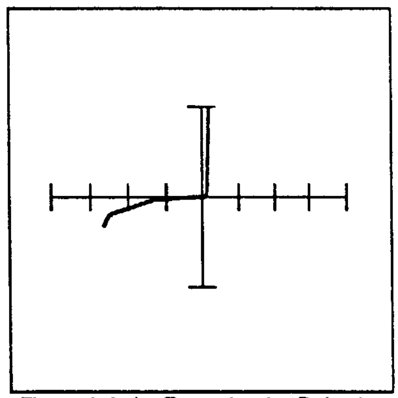


Figure 1-4. An Example of a Defective Component's Analog Signature.

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 1-4.

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 changes from a horizontal line (good signature) into a curve (defective signature). These types of problems are 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 Appendices D and E of this manual for detailed information and more 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/RP388, please contact Huntron Technical Support.

CHAPTER 2
TRACKER 5100DS SETUP

2-1. INTRODUCTION

NOTE
If you have an RP388, skip to Chapter 3 for 5100DS/RP388 setup instructions.

The Huntron Tracker 5100DS troubleshooting system is designed to be used with an IBM personal computer or IBM PC compatible computer with a GPIB interface which conforms to the IEEE-488 standard. The Tracker 5100DS is the most advanced member of the Huntron Tracker family of troubleshooting systems. It is a fast system to learn and 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 zero insertion force (ZIF) socket on the front panel. You can also connect to test fixtures and adapters to simplify interfacing your board to the 5100DS using the IDC connectors. Refer to the application notes in the back of this manual or contact Huntron for more information.

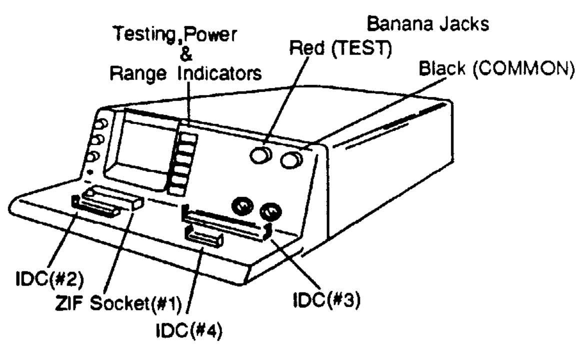


Figure 2-1. Front of 5100DS Showing Test Connectors and Indicators.

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. This provides you with immediate feedback of what is being tested and whether or not the 5100DS is obtaining signatures. During the signature digitizing cycle, the signatures are displayed in quick succession on the CRT.

The 5100DS is capable of testing in any or all of four impedance (current/voltage) ranges. These ranges (LOW, MEDIUM 1, MEDIUM 2, and HIGH) allow you to choose the range(s) that displays the most descriptive signature. 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 Appendices D and E in this manual or contact Huntron Technical Support.

2-2. WHAT YOU SHOULD HAVE

These items will be referred to in the following pages. Check that you received the following:

QUANTITY	DESCRIPTION	HUNTRON PART NUMBER
1	Tracker 5100DS	-
1	User's Manual including 5100DS/RP388 software	-
1	Tracker 5100DS Technical Reference Manual	-
1	GPIB board (one of the following)	
	AT bus	98-0300
	MCA bus	98-0303
1	GPIB cable	98-0047
1	Power cord (115V)	98-0015
1	Demo board	06-3059
1	20 pin test clip cable	98-0025
1	40 pin test clip cable	98-0026
1	8 pin IC test clip	07-1235
1	14 pin IC test clip	07-1236
1	16 pin IC test clip	07-1229
1	18 pin IC test clip	07-1237
1	20 pin IC test clip	07-1234
1	22 pin IC test clip	07-1238
1	24 pin IC test clip	07-1239
1	28 pin IC test clip	07-1240
1	40 pin IC test clip	07-1230
1	Huntron Probes set	98-0078
1	Front End Adapter Board	06-3046
1	64 conductor cable	98-0072
1	40 conductor cable	98-0071
1	1K jumper cable	98-0029
1	10K jumper cable	98-0028
1	Black common clip cable	98-0043

2-3. PC REQUIREMENTS

The following requirements are provided to assist you in purchasing the correct computer system to use with a Tracker 5100DS or to determine if the system you already have will work.

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 are slow.

- IBM PC/XT or 100% compatible
- MS-DOS/PC-DOS 3.3 or later
- 640K RAM
- One 5.25″ or 3.5″ floppy disk drive
- Hard disk
- EGA video board
- EGA color monitor
- Parallel printer port
- Printer
- One spare PC expansion slot (for GPIB board)

RECOMMENDED

Using this configuration, the system will run faster resulting in better performance and you will be able to add a Robotic Prober RP388 in the future.

- IBM compatible 386 or 486 with AT or MCA bus
- MS-DOS/PC-DOS 5.0 or later
- 1 MB RAM
- 2 MB Extended RAM
- High Density 3.5″ and 5.25″ floppy disk drives
- Hard disk (80 MB or larger)
- VGA video board
- VGA color monitor
- Parallel printer port
- Printer
- Serial Port
- Three spare expansion slots

2-4. INSTALLING THE GPIB BOARD INTO YOUR PC

To install the GPIB board in the spare expansion slot of your computer, you will need a screwdriver, slot or Phillips, etc., depending on the type of screws on the back of your personal 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. The GPIB board comes properly configured for 5100DS operation. Do not change any jumpers or DIP switch settings.
6. 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.
7. Secure the GPIB board with rear panel screw.
8. Install the PC's top cover and secure with screws.
9. Attach the monitor, keyboard, printer and power cord.

You are now ready to proceed with the next setup step for 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/RP388 Disk #3 supplied with your 5100DS.
3. When the reference program asks for the option disk, remove the IBM reference disk and insert the 5100DS/RP388 Disk #3 in the disk drive. Re-insert the IBM reference diskette when the program asks for it.
4. After the files have been copied, exit the reference program, remove the IBM reference 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 cord.
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.

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

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

2-5. ASSEMBLING THE TRACKER 5100DS SYSTEM

1. Check to see that 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, gently pry the fuse holder out using a small flat blade tool at the access slot just below the recessed male power cord connector. Remove and rotate the 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 GPIB connector on the back of the 5100DS.

3. Attach the power cord, and turn the 5100DS on. The indicators (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 power up 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 5100DS 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.

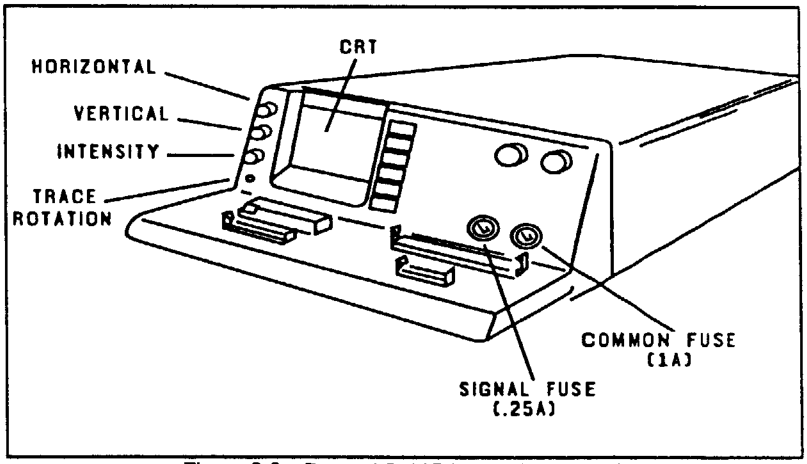


Figure 2-2. Front of 5100DS Showing the Adjustment Knobs.

2-6. INSTALLING THE SOFTWARE

NOTE

Before proceeding with software installation, make backup copies of the diskettes supplied with the 5100DS. Keep your original 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/RP388 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. When you are asked by the program if you want to set up for a Robotic Prober RP388 system, type "N" for No.

NOTE

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

2-7. SYSTEM CHECKOUT

Reboot your computer and perform the following steps to verify that your system is ready for operation.

1. At the prompt, start the 5100DS software by typing "**cd 51ds**" ↵ and then type "**51ds**" ↵.
2. The Huntron logo screen should appear. Press ↵.
3. The Log On security screen should appear. Press ↵ twice.
4. The Main menu appears next. Press **M** to activate Maintenance mode.
5. At the Maintenance menu, press **C** to select "Calibration Check" and then press ↵ to begin the test.
6. The message "5100DS IS IN CALIBRATION" should appear in the lower portion of the Calibration Check screen. Press **Esc** to return to the Maintenance menu.
7. Activate the Relay Check by pressing **R** (the test starts automatically).
8. When the Relay Check is complete, all relays should show "G" for good.

This completes the checkout of your Tracker 5100DS system. Press **Esc** to return to the Main menu, then turn to Chapter 4: SOFTWARE OVERVIEW.

For more information on the Maintenance features refer to the Tracker 5100DS Technical Reference Manual.

IMPORTANT NOTE

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

NOTES:

CHAPTER 3
PROBER RP388 SETUP

3-1. INTRODUCTION

NOTE

If you do not have an RP388, go to Chapter 2 for 5100DS setup instructions.

The Huntron Robotic Prober RP388 is designed to incorporate a Tracker 5100DS and provide an automatic testing interface from the 5100DS to a printed circuit board that is mounted in the RP388. It is not necessary to have an operator clip onto individual components one by one. However, all of the 5100DS's connectors are still available for testing using cables, probes or ZIF socket. Unattended testing is now possible with full access to conventional through-hole components as well as the latest fine-pitch surface mount devices. The ease of use of Huntron's proven ASA technology with digital storage moves to new heights.

The 5100DS/RP388 system is controlled by an IBM PC compatible or IBM PS/2 compatible computer using Huntron 5100DS/RP388 Software Version 7.0 or later. The computer uses three interfaces to the 5100DS/RP388: a GPIB (IEEE-488) interface to communicate with the 5100DS inside the RP388, an RS-232 serial interface to control the stepper motors in the RP388, and a camera interface to capture images of the test board.

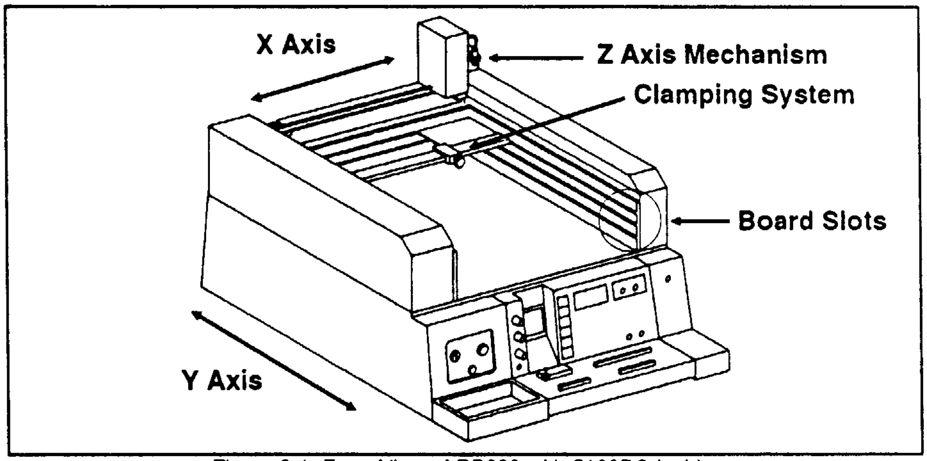


Figure 3-1. Front View of RP388 with 5100DS Inside.

Although the 5100DS has a built-in CRT, the main display is your computer monitor. The 5100DS/RP388 is software driven, so your computer controls it for testing and then processes the data for viewing on your computer screen.

The 5100DS CRT serves as an analog signature real time monitor. This provides you with immediate feedback of what is being tested and whether or not the 5100DS/RP388 is obtaining signatures. During the signature digitizing cycle, the signatures are displayed in quick succession on the CRT.

The 5100DS/RP388 is capable of testing in any or all of four impedance (current/voltage) ranges. These ranges (LOW, MEDIUM 1, MEDIUM 2, and HIGH) allow you to choose the range(s) that displays the most descriptive signature. 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 Appendices D and E in this manual or contact Huntron Technical Support.

3-2. WHAT YOU SHOULD HAVE

First remove the top of the shipping container. The accessories box is located on top of the RP388. These items will be referred to in the following pages. Check that you received the following:

QUANTITY	DESCRIPTION	HUNTRON PART NUMBER
1	User's Manual with 5100DS/RP388 software	-
1	Camera interface board	98-0108
1	Camera Offset board	98-0114
1	Trackball package	98-0128
2	Serial Cables (male DB9 to female DB9)	98-0107
1	Serial Cable Adaptor (female DB25 to male DB9)	98-0130
1	Jumper Power Cable	98-0115
1	Red Banana Cable	98-0100
1	Tool kit (w/probe tips, receptacles, & rail lubricant)	98-0127
1	Cross Bar with locks	98-0110
1	Slide Bar	98-0109
4	Board Spacers	98-0111
1	Pad insert for left front panel block	01-1149
4	5100DS mounting screws (6-32 x 3/4 in.)	07-3106

The Prober RP388 is packed at the bottom of the shipping container. Removal instructions for the RP388 are found in section 3-5 of this chapter.

If you have also purchased a new Tracker 5100DS with your RP388, refer to the list of "What You Should Have" in Chapter 2, section 2-2.

3-3. PC REQUIREMENTS

The following requirements are provided to assist you in purchasing the correct computer system to use with a 5100DS/RP388 system or to determine if the system you already have will work.

MINIMUM

With a computer system meeting only the minimum requirements, you will be able to use the 5100DS/RP388 and all of its functions. However, you may find that certain functions are slow.

- IBM PC/XT or 100% compatible
- MS-DOS/PC-DOS 3.3 or later
- 640K RAM
- One 3.5" or 5.25" floppy disk drive
- Hard disk
- VGA video board
- VGA color monitor
- Parallel printer port
- Printer
- Two serial ports
- AT bus: three spare expansion slots (for GPIB, Camera and trackball boards)
- MCA bus: two spare expansion slots (for GPIB and Camera boards)
- MCA computer: mouse port

RECOMMENDED

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

- IBM compatible 386 or 486 with AT or MCA bus
- MS-DOS/PC-DOS 5.0 or later
- 1 MB RAM
- 2 MB Extended RAM
- High Density 3.5" and 5.25" floppy disk drives
- Hard disk (80 MB or larger)
- VGA video board
- VGA color monitor
- Parallel printer port
- Printer
- Two serial ports
- AT bus: three spare expansion slots (for GPIB, Camera and trackball boards)
- MCA bus: two spare expansion slots (for GPIB and Camera boards)
- MCA computer: mouse port

3-4. INSTALLING THE HARDWARE INTO YOUR PC

This section covers the installation of trackball, GPIB and Camera boards into your PC.

The section is broken down into two major sections: IBM PC/XT/AT bus computers and IBM PS/2 computers with MCA bus.

TRACKBALL INSTALLATION

Remove the trackball from its protective wrapping. Refer to the trackball manual for installation.

BOARD INSTALLATION FOR 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 board installation procedure is the same. You will need a screwdriver, slot or Phillips, etc., depending on the type of screws on the back of your personal computer.

1. Turn your PC system off.
2. Remove the monitor, keyboard, printer and power cable from the PC.
3. Remove the PC's 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 two unused slots and remove the rear cover plates for those slots.

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. The GPIB board comes properly configured for 5100DS operation. Do not change any jumpers or DIP switch settings.
6. Place the GPIB board over a 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.
7. Secure the GPIB board with the rear panel screw.
8. Remove the Camera board from its protective wrapping. Handle the Camera board by its sides only and avoid touching the board's edge connector.
9. Place the Camera board over another spare slot with the board's edge connector down and the 9 pin female connector towards the rear access panel of your PC. Press the Camera board down until mated with the main board of your PC.
10. Secure the Camera board with the rear panel screw.
11. Re-install the PC's top cover and secure with screws.
12. Attach the monitor, keyboard, printer and power cord.

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

INSTALLATION FOR AN IBM PS/2 WITH MCA.

IMPORTANT NOTE

Before proceeding with the installation, make backup copies of the software 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/RP388 Disk #3 supplied with your 5100DS.

3. When the reference program asks for the option disk, remove the IBM reference disk and insert the 5100DS/RP388 Disk #3 in the disk drive. Re-insert the IBM reference diskette when the program asks for it.

4. After the files have been copied, exit the reference program, remove the IBM reference disk and turn off your PS/2.

5. Remove the monitor, keyboard, printer and power cable from the PS/2.

6. Remove the PS/2's 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 two unused slots and remove the rear cover plates for those slots.

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 a 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 the rear panel screw.

11. Remove the EDC-1000MC camera board from its protective wrapping. Handle the EDC-1000MC board by its sides only and avoid touching the board's edge connector.

12. Place the EDC-1000MC board over another spare slot with the board's edge connector down and the 9 pin female connector towards the rear access panel of the PS/2. Press the EDC-1000MC board down until mated with the PS/2's main board.

13. Secure the EDC-1000MC board with the rear panel screw.

14. Reinstall the PS/2's cover and secure with screws.

15. Plug your trackball into your PS/2's mouse port.

16. Attach the monitor, keyboard, printer and power cord.

17. Insert the IBM reference disk in floppy drive A and turn your PS/2 on.

18. 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 and EDC-1000MC boards. After the hardware has been configured, restart your PS/2 with the IBM reference disk still in floppy drive A. 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 3-1 for later reference.

Table 3-1. PS/2 Board Configuration Settings.

SETTING	MC-GPIB	EDC-1000MC
I/O Address		
Interrupt Level		Not Applicable
Arbitration Level		Not Applicable

You are now ready to proceed with the next setup step for your 5100DS/RP388 system.

3-5. PREPARING YOUR PROBER RP388

CAUTION

To safely accomplish some portions of the following procedure, two people are required. Also, the RP388 needs to be placed on a sturdy workbench. The RP388 should never be allowed to extend over the edge of the workbench.

1. Clear an area on your workbench next to your computer.

2. Using two people, lift the RP388 from the shipping pallet onto the workbench.

3. If you are setting up your RP388 with a previously purchased 5100DS, unplug the power cord from the rear panel of the 5100DS. Also, disconnect the GPIB cable from your 5100DS and from your computer.

4. Check to see that the 5100DS is set to the proper line voltage for your area by inspecting the fuse holder on the back panel of the 5100DS. The correct voltage should be aligned with the small arrow below the fuse holder. For 100 Volt units, use the 110-120 position.

   If incorrect, gently pry the fuse holder out using a small flat blade tool at the access slot just below the recessed male power cord connector. Remove and rotate the fuse holder to align it with the new voltage setting. Refer to the Tracker 5100DS Technical Reference Manual for further information.

5. Turn the 5100DS over and place it on a flat surface. Remove four screws from the bottom. Turn the unit right side up. Slide the case cover towards the rear of the unit and remove cover.

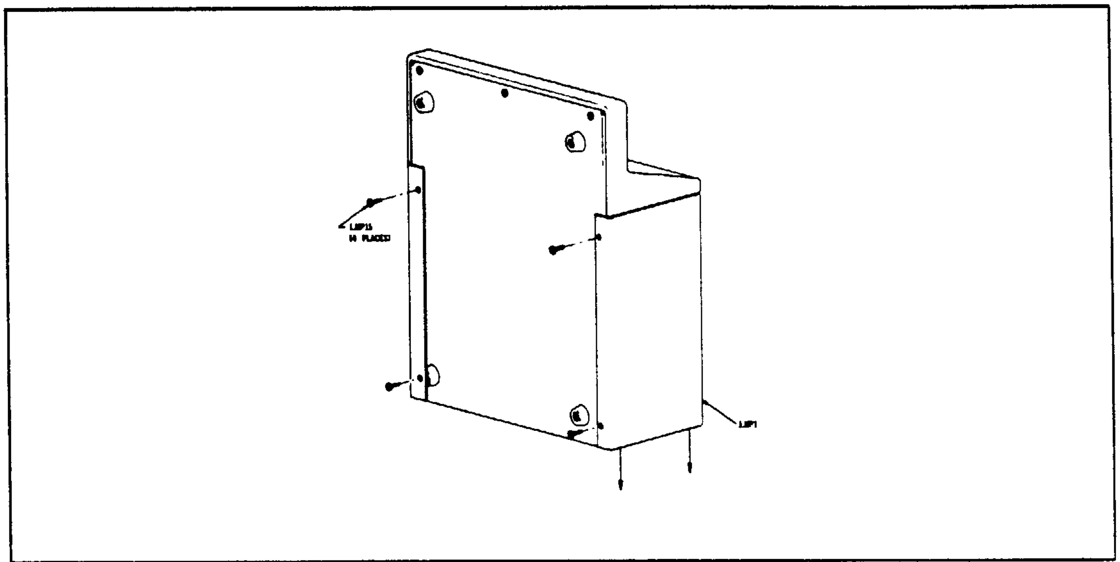


Figure 3-2.Removing the 5100DS Case Cover.

6. Remove the back panel door from the RP388 (see the following figure).

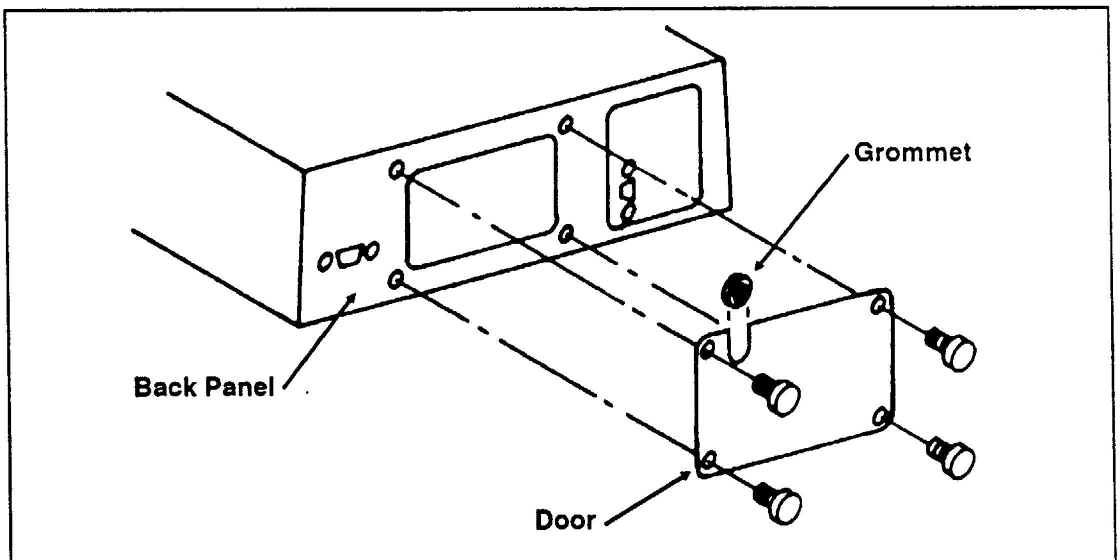


Figure 3-3.Removing the Door from the RP388 Back Panel

7. Insert the back end of the 5100DS into the front of the RP388 as shown in the next figure.

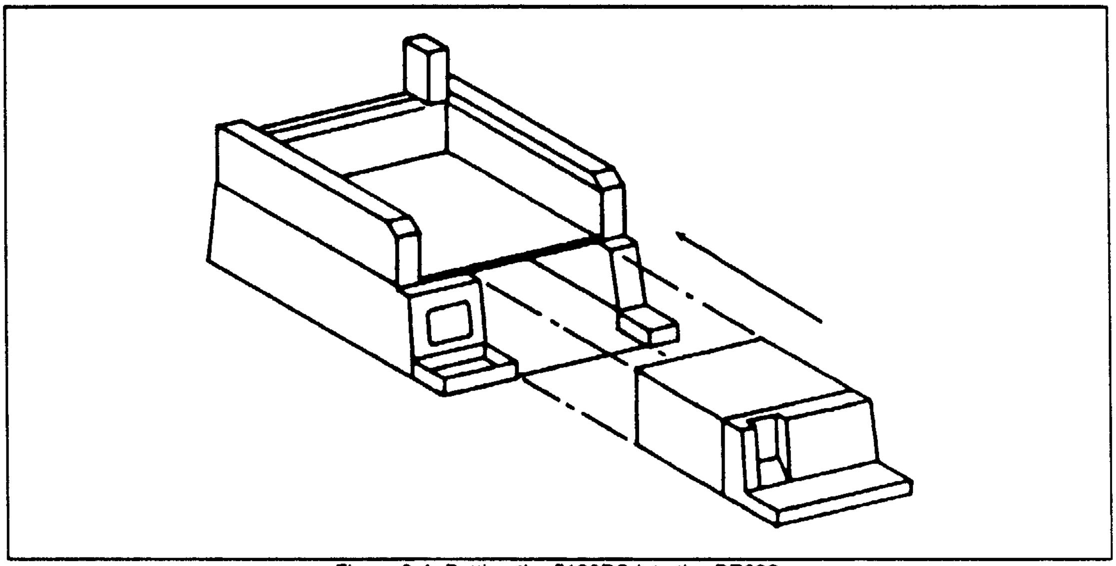


Figure 3-4. Putting the 5100DS into the RP388.

8. While one person tilts the RP388 on it's side and holds it in place, another person should secure the 5100DS to the RP388 with four 6-32 x ¾ in. screws from the bottom side of the RP388. These screws go into the threaded chassis holes that formerly held the 5100DS case cover in place.

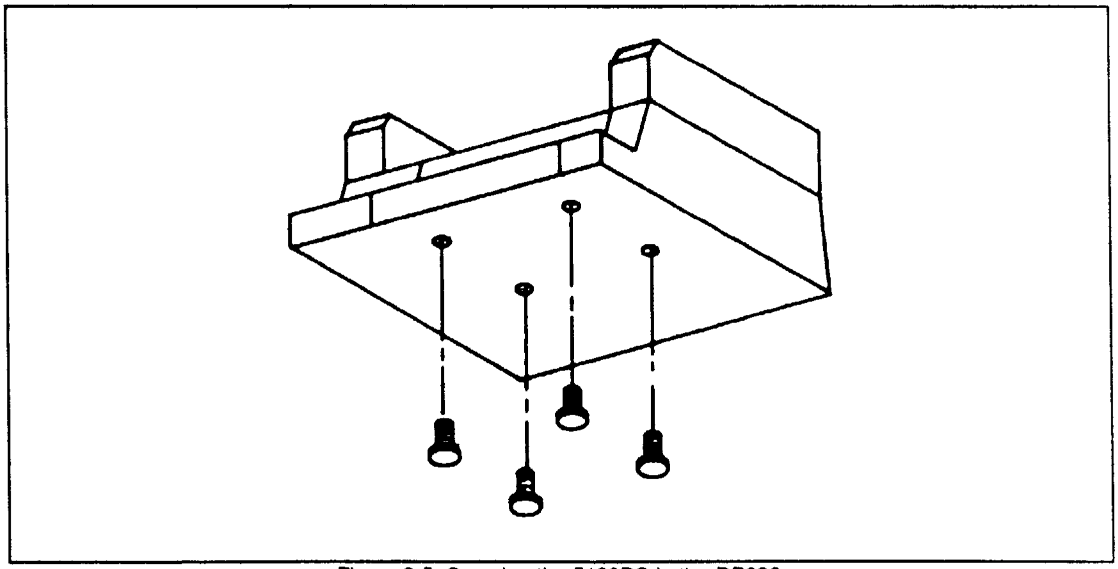


Figure 3-5. Securing the 5100DS in the RP388.

9. Refer to the following figure for the next three steps. Locate the jumper power cord and connect the recessed male end of it to the female power receptacle on the side wall of the power supply chassis.

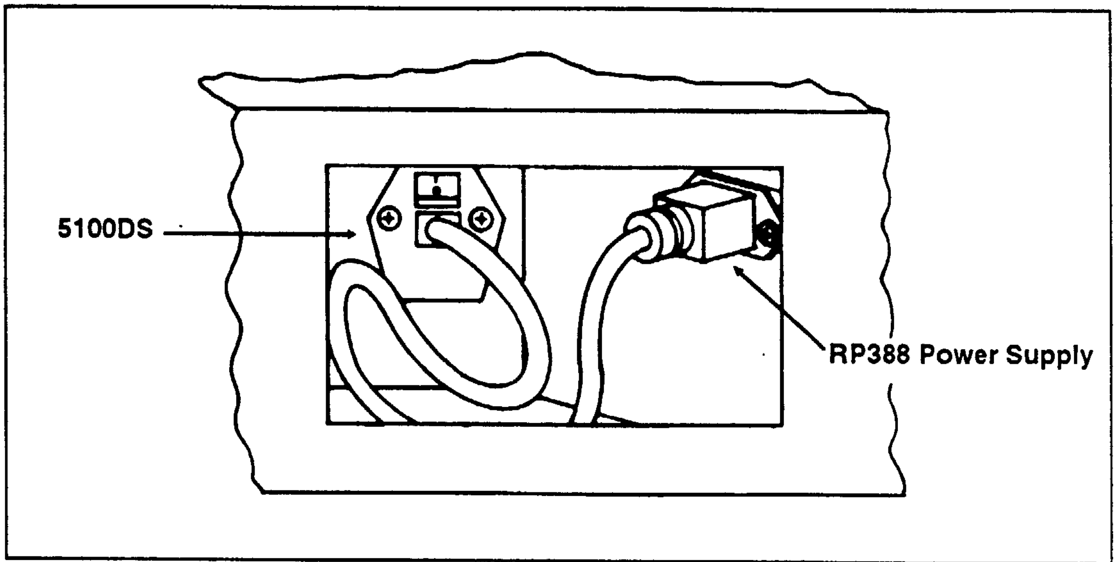


Figure 3-6. Connection of the Jumper Power Cord.

10. Plug the other end of the jumper power cord into the 5100DS power receptacle.
11. Store the excess jumper power cord in the empty space behind the 5100DS.
12. Turn the 5100DS power switch ON (0 → 1).
13. Connect one end of the GPIB cable to the GPIB connector on the back panel of the 5100DS.
14. Remove the grommet from the RP388's back panel door. Put the rubber grommet on the GPIB cable.
15. Put the rubber grommet with the GPIB cable back in the back panel door's cable hole.

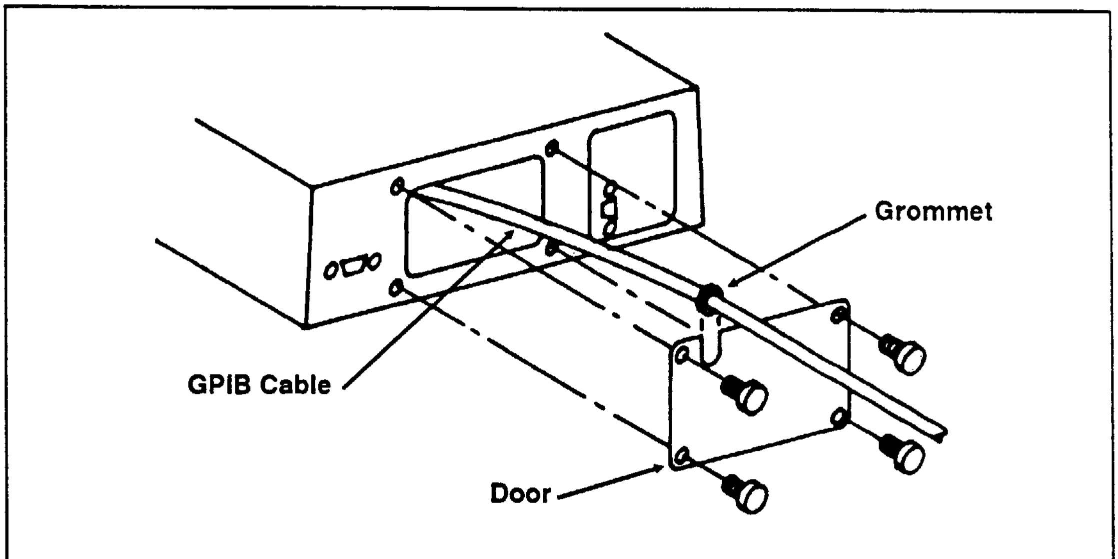


Figure 3-7. GPIB Cable Routing from Back Panel Door.

16. Reinstall the back panel door onto the back of the RP388 with the GPIB cable routed through the cable hole.

17. Using a hex screwdriver, remove the red shipping stoppers from the X and Y rails so that the Z Axis mechanism is free. Retain the stoppers for future RP388 shipping.

Your RP388 is now ready to be assembled into a complete system.

3-6. ASSEMBLING THE RP388 SYSTEM

1. Check to see that your RP388 is correctly set to operate with the voltage in your area by inspecting the fuse holder on the back of the RP388. The correct voltage should be aligned with the small arrow below the fuse holder. For 100V units, use the 110-120 position.

   If incorrect, gently pry the fuse holder out using a small flat blade tool at the access slot just below the recessed male power cord connector. Remove and rotate the 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.

CAUTION

The RP388 voltage setting must match your AC source before operating.

2. Attach the GPIB cable that is already attached to the RP388 to the exposed connector of the GPIB board you have just installed in your computer.

3. Plug the male end of one of the two serial cables into the female DB9 connector labeled "SERIAL PORT" on the rear panel of the RP388. Connect the female end of the same cable to the male serial connector on your PC. If your PC has a DB25 (25pin) serial connector instead of a DB9 (9 pin), use the 25 pin to 9 pin adapter to connect the serial cable to the PC.

4. Take the remaining serial cable and plug the female end into the male DB9 connector labeled "CAMERA PORT" on the rear panel of the RP388. The male end of the same cable should be plugged into the female DB9 connector on the Camera board that you installed into your PC.

5. Attach the power cord, and turn the RP388 on. The indicators (LOW, MED1, MED2, HIGH, TESTING) on the front panel of the 5100DS will flash in sequence immediately after the power is switched on. The power light and MED2 light should remain on after the power up test is completed. The red light source on the Z Axis mechanism will be on. If the light source is on but the 5100DS front panel lights are off, check the 5100DS ON/OFF power switch. It should be switched to ON. If you do not obtain these results, turn off the RP388, check connections and turn it on again. Refer to the 5100DS Technical Reference manual or contact Huntron if the unit does not pass this step.

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

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

8. Plug one end of the short red banana cable to the red TEST jack on the 5100DS front panel. Plug the other end of the banana cable to the red unmarked jack on the right side of the RP388.

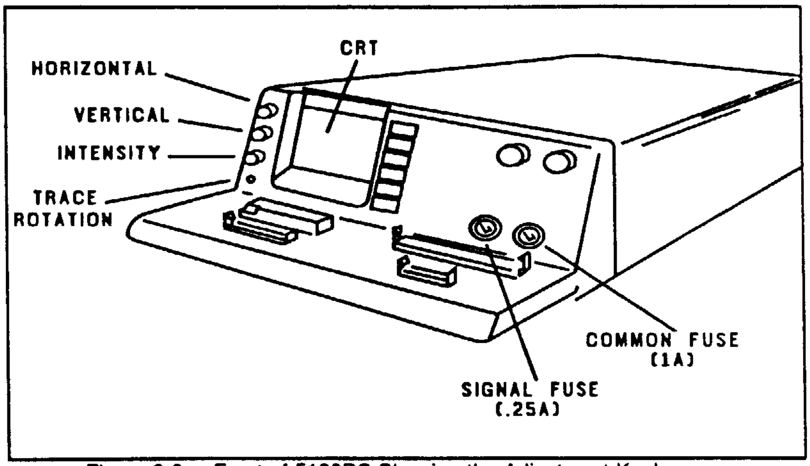


Figure 3-8. Front of 5100DS Showing the Adjustment Knobs.

3-7. INSTALLING THE SOFTWARE

NOTE

Before proceeding with software installation, make backup copies of the diskettes supplied with the RP388. Keep your original 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/RP388 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. When you are asked by the program if you want to setup for a Robotic Prober RP388 system, type "Y" for Yes.

NOTE

If there is a mouse other than the trackball mouse installed on your system, the mouse driver MUST be removed from your CONFIG.SYS file.

3-8. SYSTEM CHECKOUT

Reboot your computer and perform the following steps to verify that your system is ready for operation.

1. At the prompt, start the 5100DS/RP388 software by typing "**cd 51ds**" ↵ and then type "**51ds**" ↵.
2. The Huntron logo screen should appear. Press ↵.
3. The Log On security screen should appear. Press ↵ twice.
4. The Main menu appears next. If you are using a Logitech trackball then skip to the next step. Otherwise, you will need to change the trackball default setting in the software. Press **U** to activate SETUP mode and use the arrow keys to select the "Trackball" option. Press < or > key to change "Trackball: Logitech" to "Trackball: MicroSpeed". Next press **Esc** then **Y** to save and exit SETUP.
5. Press **M** to activate Maintenance mode. At the Maintenance menu, press **C** to select "Calibration Check" and then press ↵ to begin the test.
6. The message "5100DS IS IN CALIBRATION" should appear in the lower portion of the Calibration Check screen. Press **Esc** to return to the Maintenance menu.
7. Activate the Relay Check by pressing **R** (the test starts automatically).
8. When the Relay Check is complete, all relays should show "G" for good. Press **Esc** to return to the Maintenance menu.

IMPORTANT NOTE

The RP388 has been factory calibrated and should not require any adjustments. In the following steps you will only be verifying the RP388 XY calibration. Contact Technical Support for assistance before attempting to make any adjustments. Do not open any access doors or adjust any hardware unless directed by Technical Support.

9. Press **V** to activate "Verify/Adjust XY Calibration". This test is used to verify that boards learned on this RP388 can be tested on another RP388. Follow the on-screen instructions given until the RP388 starts to move back and forth on an angle.

10. After the RP388 has cycled three times, it will stop over the first calibration target and the CALIBRATION screen will appear.

11. If the camera image is out of focus, press F to go to the FOCUS screen. Adjust the knob on the top of the camera until the target is clearly in focus. Press Esc to return to the CALIBRATION screen.

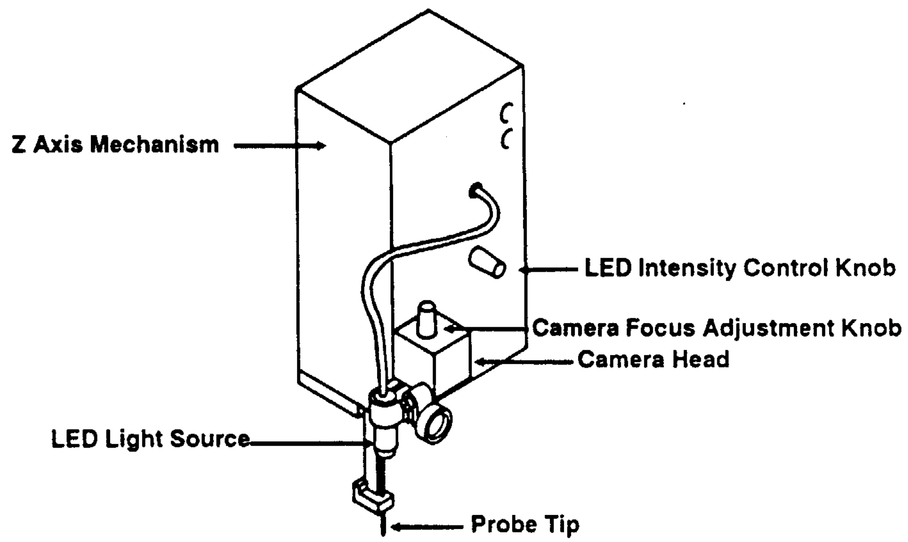


Figure 3-9. Focus Adjustment Knob On Top of Camera.

12. Use the trackball or the arrow keys on the keyboard to position the camera cross hair directly over the calibration target. If necessary, press T to set the Travel increment to a larger value so that the RP388 moves farther with each step. When the cross hairs are as close as possible, change the Travel increment to 2 mils (.0508 mm) and get the two exactly lined up. When they are, press ↵ .

13. The RP388 will move to the second calibration target. Check that the camera cross hair is exactly over the target. This shows that the RP388 is properly calibrated. Do not attempt any adjustments at this time.

14. Press ↵. The RP388 will cycle three more times and stop over the first calibration target again. Make sure the camera cross hair is still directly over the target.

15. Press ↵. The RP388 will move to the second calibration target. Check that the camera cross hair is still exactly over the second target.

IMPORTANT NOTE

If the RP388 is not in calibration, contact Technical Support for further instructions before attempting to make any adjustments.

Press Esc to return to the Maintenance menu.

NOTE

The remaining steps adjust the camera to probe tip physical offsets for each slot position. This is necessary for proper operation of your RP388 because each unit will be slightly different.

16. Press **O** to activate camera offset.

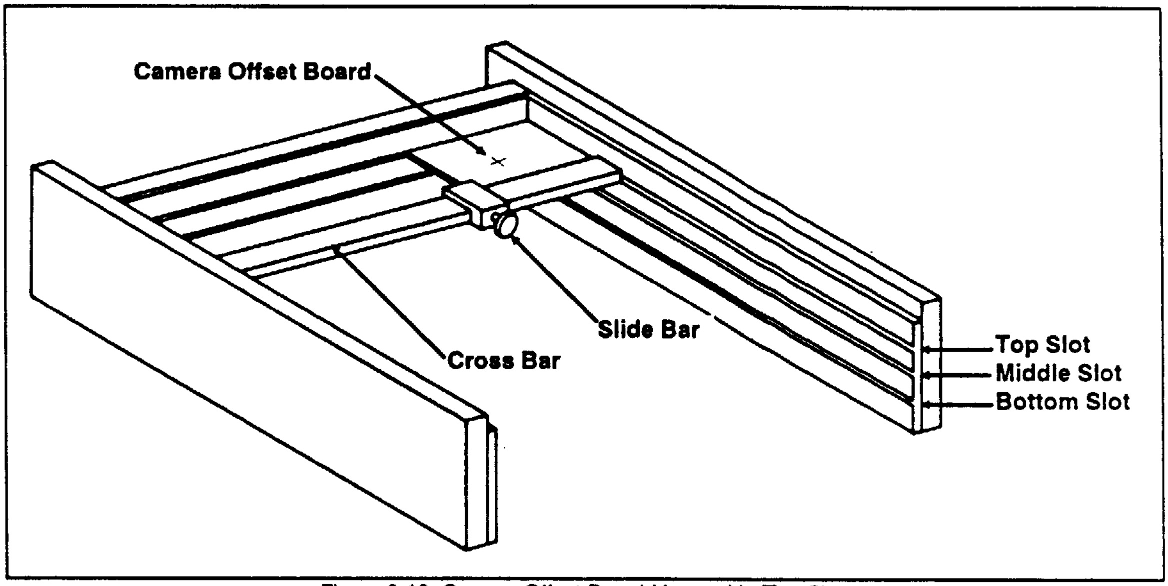


Figure 3-10. Camera Offset Board Mounted in Top Slot.

17. Press **1** to select the top slot.

18. Mount the Camera Offset board in the top slot.

19. Follow the instructions until the CAMERA OFFSETS screen appears.

20. If the camera image is out of focus, press **F** to go to the FOCUS screen. Adjust the knob on the top of the camera until the board target is clearly in focus. Press **Esc** to return to the CAMERA OFFSETS screen.

21. Use the trackball or the arrow keys on the keyboard to position the camera cross hair directly over the target on the camera offset board. If necessary, press **T** to set the Travel increment to a larger value so that the RP388 moves farther with each step. When the cross hair and target are as close as possible, change the Travel increment to 2 mils (.0508 mm) and get the two exactly lined up. When they are, press **S** to set the position.

22. Press **M** to change to Probe mode. The RP388 will move over so that the probe tip is approximately over the board target. Use **PgDn** to lower the probe tip until it just touches the board. If necessary, use **T** to precisely adjust the Z travel of the probe tip to ensure that it just touches the board. Then use the arrow keys to position the probe tip exactly at the center of the target. Press **S** to set the position.

23. Press **M** again to change back to Camera mode. The RP388 will move back so that the camera is over the board target. The camera cross hair and the board target should still be exactly lined up. Press **Esc**, then **Y** to save these offsets.

24. The program returns to the slot selection window. Press **2** to select the middle slot and repeat steps 18 to 23. Then press **3** to select the bottom slot and repeat steps 18 to 23. This completes setting of the camera offsets.

This completes the checkout of your 5100DS/RP388 system. Press **Esc** to return to the Main menu, then turn to Chapter 4, SOFTWARE OVERVIEW.

For more information on some of the Maintenance features refer to the Tracker 5100DS Technical Reference Manual.

IMPORTANT NOTE

If you experience any difficulties getting the system operational, call Huntron for assistance. In North America, call 800-426-9265 or 206-743-3171. Outside North America, contact your local Huntron distributor or use our fax: 206-743-1360.

CHAPTER 4
SOFTWARE OVERVIEW

4-1. INTRODUCTION

The 5100DS/RP388 operating software has a menu-driven user interface and is divided into three parts: TREE, LEARN/TEST, and UTILITIES.

IMPORTANT NOTE

When running the 5100DS/RP388 software always exit back to the DOS prompt before turning off your computer or performing a computer 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.

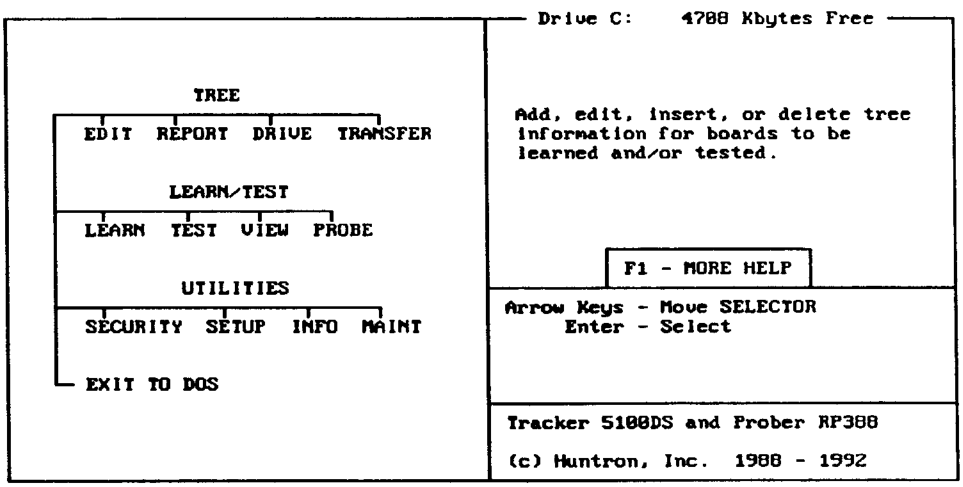


Figure 4-1. Main Menu.

4-3. DEVELOPING A DATABASE

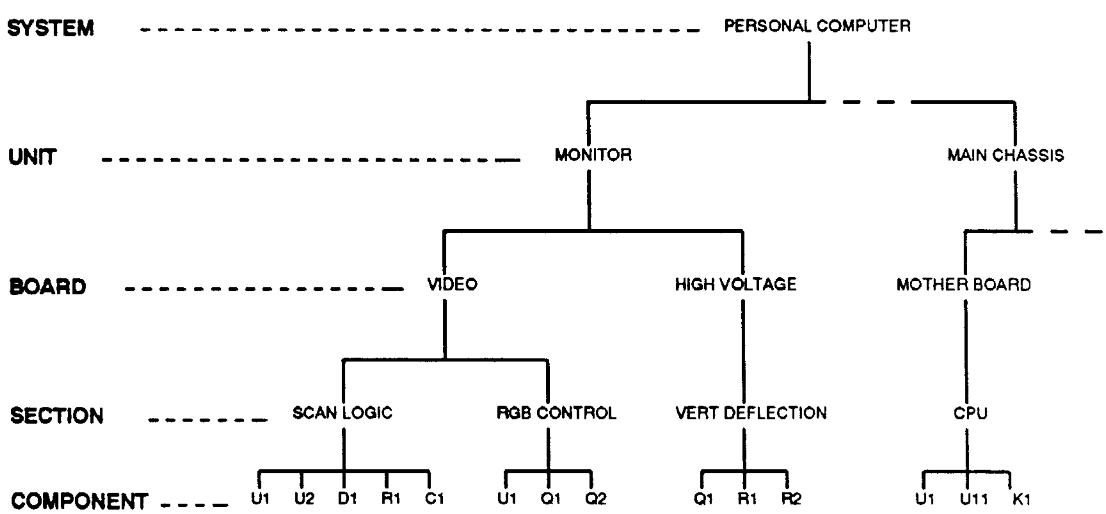
Before a test can be performed, information about the board is needed by the 5100DS/RP388 program. There are several ways of describing the board to the 5100DS/RP388 that will help make it easier to maintain the test data and keep the test results organized to simplify troubleshooting.

One way of developing a database is to divide the system to be tested into logical levels. The 5100DS/RP388 software allows up to five 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 board consists of the following:



Another way of developing a 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 board is not very complicated, or doesn't have a large number of components, the entire board may be entered as a single section especially if you have a 5100DS/RP388 system.

Table 4-1 lists the maximum database capacity for the 5100DS/RP388 Software.

Table 4-1. 5100DS/RP388 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 5100DS/RP388 software can handle is specified in Table 4-1 above. However, the actual capacity that your own 5100DS/RP388 system 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 four modes: EDIT, REPORT, DRIVE, and TRANSFER.

In EDIT, you can create a complete database for each board to be tested or make any changes to an existing database.

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 stored in your computer.

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

EDIT MODE

In the EDIT mode, 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 EDIT, leaving more of the screen available for display of the system and its levels and other vital information.

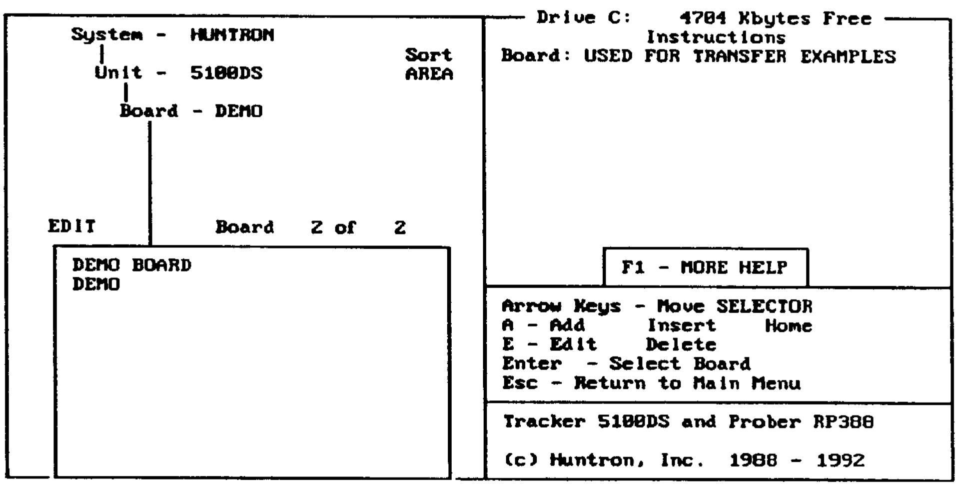


Figure 4-2. Board Selection Screen in EDIT Mode.

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.	PgDn	Move to next page.

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

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

The **SECTION ENTRY POP-UP WINDOW**, where you will enter section names, maximum number of samples, instructions or notes, and RP388 information.

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 the board 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 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 on any board, 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 identifying 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 7 of this manual.)

TRANSFER MODE

This mode allows you to BACKUP, RESTORE, MOVE, or COPY a board to and from another disk drive or path. BACKUP and RESTORE transfer an entire board to a selected floppy or hard disk drive for archiving purposes. MOVE and COPY transfer a board to a floppy disk to support older software versions. (For more information on TRANSFER, refer to Chapter 7 of this manual).

4-5. LEARN/TEST MENU

The LEARN/TEST menu consists of four modes: LEARN, TEST, VIEW, and PROBE. LEARN and TEST are similar in operation, using the full facilities of the 5100DS/RP388. 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. 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 the learn signature for any pin 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**. Board names will appear on the screen. Select the board which you want to test. 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 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 and on your monitor. You do not have to enter board or section data. Instead, you look at a component by entering the component data. Signatures are viewed in real time and are not stored. Only one signature can be viewed at a time. The testing interface to the board must be from one of the front panel connectors of the 5100DS.

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 7 of this manual.

4-6. UTILITIES MENU

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

SECURITY MODE

The SECURITY mode allows a supervisor level user to limit the access of other users to specific 5100DS/RP388 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 and your printer type is specified here. You can also enable the use of an RP388 system and set several related operating parameters 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/RP388.

Refer to Chapter 7 in this manual for more information about the above features.

MAINTENANCE MODE

The MAINTENANCE mode allows you to check the operation of the 5100DS/RP388 using seven utility functions. The 5100DS functions are Performance Test, Calibration Check, Hardware Calibration, Relay Check, and Analog Diagnostics. For information on using these functions, refer to the Tracker 5100DS Technical Reference Manual.

In RP388-equipped systems, you can also check Camera Offset and XY Calibration. Refer to Chapter 6 for more information on these functions.

4-7. MENU SHORT CUTS

After you become accustomed to the operation of the 5100DS/RP388, there are a number of convenient short cuts:

KEY(S)	DESCRIPTION
Alt+F1	Displays the Alt key help screen.
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	At the section level, this feature allows you to make global changes on all the components in the section. The LEARN ranges, TEST ranges, Test Tolerance and Filter settings can be changed. All Common Pins can be set to zero. If the component data changes make the learned signature data invalid, signatures will be deleted. You can also delete all signatures without making any component data changes which sets the number of learns back to zero.
Alt+E	The EDIT mode can be accessed from LEARN or TEST modes with the proper security level.
Alt+G	When viewing signatures, toggles the graticule ON and OFF.
Alt+H	This feature allows you to check the alignment points on a board when using the RP388. You can also re-align to use new alignment points.
Alt+I	Initializes the data for the current troublesheet. All components are set to untested.
Alt+K	This feature toggles the short between pins check ON and OFF. The LEARN short check or TEST short check are toggled depending on the mode selected.
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 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+U	Activates an automatic learn or test of an entire section when using the RP388.
Alt+V	Activates the VIEW mode. If used at the component level, the component information is set.
Alt+Z	In EDIT, activates the Z Teach mode when using the RP388.
Alt+#	When viewing signatures, allows random access zoom on any of the eight signature positions.
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, 6 and 7 and Appendices C and G in this manual for information on how to use these features.

In Chapter 5, a 5100DS 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. If you have an RP388, skip to Chapter 6 which is a tutorial on both the RP388 and 5100DS.

NOTES:

CHAPTER 5
5100DS TUTORIAL

5-1. INTRODUCTION

In this section, you will use the Huntron Demo Board and the 5100DS software to familiarize yourself with the capabilities of this powerful troubleshooting system. With the 5100DS, you will create a test routine and database in EDIT mode, record the signatures of each component on a good board in LEARN mode and do signature analysis by comparison in TEST mode.

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 match the following illustration. Your demo board may look slightly different from the one shown here.

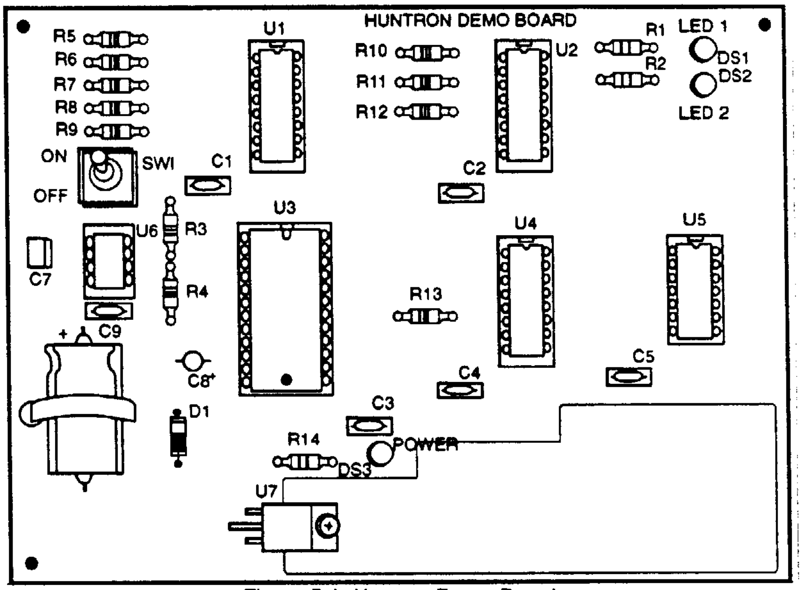


Figure 5-1. Huntron Demo Board.

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 Tracker 5100DS setup described in Chapter 2. If you have not yet done this, go to Chapter 2 before continuing.

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 PC requirements 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.

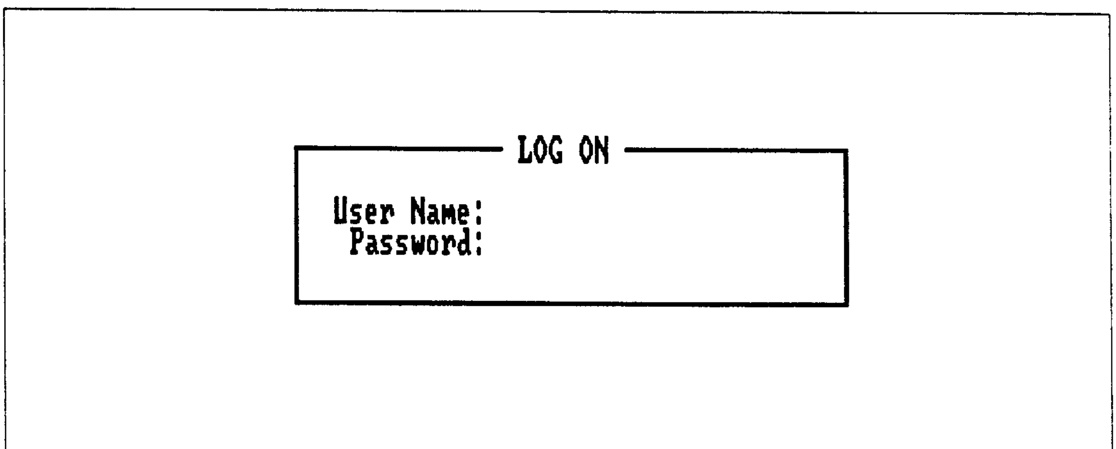


Figure 5-3. Security Log-on Screen.

The Security function displays this screen to allow a supervisor at his option to restrict users so that they can only access 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 7 for complete information on Security.

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.

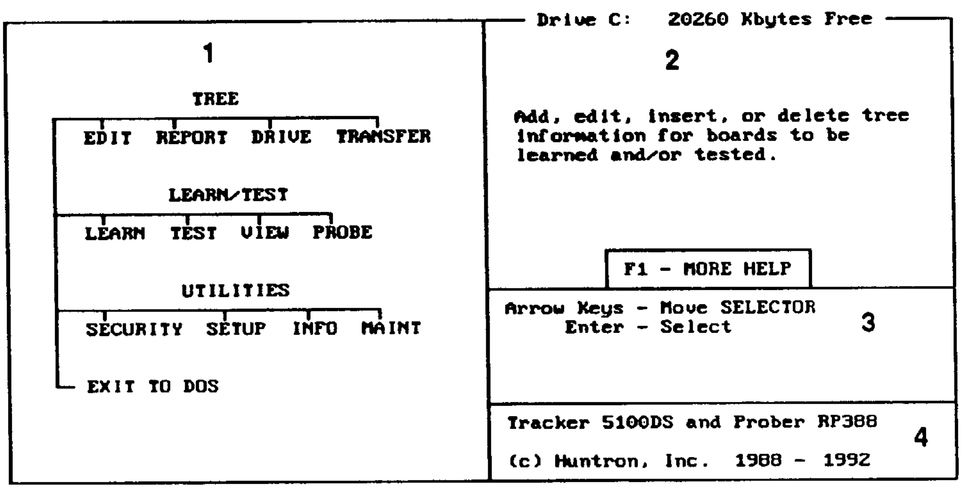


Figure 5-4. Main Menu Screen.

The Main menu screen is divided into four 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 information about the current mode selected from the Main menu. Detailed information for most selections is displayed in this area when the **F1** key is pressed. 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 5100DS/RP388 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 selector around the menu. ↑ ↓ arrows move up and down the menu, and ← → arrows move 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 the previous screen.

5-3. DEFINING A SYSTEM

All boards must be broken down into sections and components for entry into the 5100DS database. For this tutorial, the demo 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 diagram of the system that you will be entering into your database.

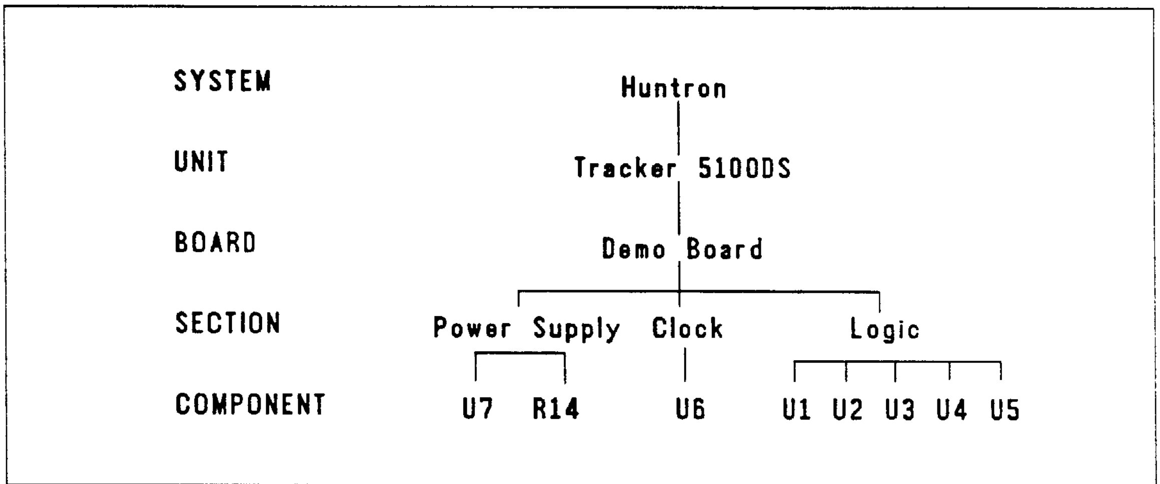


Figure 5-5. Demo Board Diagram for 5100DS Tutorial.

5-4. ENTERING THE BOARD INFORMATION

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.

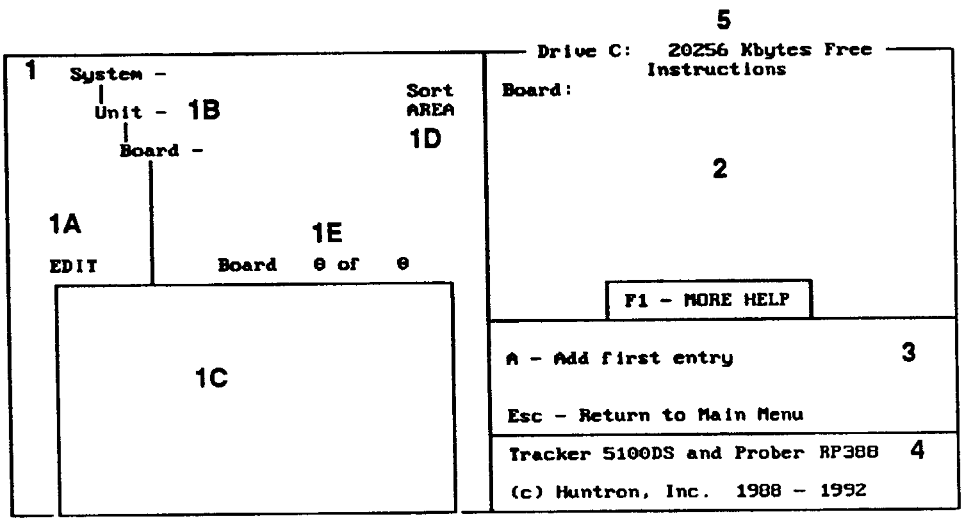


Figure 5-6. EDIT Board Screen.

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 was 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. At this point no boards are 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 7 contains information on this topic in section 7-8 and Sort is also covered in Application Note 2 in the back of 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 which features are active 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.

To enter your first board, press **A** for Add. A pop-up window will appear and ask for the following information:

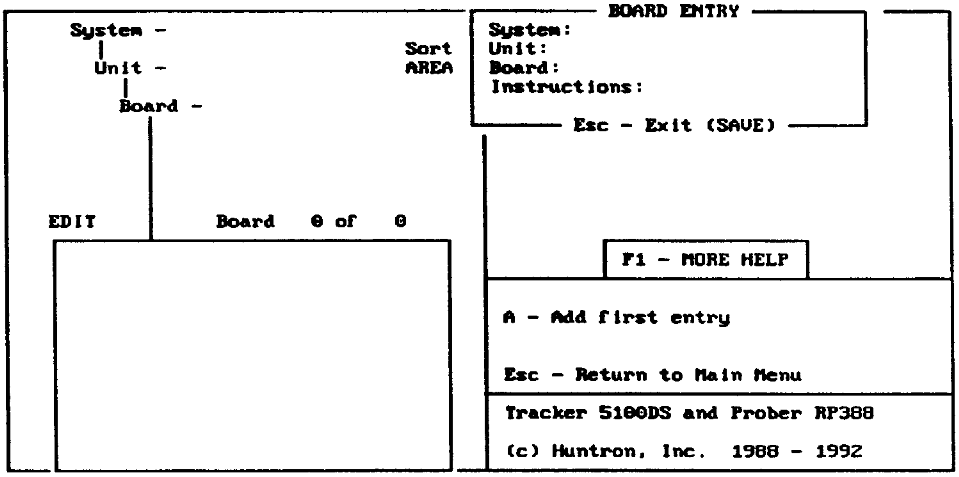


Figure 5-7. Board Entry Pop-up Window.

Each board 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 maximum).
For Unit, type **"T RACKER 5100DS"** ↵ (14 characters maximum).
For Board, type **"DEMO BOARD"** ↵ (14 characters maximum).

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

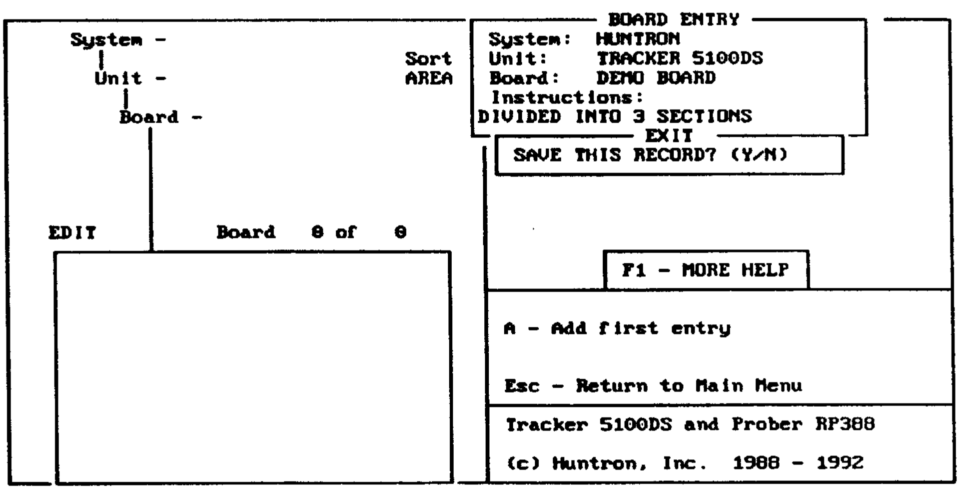


Figure 5-8. Demo Board EDIT Board Screen.

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 board 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 THE 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. At this point there are 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 Application Note 2 in the back of this manual.

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

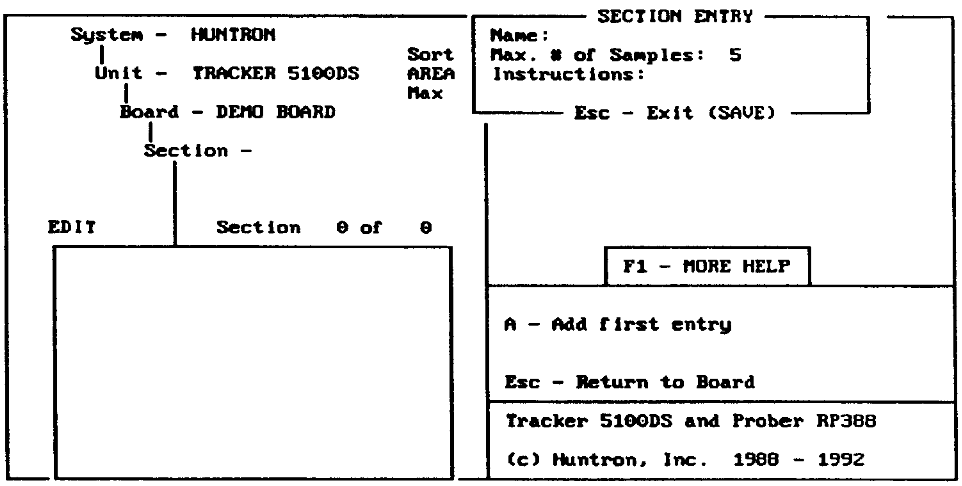


Figure 5-9. First Section Entry Pop-up Window.

For this tutorial, the demo board has been divided into three sections by function, i.e. power supply, clock, and logic. Each of these sections will demonstrate 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 the next line.

NOTE

Max # of Samples - this field sets the upper limit for the number of times the 5100DS will attempt to capture an analog signature during LEARN or TEST. Normally, the 5100DS will 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 and the signature is marked as unstable. 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 , H and the Application Notes 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 maximum)

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.

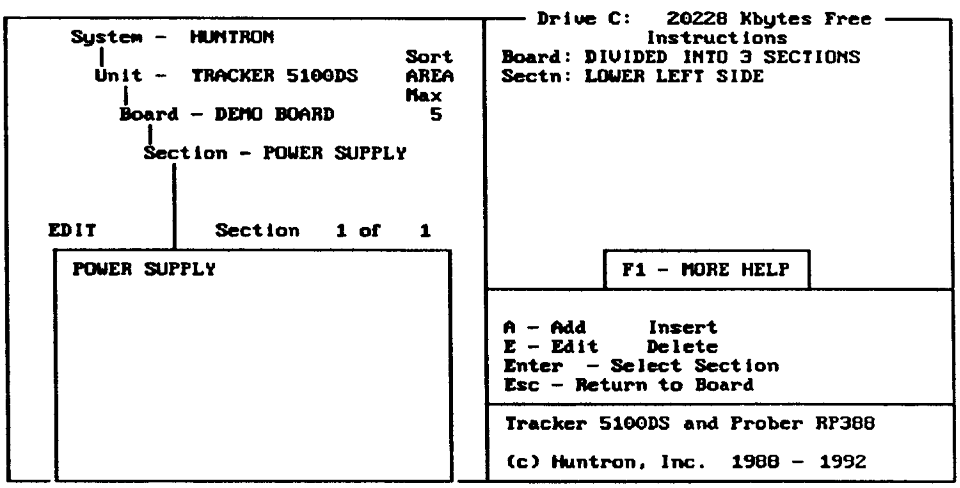


Figure 5-10. Edit Screen with Power Supply Section.

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).

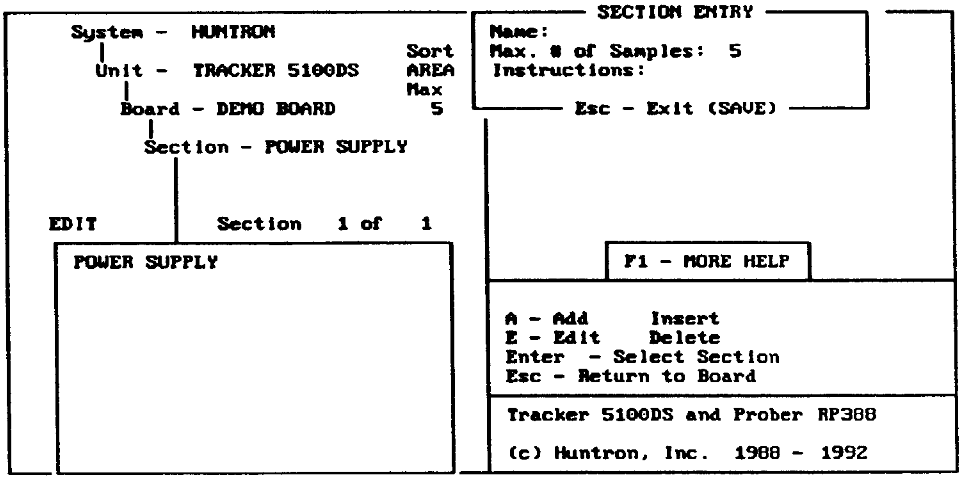


Figure 5-11. Second Section Entry Pop-up Window.

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

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

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

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

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.

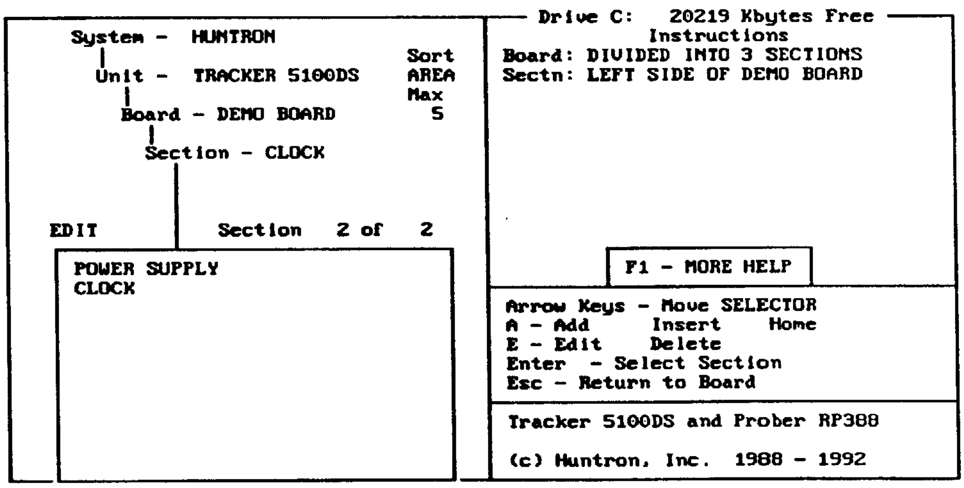


Figure 5-12. Power Supply and Clock Sections Screen.

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.

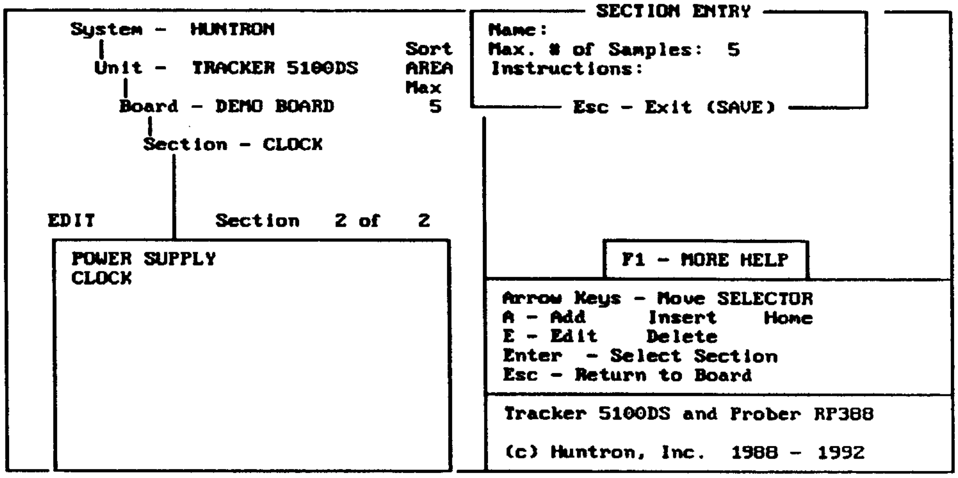


Figure 5-13. Third Section Entry Pop-up Window.

Enter information about the logic section on the demo board.

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

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

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

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.

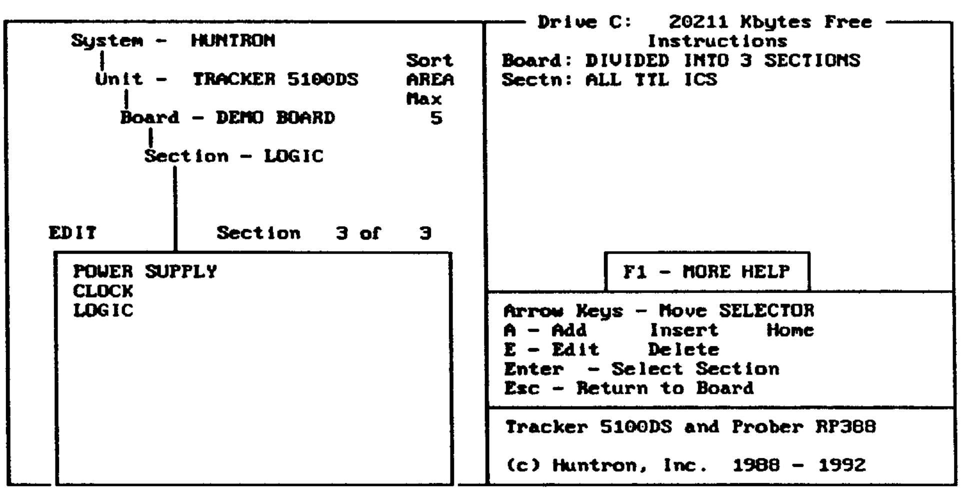


Figure 5-14. EDIT Screen with all three Sections.

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 a reference name 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 for this information. Otherwise, you will need to devise a scheme to identify all the components to be tested. Use Instructions 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.

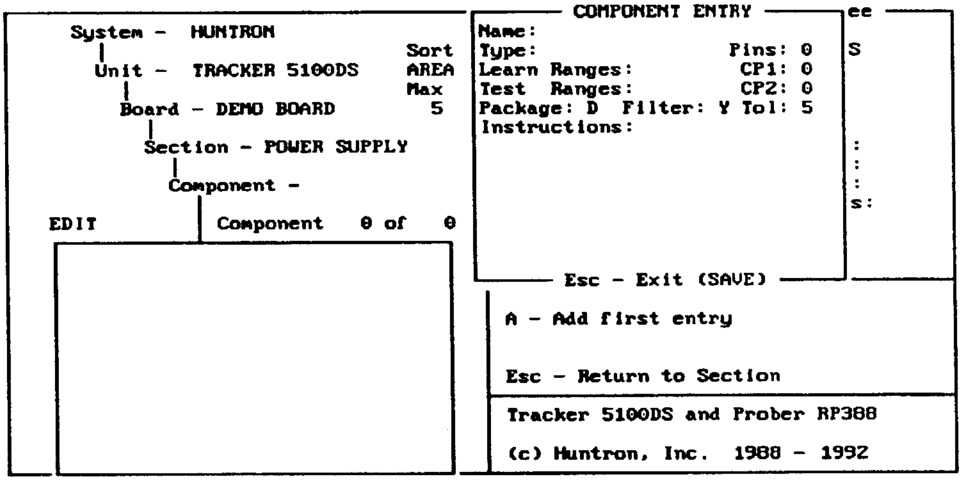


Figure 5-15. Power Supply Section Component Entry.

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 **"LM340"** ↵ (14 characters maximum).

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 (four characters maximum, from the 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 the Application Notes in the back of this manual for more information on range selection for different types of components.

For Test Ranges, use these settings when testing components. Test ranges must be equivalent to or a subset of the Learn ranges for each component. Type **"L1"** ↵ (four characters maximum, from the following set: **L, 1, 2, H** or **A**).

For Package, use these settings for the type of test connection you will use on the component. The choices are **S**(ingle in-line package or SIP), **D**(ual in-line package or DIP), **P**(robe), **M**(ulti), **F**(ront), or **B**(oth front and back). Choose **S** when a component has a single in-line row of pins like a header strip or card edge connector on a board. The pins are scanned in an alternating front and back sequence from left to right of the 5100DS IDC connector when **S** is chosen. Choose **D** when a component has two parallel rows of pins like an IC. The pins are scanned in a counterclockwise sequence starting from the left side of the front row then around to back row of the 5100DS IDC connector when **D** is chosen. Choose **P** if you will be using probes to access component pins that cannot be easily tested by standard test clips. The pins on the 5100DS IDC connectors are not used when **P** is chosen. Instead, a test lead connected to the TEST jack on the front panel is used. Choose **M** for four-sided components with a row of pins on each side. **M** is similar to package type **P** except that **M** is intended to be used with the Prober RP388. Choose **F** for a component (up to a maximum of 32 pins) that is connected to the front row of the 5100DS IDC connector. The pins are scanned from left to right when **F** is chosen. Choose **B** for a component (must have even number of pins up to a maximum of 64) that is connected to the front and back row of the 5100DS IDC connector. The pins are scanned in the following order; front row first, left to right, then back row, left to right. For more information on package types refer to Chapter 7 and the Application Notes in the back of this manual.

In this example, U7 has only 3 pins and you will press **P** ↵ (Single character from the following set: S, D, **P, M, F, or B**).

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 the Application Notes in back of this manual for more information related to package types and test pin sequencing.

For Filter, accept the default **Y** by pressing ↵. This feature removes noise from certain signatures. This subject is covered in depth in Application Note 2 in the back of this manual.

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

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. In this case, when using probes, type **0** ↵ (1 or 2 digits, 0 to 64 maximum) 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 (1 or 2 digits, 0 to 64 maximum).

Refer to the Appendices and Application Notes in back of this manual for more information about common pin selection.

For Tol(erance), this is the amount of allowable difference between component signatures (learn and test) before the software alerts you that they are different.

Accept the default of 5 for the tolerance, press ↵ (1 or 2 digits, 0 to 99, maximum).

IMPORTANT NOTE
This is not a percent 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 catastrophic differences only. Refer to Chapter 7, Section 7-9 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 PROBE INTO TEST JACK. PLUG COMMON LEAD INTO COMMON JACK AND CLIP TO C9(-). PIN 1 IS ON THE BOTTOM."(180 characters maximum).

Press **Esc** to return to the EDIT Component Screen.

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

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

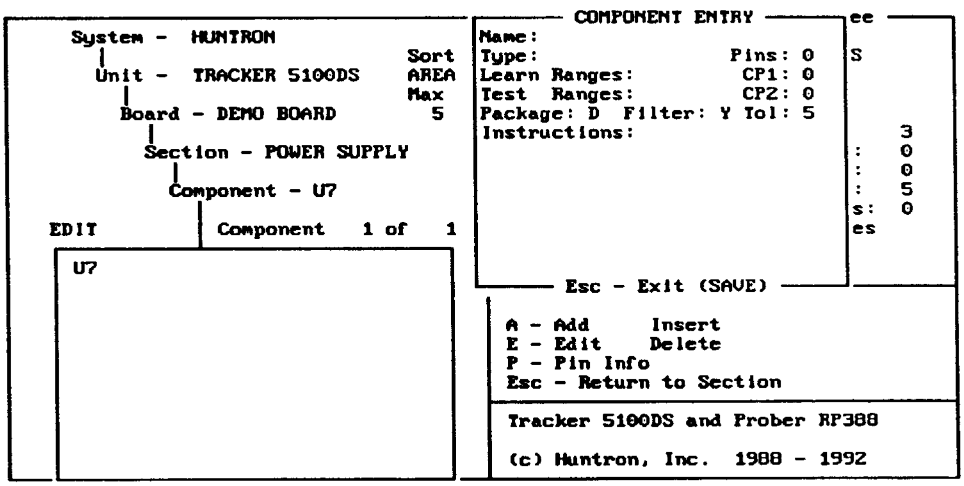


Figure 5-16. Power Supply Section R14 Entry.

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

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

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 P, M, F, B**).

For Filter, accept the default **Y** by pressing ↵. This feature removes noise from certain signatures. This subject is covered in depth in Application Note 2 in the back of this manual.

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

For C(ommon) P(in) 1, type **0** ↵ (1 or 2 digits, 0 to 64 maximum) 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 ↵ (1 or 2 digits, 0 to 64 maximum).

For TOL(erance), accept the default of 5 for the tolerance, press ↵ (1 or 2 digits, 0 to 99 maximum.).

For Instructions, type **"PLUG RED PROBE INTO TEST JACK. PLUG COMMON LEAD INTO COMMON JACK AND CLIP TO C9 (-). PIN 1 IS ON THE LEFT."** (180 characters maximum).

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:

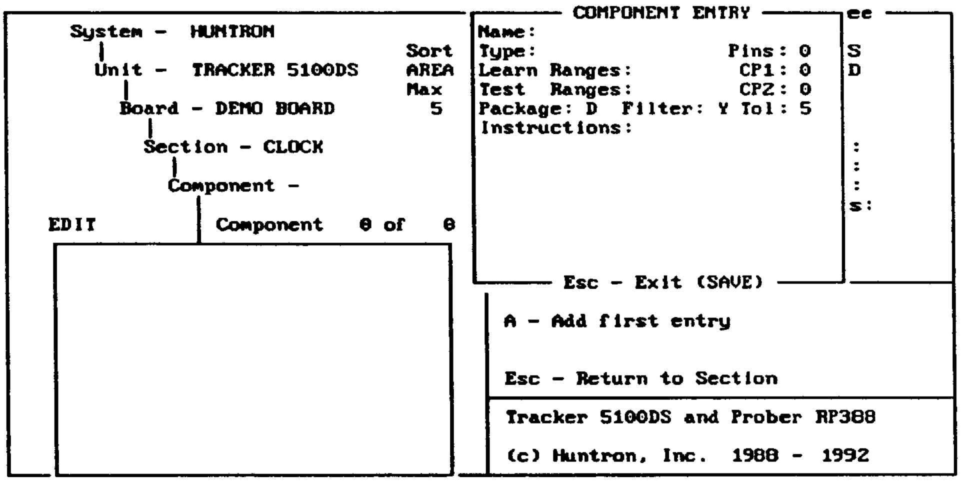


Figure 5-17. Clock Section Component Entry Pop-up.

For this component entry, a new feature called Autorange Select will be introduced. Autorange Select allows you to let the 5100DS pick the range that gives the most descriptive signature. Type the following information in the component entry window.

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" FOR LEARN.**

For the LEARN and TEST ranges, "?" was entered instead of **L, 1, 2,H,** or **A**. The "?" 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. At this point the test ranges are set to "???" which indicates that the autorange has not occurred. Autorange Select is just one of the features of the Component Pin Info option. To edit the Component Pin Info, 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 the Component Pin Info option, refer to Chapter 7, Section 7-2 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.

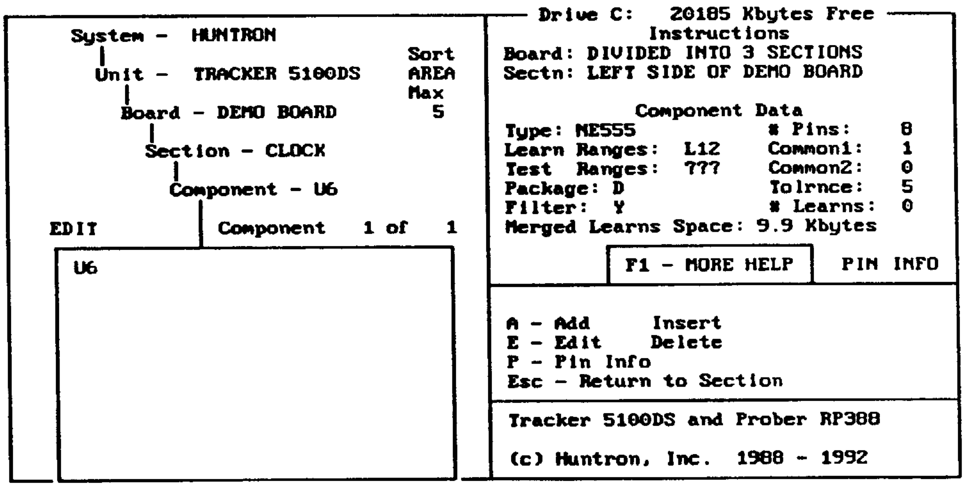


Figure 5-18. Clock Section Component EDIT Screen.

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

LOGIC SECTION

Move the selector 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 two 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 copies the current component's information to a new component if the current component name ends with a number. The number is incremented to create the new component's name (e.g. U1 is copied to U2). REPEAT is similar to BUILD in that it adds a new component by copying the current component's information except that no component Name is created. The 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 Appendices C and G in the back of 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 end with a number, then BUILD is not available.

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.

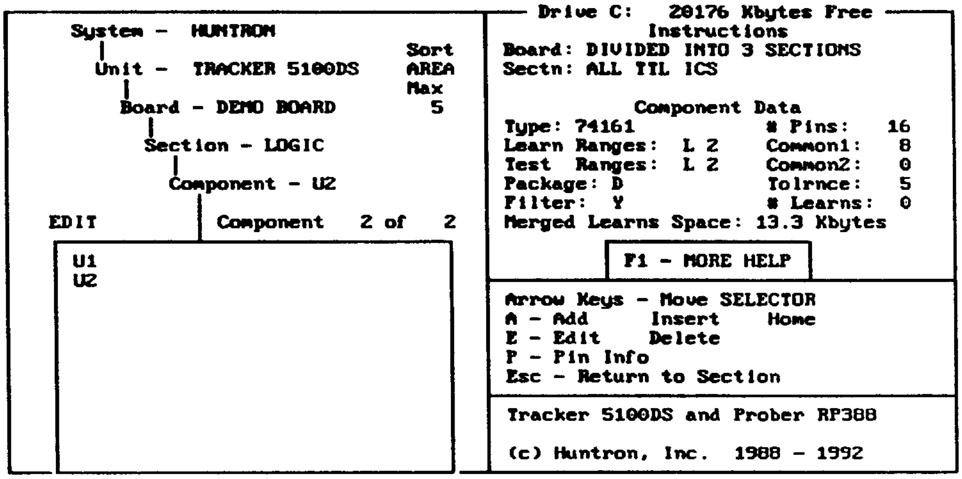


Figure 5-19. Using BUILD Feature for Component Entry.

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 data from 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 data from 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.

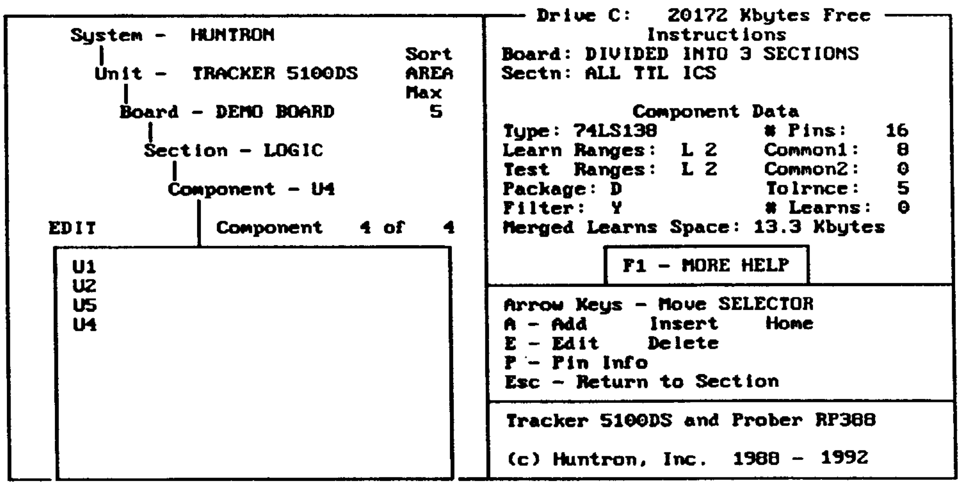


Figure 5-20. EDIT Component Screen for U4.

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 data from 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.

```
                                    Drive C:   20168 Kbytes Free
  System -  HUNTRON                              Instructions
    |                        Sort    Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS   AREA    Sectn: ALL TTL ICS
      |                      Max
      Board - DEMO BOARD      5               Component Data
        |                            Type: 74154           # Pins:    24
        Section - LOGIC              Learn Ranges:  L 2    Common1:   12
          |                          Test  Ranges:  L 2    Common2:    0
          Component - U3             Package: D            Tolrnce:    5
                                     Filter:  Y            # Learns:   0
EDIT      | Component   5 of   5     Merged Learns Space: 20.0 Kbytes

  U1                                        F1 - MORE HELP
  U2
  U5                                 Arrow Keys - Move SELECTOR
  U4                                 A - Add       Insert      Home
  U3                                 E - Edit      Delete
                                     P - Pin Info
                                     Esc - Return to Section

                                     Tracker 5100DS and Prober RP388

                                     (c) Huntron, Inc.  1988 - 1992
```

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 two choices, **T** - Tree and **P**- Pin Info, in this window. First, press T to print the TREE REPORT. When REPORT is done, the program will 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: 11/21/91
  Board: DEMO BOARD          DIVIDED INTO 3 SECTIONS                 Time: 11:25:53
Section: POWER SUPPLY        LOWER LEFT SIDE

Name    Type              Rang Tol F #P CP P Instructions
-----------------------------------------------------------------------
U7      LM340             L1      5 Y  3  O P PLUG RED PROBE INTO TEST JACK.
                          L1              O   PLUG COMMON LEAD INTO COMMON
                                              JACK AND CLIP TO C9(-). PIN 1
                                              IS ON THE BOTTOM.


R14     180 OHM           L1      5 Y  2  O P PLUG RED PROBE INTO TEST JACK.
                          L1              O   PLUG COMMON LEAD INTO COMMON
                                              JACK AND CLIP TO C9(-). PIN 1
                                              IS ON THE LEFT.




  ** This report lists all components on the selected board by  **
  ** section.  The learn and test  ranges are listed vertically **
  ** with the learn ranges on top.  The common pins are listed  **
  ** vertically with common pin 1 on top.                       **
```

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

```
  System: HUNTRON                   TREE REPORT                  Page: 2
    Unit: TRACKER 5100DS                                         Date: 11/21/91
   Board: DEMO BOARD         DIVIDED INTO 3 SECTIONS             Time: 11:25:56
 Section: CLOCK              LEFT SIDE OF DEMO BOARD

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

U6       NE555          L12    5 Y  8  1 D MAKE SURE SWITCH SW1 IS SET TO
                        ???            O   "CLOCK-ON" FOR LEARN.









        ** This report lists all components on the selected board by  **
        ** section.  The learn and test  ranges are listed vertically **
        ** with the learn ranges on top.  The common pins are listed  **
        ** vertically with common pin 1 on top.                       **
```

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

```
  System: HUNTRON                   TREE REPORT                  Page: 3
    Unit: TRACKER 5100DS                                         Date: 11/21/91
   Board: DEMO BOARD         DIVIDED INTO 3 SECTIONS             Time: 11:25:59
 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
                        L 2            O   SOCKET 4.


U2       74162          L 2    5 Y 16  8 D USE THE 16 PIN CLIP FROM
                        L 2            O   SOCKET 4.


U5       74LS02         L 2    5 Y 14  7 D USE THE 16 PIN CLIP FROM
                        L 2            O   SOCKET 4. MAKE SURE PIN 1
                                           OF CLIP IS ON PIN 1 OF U5.


U4       74LS138        L 2    5 Y 16  8 D USE THE 16 PIN CLIP FROM
                        L 2            O   SOCKET 4.


U3       74154          L 2    5 Y 24 12 D USE THE 24 PIN CLIP FROM
                        L 2            O   SOCKET 2.



        ** This report lists all components on the selected board by  **
        ** section.  The learn and test  ranges are listed vertically **
        ** with the learn ranges on top.  The common pins are listed  **
        ** vertically with common pin 1 on top.                       **
```

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 has 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 7, Section 7-2 in this manual for complete information.) The following figure shows the PIN INFO REPORT for the clock section of the demo board. The PIN INFO reports for the power supply section and logic section show "No pin information."

```
 System: HUNTRON              PIN INFO REPORT               Page: 2
   Unit: TRACKER 5100DS                                     Date: 11/21/91
  Board: DEMO BOARD        DIVIDED INTO 3 SECTIONS          Time: 11:27:54
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   L  5  Y  1   0        5   5   L  5  Y  1   0
             2   2   L  5  Y  1   0        6   6   L  5  Y  1   0
             3   3   L  5  Y  1   0        7   7   L  5  Y  1   0
             4   4   L  5  Y  1   0        8   8   L  5  Y  1   0
```

Figure 5-25. Pin Info Report for the 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 capture and store signatures of 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 storing 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 monitor and zoom in on the signature of an individual pin.

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, Tracker 5100DS Setup if the 5100DS has not been installed yet.

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

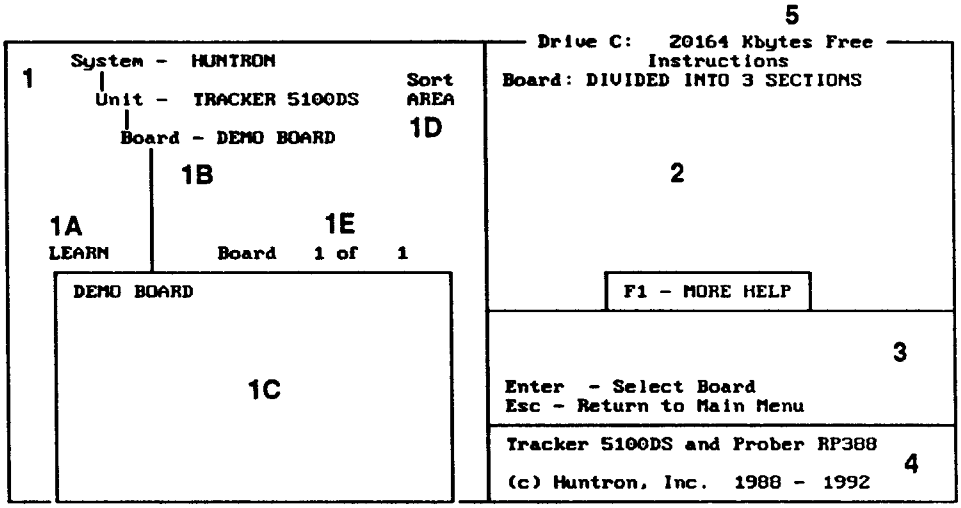


Figure 5-26. LEARN Board Screen.

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 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.

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.

```
                                           Drive C:   18046 Kbytes Free
   System -  HUNTRON                               Instructions
     |                          Sort      Board: DIVIDED INTO 3 SECTIONS
     Unit -  TRACKER 5100DS     AREA      Sectn: LOWER LEFT SIDE
       |                        Max
       Board - DEMO BOARD        5               Component Data
         |                                Type: LM340           # Pins:     3
         Section - POWER SUPPLY           Learn Ranges:  L1     Common1:    0
           |                              Test  Ranges:  L1     Common2:    0
           Component - U7                 Package: P            Tolrnce:    5
                                          Filter:  Y            # Learns:   0
 LEARN         | Component    1 of   2    Merged Learns Space: 2.5 Kbytes
                                                   F1 - MORE HELP
   U7
   R14                                    Arrow Keys - Move SELECTOR

                                                          End
                                          Enter  - Learn [ INSTRUCTIONS  ]
                                          Esc - Return to Section

                                          Tracker 5100DS and Prober RP388

                                          (c) Huntron, Inc.   1988 - 1992
```

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 into account each sample component's minor differences that are due to the manufacturing process. This composite 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. It is vital that each sample is known good. Merging a good component's signature with a faulty one will create a bad reference and when testing, faulty components will pass as good. This tutorial will not cover this topic in depth. For more information, refer to Application Note 2 in the back of this manual.

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 capacitor C9.

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 instructions as directed in the Component Instructions pop-up window.

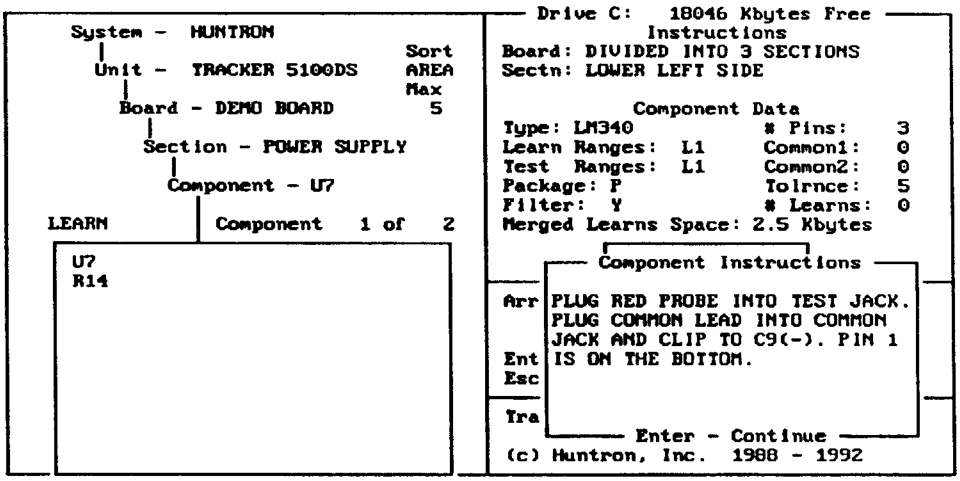


Figure 5-28. U7 Component Instructions Pop-up Window.

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 7, Section 7-8 in this manual for more 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.

```
                                        Drive C:   18038 Kbytes Free
  System -  HUNTRON                             Instructions
    |                           Sort    Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS      AREA    Sectn: LOWER LEFT SIDE
      |                         Max
      Board - DEMO BOARD         5               Component Data
        |                               Type: LM340          # Pins:     3
        Section - POWER SUPPLY          Learn Ranges:  L1    Common1:    0
          |                             Test  Ranges:  L1    Common2:    0
          Component - U7                Package: P           Tolrnce:    5
            |                           Filter:  Y           # Learns:   0
LEARN       |  Component   1 of   2     Merged Learns Space: 2.5 Kbytes

  U7                                          F1 - MORE HELP
  R14
                                                  LEARN

                                            Enter - Scan Pin: 1

                                                           Esc - Exit
```

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

NOTE
If AUDIO is set to YES (in SETUP), then the PC will make an audible beep to alert you to go to the next pin or component. After the beep, move the test probe to the next pin when Package = P (probe) or move the IC test clip to the next IC component when Package = D (DIP), F (front), B (both front and back) or S (SIP). For more information on AUDIO refer to Chapter 7, Section 7-8 in this manual.

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 ↵.

```
                                        Drive C:   18038 Kbytes Free
  System -  HUNTRON                             Instructions
    |                           Sort    Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS      AREA    Sectn: LOWER LEFT SIDE
      |                         Max
      Board - DEMO BOARD         5               Component Data
        |                               Type: LM340          # Pins:     3
        Section - POWER SUPPLY          Learn Ranges:  L1    Common1:    0
          |                             Test  Ranges:  L1    Common2:    0
          Component - U7                Package: P           Tolrnce:    5
            |                           Filter:  Y           # Learns:   0
LEARN       |  Component   1 of   2     Merged Learns Space: 2.5 Kbytes

  U7                                          F1 - MORE HELP
  R14
                                                  LEARN

                                            Enter - Scan Pin: 2
                                                P - Previous Pin

                                                           Esc - Exit
```

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.

```
                                     Drive C:   18030 Kbytes Free
  System -  HUNTRON                          Instructions
    |                      Sort   Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS AREA   Sectn: LOWER LEFT SIDE
      |                    Max
      Board - DEMO BOARD    5              Component Data
        |                         Type: LM340          # Pins:    3
        Section - POWER SUPPLY    Learn Ranges:  L1    Common1:   0
          |                       Test  Ranges:  L1    Common2:   0
          Component - U7          Package: P           Tolrnce:   5
            |                     Filter:  Y           # Learns:  0
LEARN       | Component  1 of  2  Merged Learns Space: 2.5 Kbytes
  U7                                    F1 - MORE HELP
  R14                                       LEARN

                                      Enter - Scan Pin: 3
                                          P - Previous Pin

                                                      Esc - Exit
```

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.

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.

```
                                     Drive C:   18030 Kbytes Free
  System -  HUNTRON                          Instructions
    |                      Sort   Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS AREA   Sectn: LOWER LEFT SIDE
      |                    Max
      Board - DEMO BOARD    5              Component Data
        |                         Type: LM340          # Pins:    3
        Section - POWER SUPPLY    Learn Ranges:  L1    Common1:   0
          |                       Test  Ranges:  L1    Common2:   0
          Component - U7          Package: P           Tolrnce:   5
            |                     Filter:  Y           # Learns:  0
LEARN       | Component  1 of  2  Merged Learns Space: 2.5 Kbytes
  U7                                    F1 - MORE HELP
  R14                                       LEARN

                                      Enter - Continue
                                          P - Previous Pin

                                                      Esc - Exit
```

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.

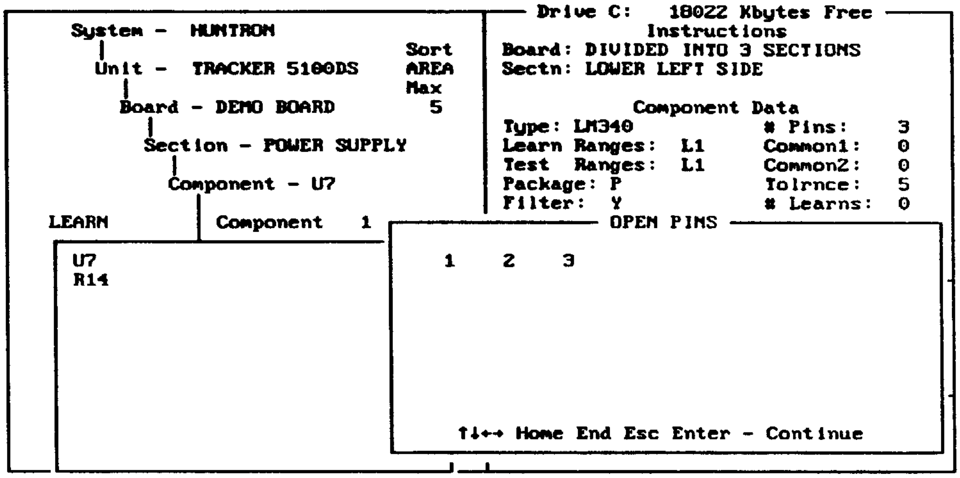


Figure 5-33. Open Pins of U7 due to Faulty Connections.

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, 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 on screen. The following figure shows the "First Learn " screen.

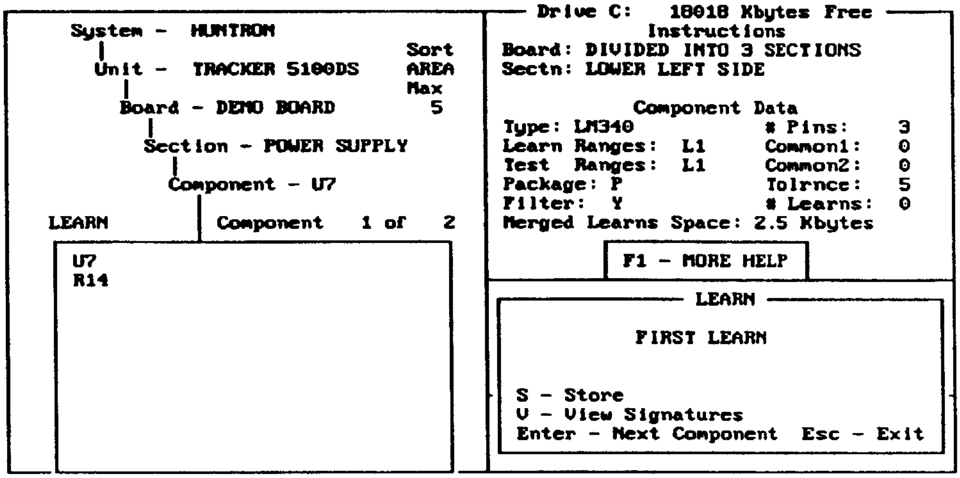


Figure 5-34. LEARN Screen for "First Learn" of U7.

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

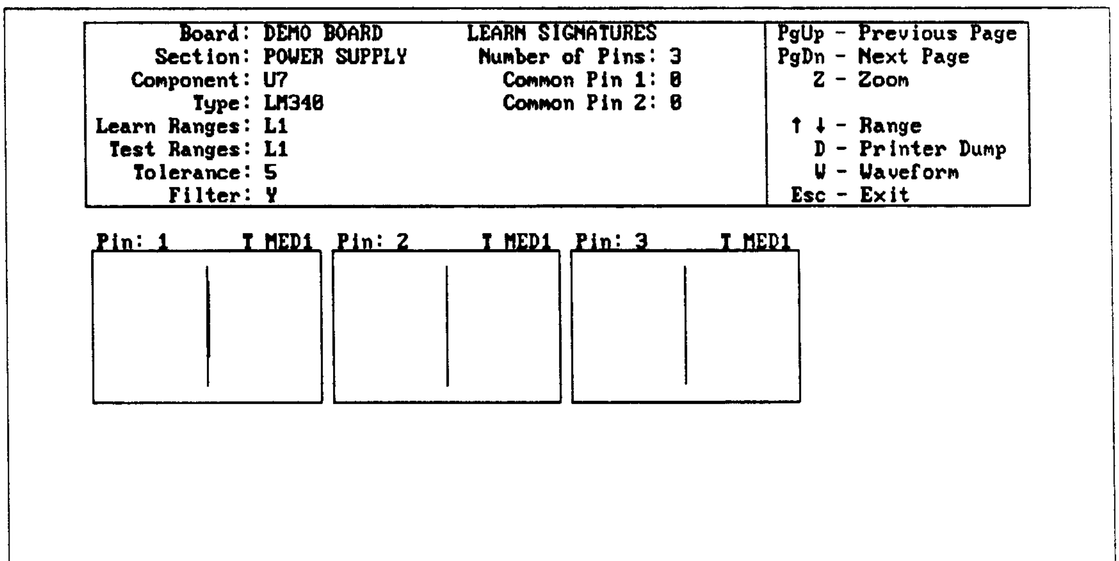


Figure 5-35. LEARN SIGNATURES Screen for U7 in MED1.

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 without graticules in this manual where it is necessary for clarity. Alt+G toggles the graticule on/off.

The LEARN SIGNATURES screen displays up to eight pins of a component at a time. The signatures shown are from the highest range selected which is Medium 1 for this example. To see the next group of eight pins, press the **PageDown** key. Press the **PageUp** key to look at the previous pins. In this case, U7 only has three 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 the ↓ arrow key to see the pin signatures in the Low range.

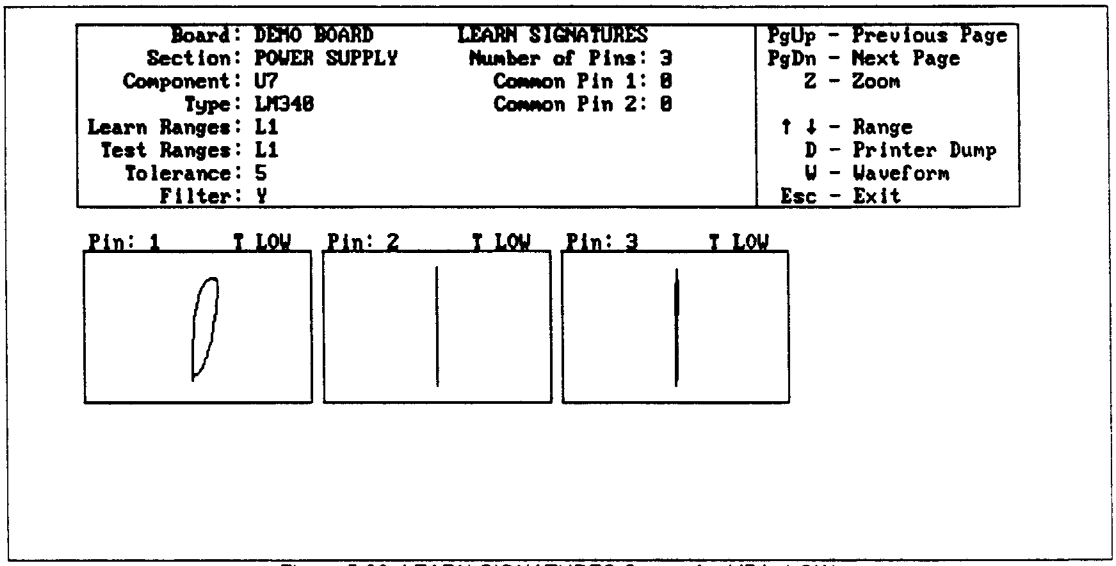


Figure 5-36. LEARN SIGNATURES Screen for U7 in LOW.

The entire signature screen can be printed to produce a hard copy by pressing D, but make sure your printer is attached to your PC, on-line, 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 hard copy will probably be unusable. Refer to Chapter 7, Section 7-8 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 250% of the original size.

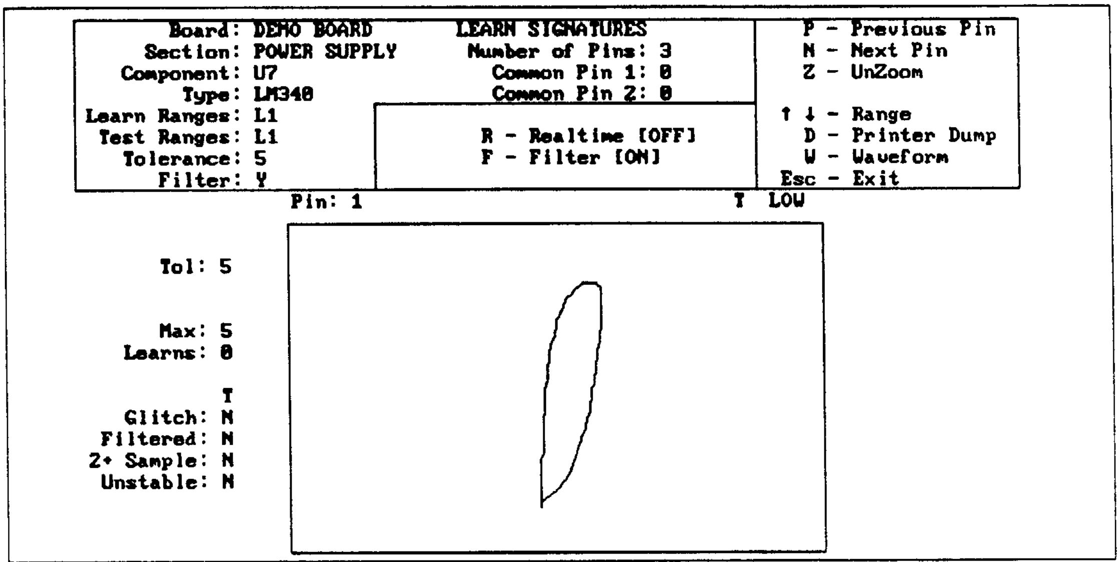


Figure 5-37. Zoom Signature Screen for U7 Pin 1.

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 another range that was learned.

D (Printer Dump) if you want to print this single signature (but make sure you have your printer configured properly 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 only useful for explaining how an analog signature is derived. It is never used for troubleshooting. Refer to Chapter 1 and the appendices in this manual for further information about analog signatures.

Z to unzoom and return to the multiple signatures screen.

R (Realtime) to enable or disable signature updates on your monitor. When enabled, the signature on your monitor is updated in real time. When disabled, the original learn signature is displayed on the monitor.

F (Filter) to enable or disable the digital filtering routine which removes oscillations (spider webbing) from certain types of signatures.

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 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 (i.e. more than one 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.

Press **Esc** to return to the LEARN results 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 capacitor C9.

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 is 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.

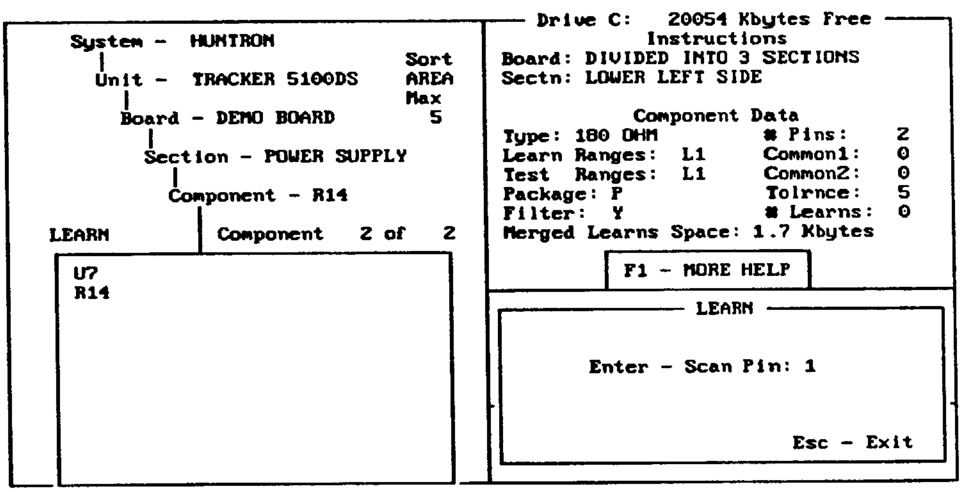


Figure 5-38. LEARN Scanning Prompt for R14 Pin 1.

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.

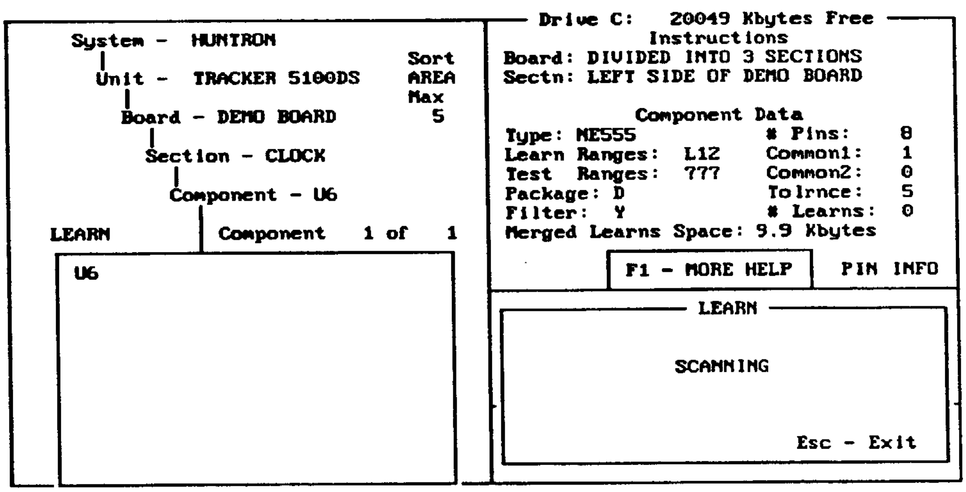


Figure 5-39. LEARN Scanning Prompt for U6.

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 has changed 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 already done 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 the 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 ↵.

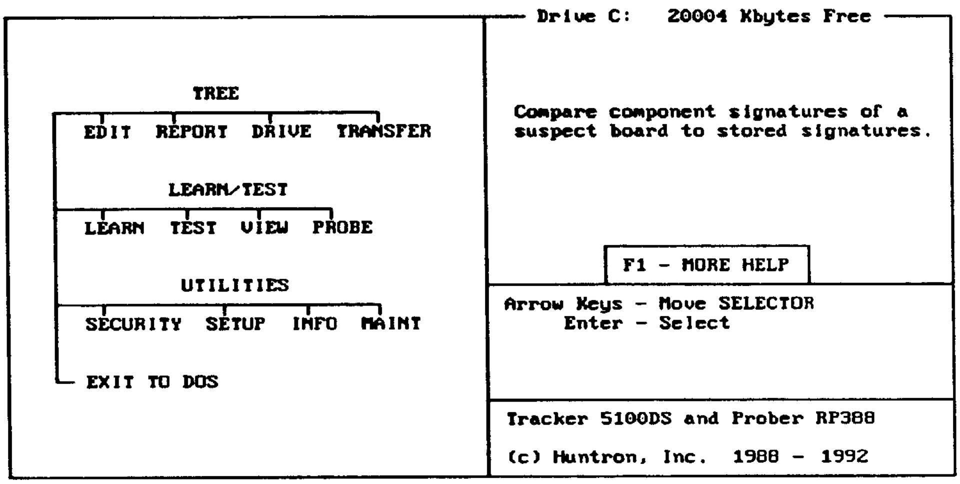


Figure 5-40. Selecting TEST Mode from Main Menu.

Select DEMO BOARD, then press ↵.

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

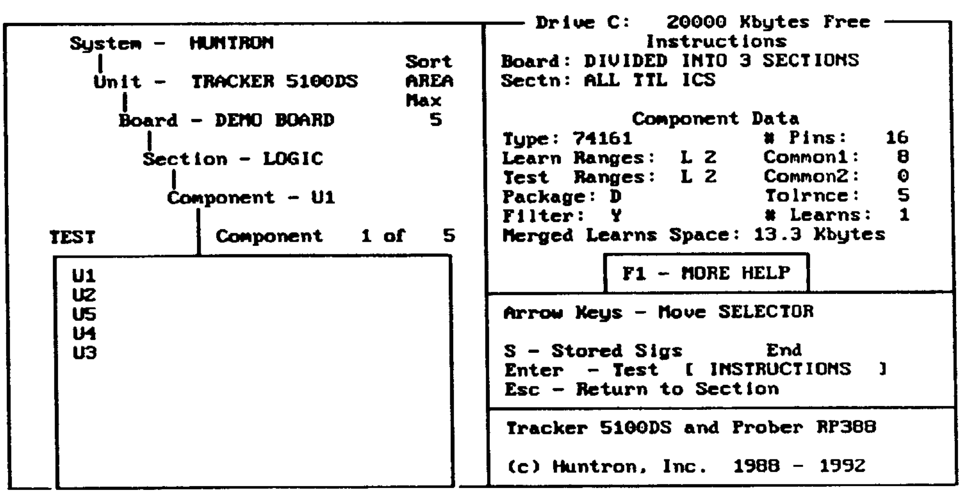


Figure 5-41. Logic Section TEST Screen.

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 the lower right window of the screen.

```
System -  HUNTRON                    Drive C:   20000 Kbytes Free
  |                        Sort              Instructions
  Unit -  TRACKER 5100DS   AREA     Board: DIVIDED INTO 3 SECTIONS
    |                      Max      Sectn: ALL TTL ICS
    Board - DEMO BOARD       5
      |                                   Component Data
      Section - LOGIC               Type: 74161           # Pins:    16
        |                           Learn Ranges:  L 2    Common1:    8
        Component - U1              Test  Ranges:  L 2    Common2:    0
                                    Package: D            Tolrnce:    5
                                    Filter:  Y            # Learns:   1
TEST      Component   1 of   5      Merged Learns Space: 13.3 Kbytes

 U1                                        F1 - MORE HELP
 U2
 U5                                  ------------ TEST ------------
 U4
 U3                                           SCANNING

                                                        Esc - Exit
```

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

NOTE

If AUDIO is set to YES (in SETUP), then the PC will make an audible beep to alert you to go to the next pin or component. After the beep, move the test probe to the next pin when Package = P (probe) or move the IC test clip to the next IC component when Package = D (DIP), F (front), B (both front and back) or S (SIP). For more information on AUDIO refer to Chapter 7, Section 7-8 in this manual.

When done testing, the TEST Results window will display "1 DIFFERENT PINS".

```
System -  HUNTRON                    Drive C:   20000 Kbytes Free
  |                        Sort              Instructions
  Unit -  TRACKER 5100DS   AREA     Board: DIVIDED INTO 3 SECTIONS
    |                      Max      Sectn: ALL TTL ICS
    Board - DEMO BOARD       5
      |                                   Component Data
      Section - LOGIC               Type: 74161           # Pins:    16
        |                           Learn Ranges:  L 2    Common1:    8
        Component - U1              Test  Ranges:  L 2    Common2:    0
                                    Package: D            Tolrnce:    5
                                    Filter:  Y            # Learns:   1
TEST      Component   1 of   5      Merged Learns Space: 13.3 Kbytes

 U1                                        F1 - MORE HELP
 U2
 U5                                  ------------ TEST ------------
 U4
 U3                                       1 DIFFERENT PINS

                                     C - Continuous Test
                                     R - Remove From Troublesheet
                                     V - View Signatures
                                     Enter - Next Component   Esc - Exit
```

Figure 5-43. Test Results for U1 on the Demo Board.

VIEWING COMPONENT SIGNATURES

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

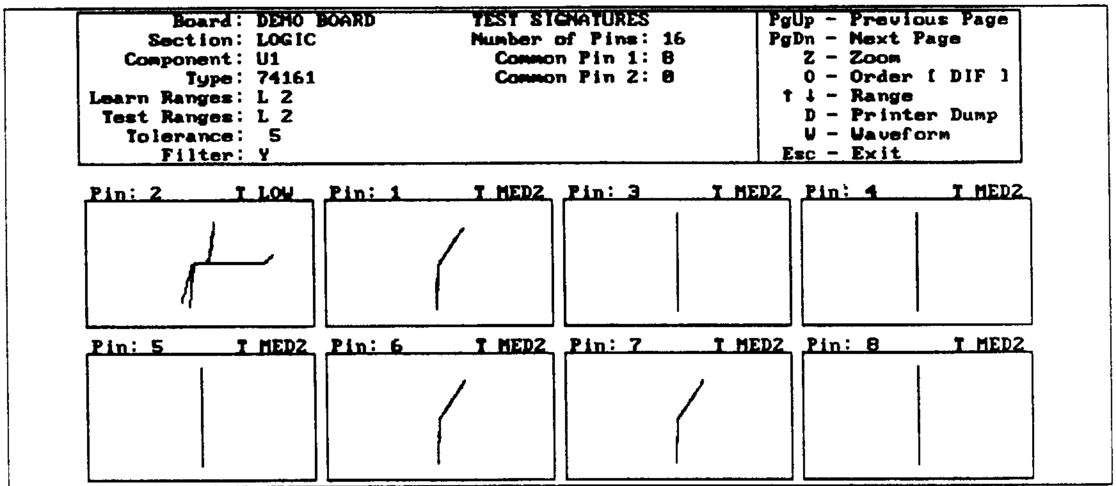


Figure 5-44. TEST SIGNATURES for U1, ORDER = DIF.

Each box contains two overlaid signatures. On your PC monitor, the green signature is the stored or LEARN signature and the red is the TEST signature.

The indicators above each signature box are color coded to help in quick visual analysis of signatures. The pin number, which appears to the right of "Pin:", is green if the pin was equivalent in all selected test ranges. The pin number is red if any selected test range was different. The range indicator (above the right side of the box) is red if the signature of that range was different and green if the signature was equivalent. So you can tell which pins are different by looking for red pin numbers and then see exactly which ranges were different by looking for red range indicators.

Signature order is set to DIF in the figure above so signatures of the pins are displayed in order of difference, from greatest to least. Since U1 only has one 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. Signature order is set to NUM in the figure below so signatures of the pins are displayed in ascending numerical order (i.e. pin 1, 2, 3, ...16).

NOTE

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

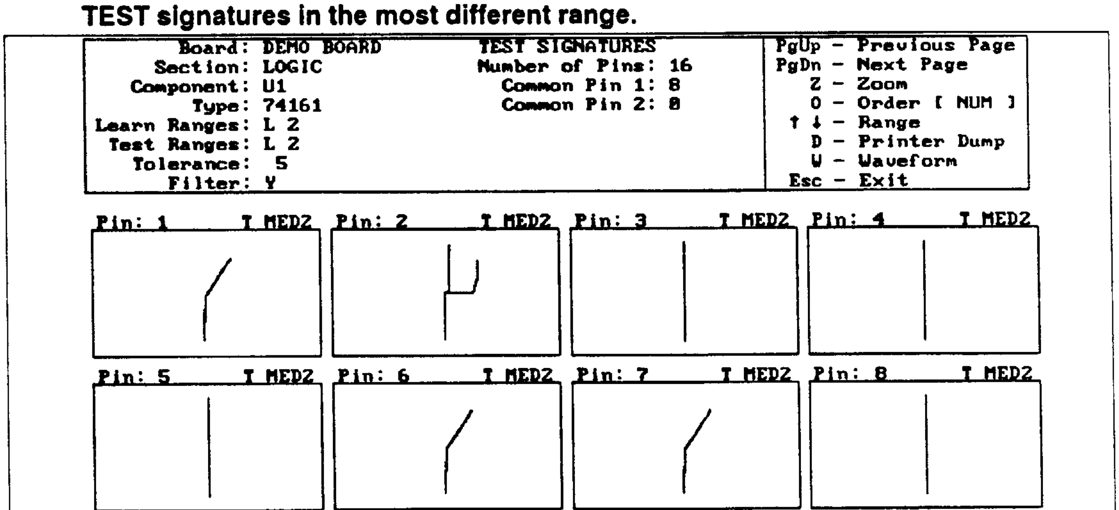


Figure 5-45. TEST SIGNATURES for U1, ORDER = NUM.

You can also view the signature differences in different ranges. Press ↓ to see how the signatures change in the Low range.

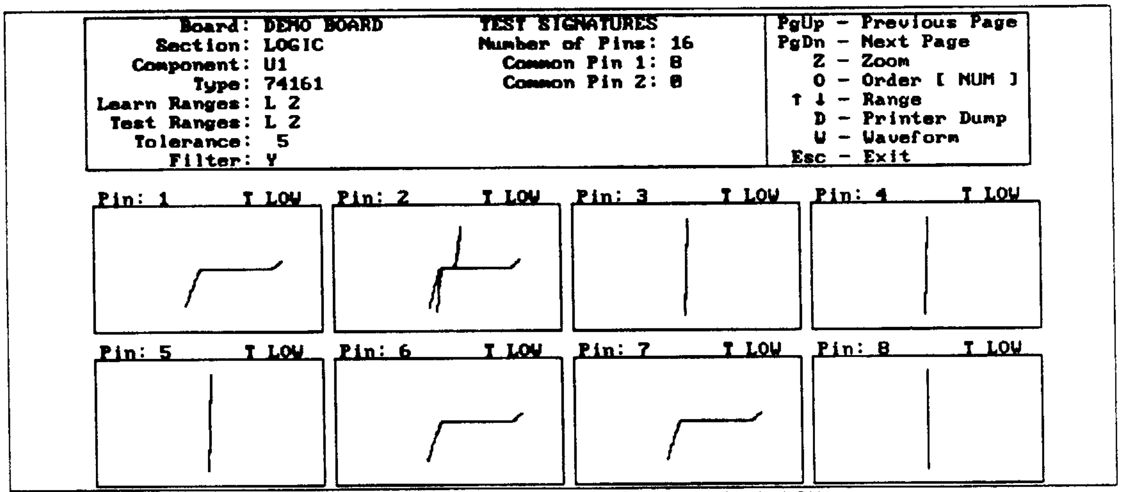


Figure 5-46. TEST SIGNATURES Screen for U1 in LOW.

Press **O** to return to the ORDER = DIF screen.

ANALYZING A SIGNATURE IN THE ZOOM SCREEN

Press **Z** to magnify the signature of Pin 2 250%.

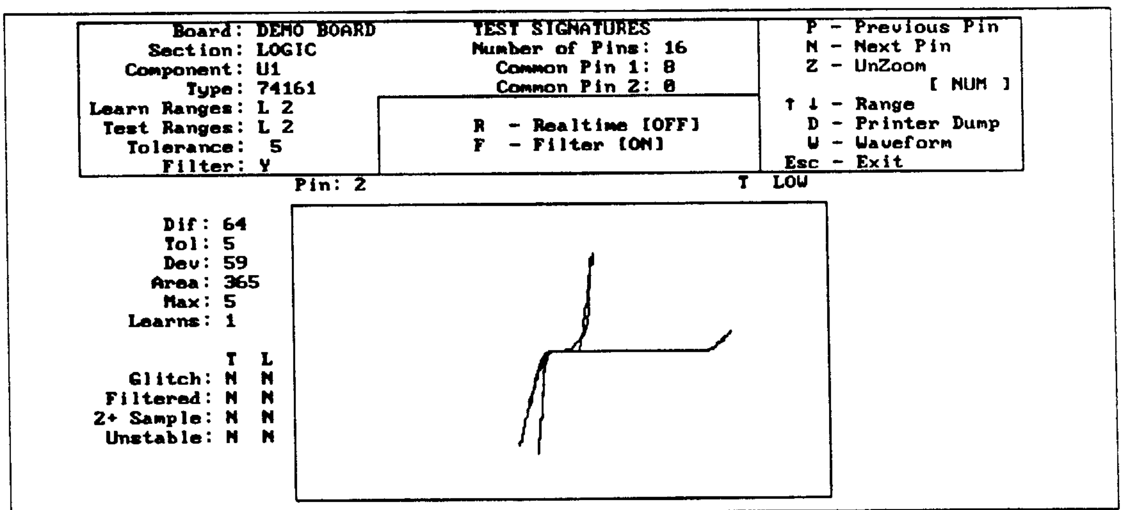


Figure 5-47. Zoom Signature Screen of U1 - Pin 2.

NOTE

When performing a TEST on your own Demo Board, the test results may not be the same 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:

Dif: 64

This number indicates the largest difference between the LEARN and TEST signature data points. If the pin/range was equivalent this number shows how close it was to being marked DIFFERENT (i.e. when DIF is greater than TOL).

Tol: 5

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

Dev: 59

This number is the amount that DIF exceeds TOL and is the value that determines whether a signature is DIFFERENT or EQUIVALENT. When DIF is equal to or less than TOL, DEV is zero and the signature is EQUIVALENT because no data points have "deviated" outside the band of acceptable values formed by the LEARN signature and the value of TOL. When DIF is greater than TOL, DEV is equal to DIF minus TOL and the signature is DIFFERENT. In this example DIF was 64 and TOL was 5 so DEV is 59. 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: 365

This number shows the total sum of all the deviations of the TEST signature data points 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 = 365 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 how many times this particular component has been learned.

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 (i.e. more than one 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 results 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 the lower right window. When finished, the TEST results window will display "1 DIFFERENT PINS".

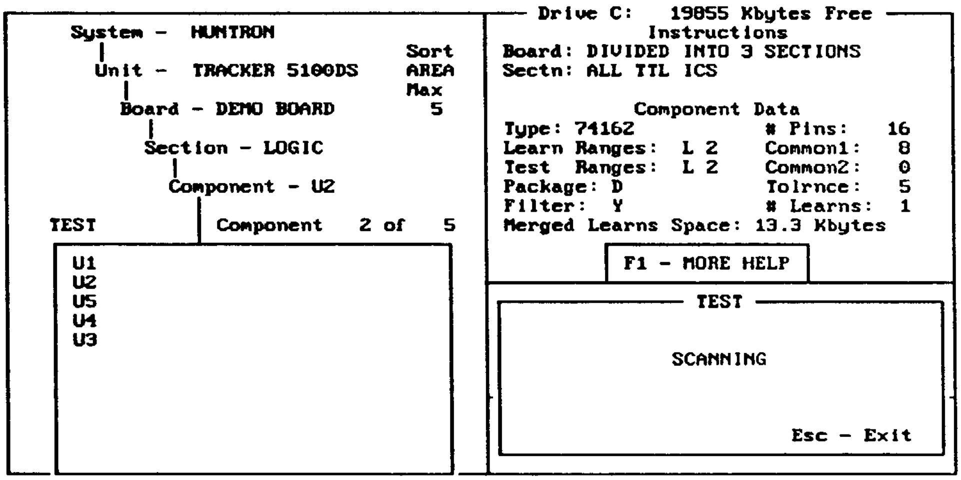


Figure 5-48. Testing U2 of the Demo Board.

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 the lower right window. When finished, the TEST results 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 the lower right window. When finished, the TEST results 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 results window will display "EQUIVALENT".

NOTE

You can perform continuous testing of this component by pressing C. The test will repeat until differences are found. This loop test feature may be helpful when there is an intermitent problem. To stop loop test, press S which returns to the current component or press Esc which advances to the next component.

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 (maximum).

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).

```
-------------------------------- TROUBLESHEET ------------------------------
                                   SECTION
 Date: 12-2-1991      Serial No.: 1234567                          Page: 1
System: HUNTRON
  Unit: TRACKER 5100DS
 Board: DEMO BOARD      DIVIDED INTO 3 SECTIONS

              Component      * SIMPLE PRINTOUT *                   Sort: AREA
Section       Name   Type           #P C1 C2 Ranges F Pins
----------------------------------------------------------------------------
LOGIC         U2     74162          16  8  0 L 2    Y 2

LOGIC         U1     74161          16  8  0 L 2    Y 2
```

Figure 5-49. Simple Troublesheet for Logic Section.

```
-------------------------------- TROUBLESHEET ------------------------------
                                   SECTION
 Date: 12-2-1991      Serial No.: 1234567                          Page: 1
System: HUNTRON
  Unit: TRACKER 5100DS
 Board: DEMO BOARD      DIVIDED INTO 3 SECTIONS

              Component      * DETAIL PRINTOUT *                   Sort: AREA
Section       Name   Type           #P Ranges Pin  F C1 C2 Range Tol  Dev  Area
----------------------------------------------------------------------------

LOGIC         U2     74162          16 L 2    2    Y  8  0 LOW    5   58   354

LOGIC         U1     74161          16 L 2    2    Y  8  0 LOW    5   58   353
```

Figure 5-50. 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 fine 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 - Restore to Troublesheet" 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.

```
                                           Drive C:   19834 Kbytes Free
  System -  HUNTRON                              Instructions
                                   Sort    Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS         AREA    Sectn: ALL TTL ICS
                                   Max
      Board - DEMO BOARD            5             Component Data
                                           Type: 74161          # Pins:   16
        Section - LOGIC                    Learn Ranges:  L 2   Common1:   8
                                           Test  Ranges:  L 2   Common2:   0
          Component - U1                   Package: D           Tolrnce:   5
                                           Filter:  Y           # Learns:  1
TEST            Component    1 of   5      Merged Learns Space: 13.3 Kbytes

 U1                                              F1 - MORE HELP
 U2
 U5                                        ------------ TEST ------------
 U4
 U3                                                   REMOVED

                                            C - Continuous Test
                                            R - Restore To Troublesheet
                                            V - View Signatures
                                            Enter - Next Component   Esc - Exit
```

Figure 5-51. 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 fine. 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 results screen.

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

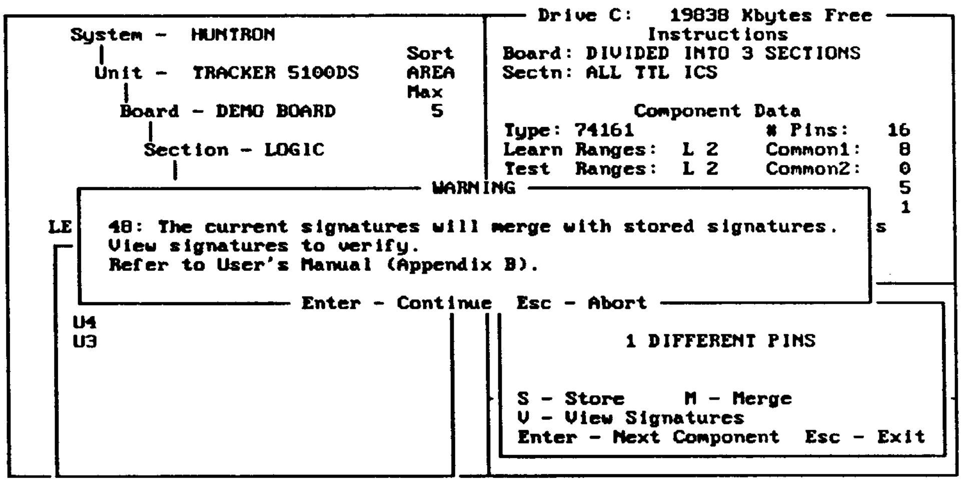


Figure 5-52. Merging Signatures for U1.

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 ↑ 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 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 most different 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 7 and the appendices in the back of this manual.

CHAPTER 6
RP388 TUTORIAL

6-1. INTRODUCTION

In this section, you will use the Huntron demo board and the 5100DS/RP388 software to familiarize yourself with the capabilities of this powerful troubleshooting system. The demo board is the same one used for the 5100DS tutorial. If you are a new 5100DS user, it is advisable to first read the 5100DS tutorial in Chapter 5.

The 5100DS/RP388 automates the testing of a large variety of boards without the need for custom fixturing. Teaching the XYZ coordinates of the test points is easy. Once the test points are set, testing the board is completely automatic requiring no operator intervention. A known-good board is required. This tutorial will guide you through these steps.

Test signatures are obtained relative to a board COMMON. More than one common can also be used. A camera located on the Z Axis mechanism produces an image of the board on the PC monitor. Storing the XY location of a test point is achieved by simply pointing a trackball cursor at the test point. The software is easy to use and does not require you to teach all the pins of the common IC package types. Common IC packages like DIPs, SIPs, PGAs and surface mount devices can easily be set up.

Before a board can be tested, it needs to be mounted in the RP388 and aligned. The board is put in one of the three slots and is held in place by the RP388 clamping system. The alignment feature compensates for a board that is not in the same position as the known-good board.

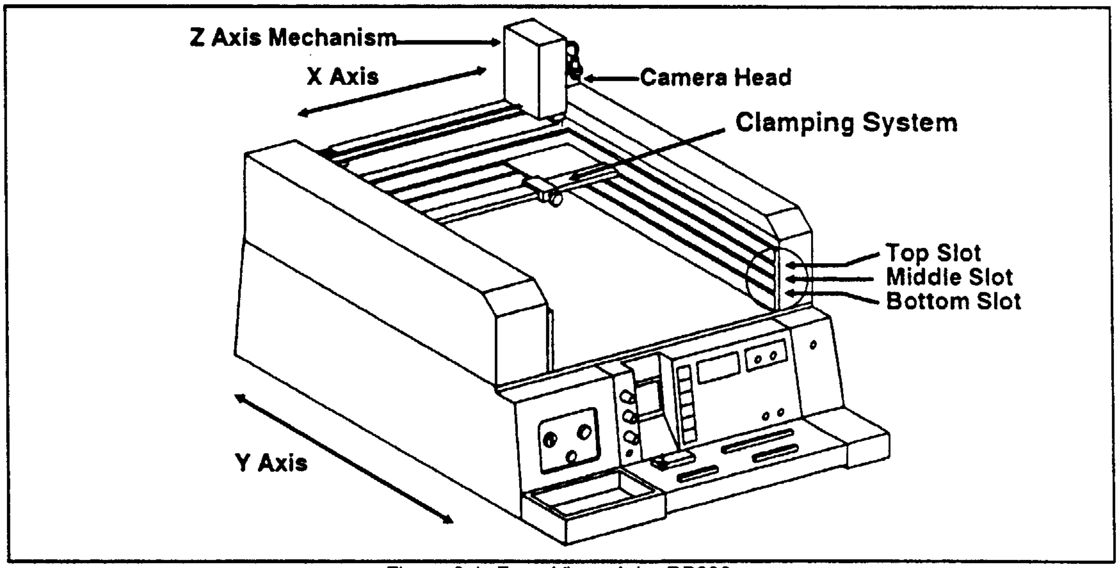


Figure 6-1. Front View of the RP388.

The RP388 can probe either side of a board. It is usually best to test the solder side since most test points are on the same horizontal plane. The Z Axis moves the probe tip up or down. It is only necessary to set the Z data for the first component. All subsequent component Z data will default to that of the first component. The three slots on the RP388 are used to allow the mounting of boards with tall components. For example, if a tall capacitor extends two inches (50.8mm) above the board, mount it in the bottom slot to test the component side or turn the board over and mount it in the top slot to test the solder side.

The 5100DS front panel connectors are still available for testing. For example, testing the edge connectors of a board may be faster using the Universal Edge Card Adapter (UECA) accessory.

An optional dust cover is available. This cover completely encloses the moving parts of the RP388. If the cover is lifted while testing, the RP388 will stop immediately.

6-2. GETTING THE SOFTWARE STARTED

Turn on your computer and wait until it boots up.

Turn on the RP388. This turns on the 5100DS also.

At the DOS prompt (typically "C:>"), type "**cd\51DS**" ↵ followed by "**51DS**" ↵ to start the program. The HUNTRON logo screen will appear.

NOTE

If the HUNTRON logo does not appear, your PC may not meet the minimum requirements to work with the 5100DS/RP388. Recheck the PC requirements in Chapter 3 of this manual. If you are still having difficulties, contact Huntron Technical Support for assistance.

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

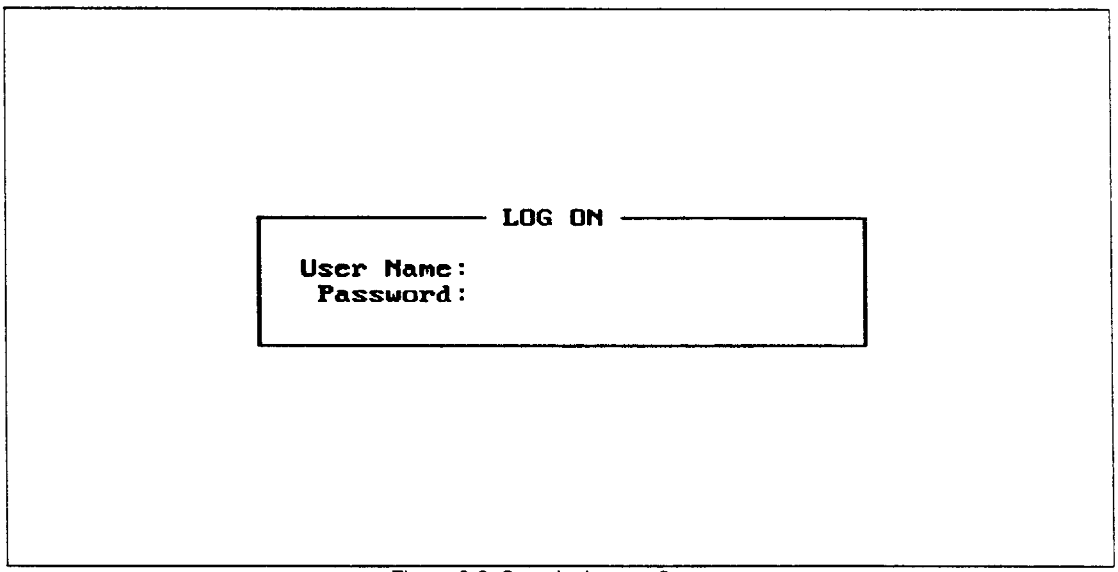


Figure 6-2. Security Log-on Screen.

Press ↵ twice if no user name or password was previously specified.

The Main menu screen will then be displayed.

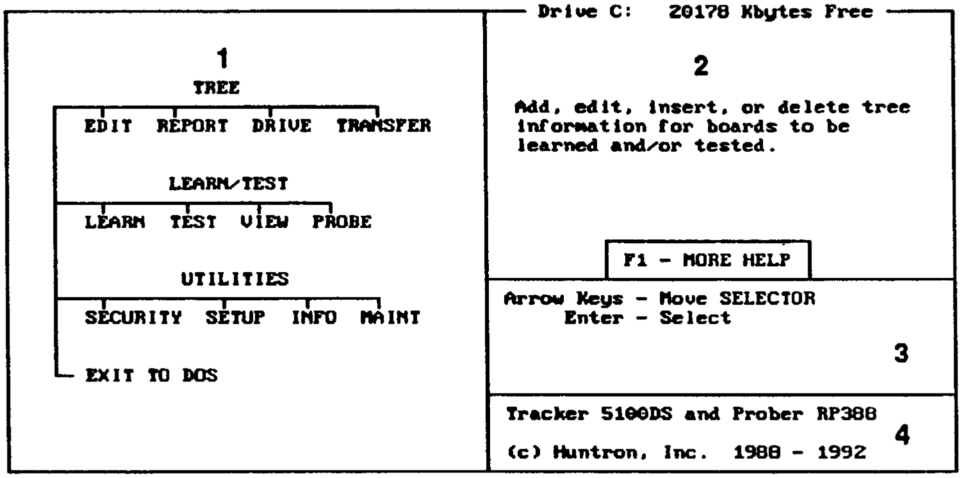


Figure 6-3. Main Menu.

The Main menu screen is divided into four 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 information about the current mode selected from the Main menu. Detailed information for most selections is displayed in this area when the **F1** key is pressed. **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 5100DS/RP388 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 selector around the menu. ↑ ↓ arrows move up and down the menu, and ← → arrows move 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 the previous screen.

6-3. DEFINING A SYSTEM

All boards must be broken down into sections and components for entry into the 5100DS/RP388 database. For this tutorial the demo board will be treated as a single section consisting of most of the components on the board. Once all the data is entered, the 5100DS/RP388 can learn the entire section one component at a time without requiring any operator intervention.

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

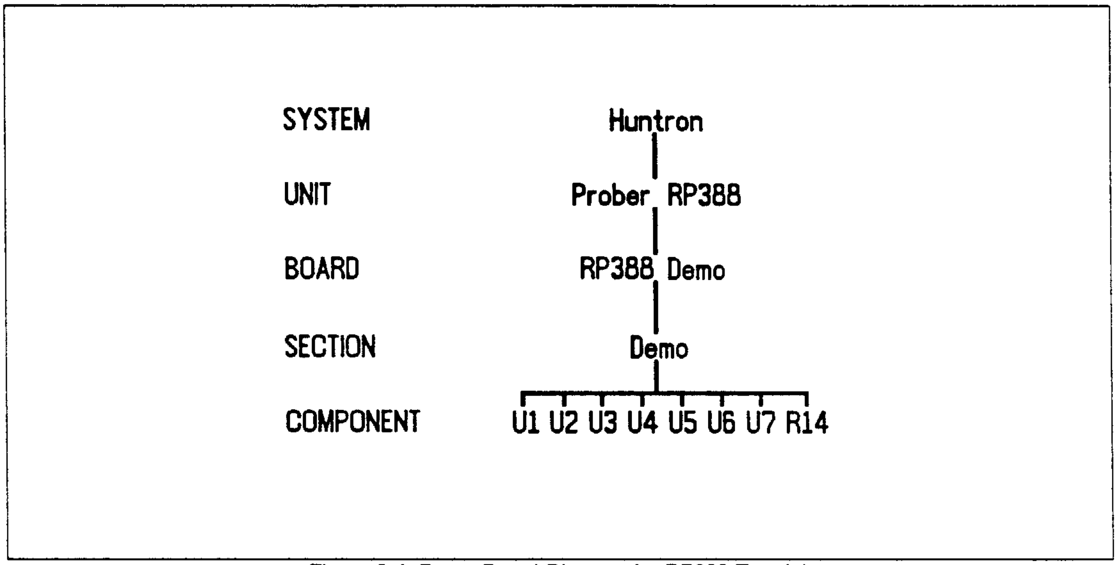


Figure 6-4. Demo Board Diagram for RP388 Tutorial.

6-4. ENTERING THE BOARD INFORMATION

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.

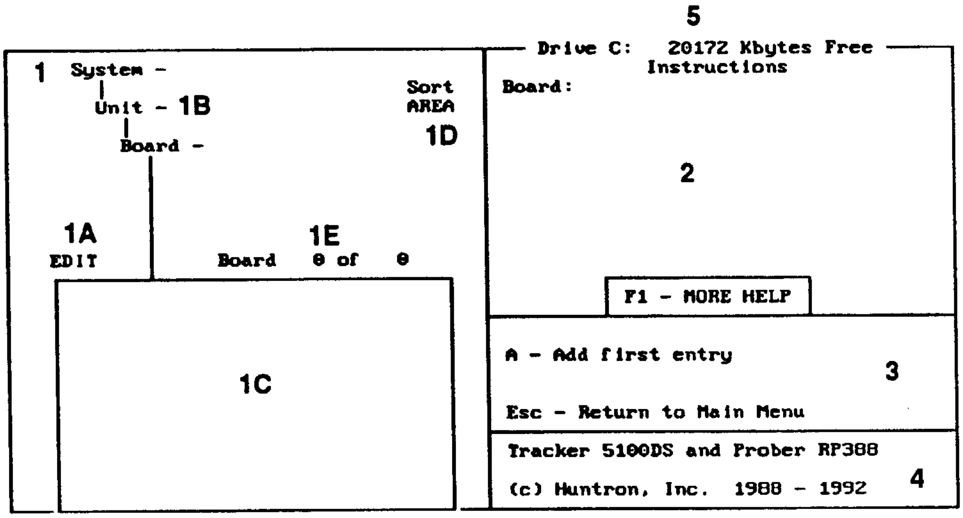


Figure 6-5. EDIT Board Screen.

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 was 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. At this point no boards are 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 7 contains information on this topic in Section 7-8 and Sort is also covered in Application Note 2 in the back of 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.

Area 3 is the active key box and displays which features are active 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.

To enter a board, press **A** for Add. A pop-up window will appear and ask for the following information:

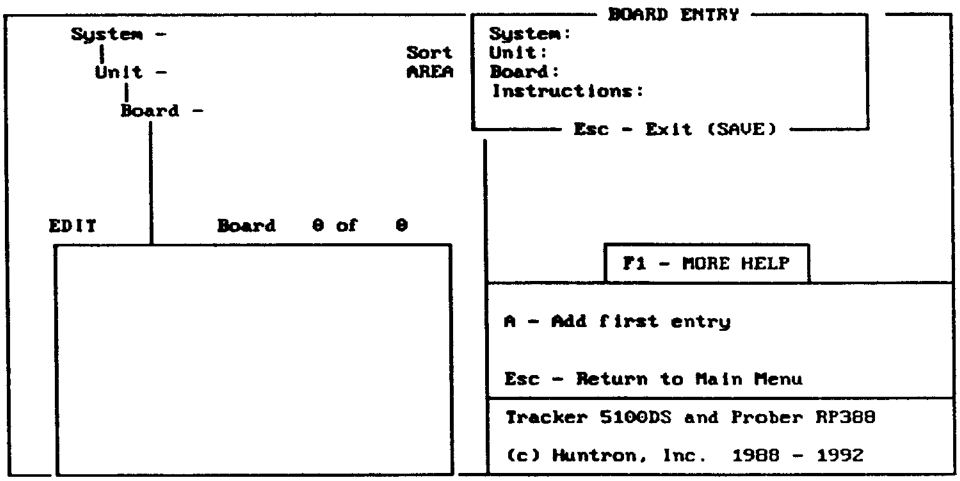


Figure 6-6. Board Entry Pop-Up Window.

Each board 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 PROBER RP388 unit, and the RP388 DEMO board. Enter the following:

For System, type **"HUNTRON"**↵ (14 characters maximum).
For Unit, type **"PROBER RP388"** ↵ (14 characters maximum).
For Board, type **"RP388 DEMO"** ↵ (14 characters maximum).

Instructions are used to provide specific details about the board, such as a part number, serial number, revision level, or a description (30 characters maximum).

For Instructions, type "**ALL COMPONENTS IN ONE SECTION**".

Press **Esc** to return to the EDIT board screen. Refer to the next figure for this discussion.

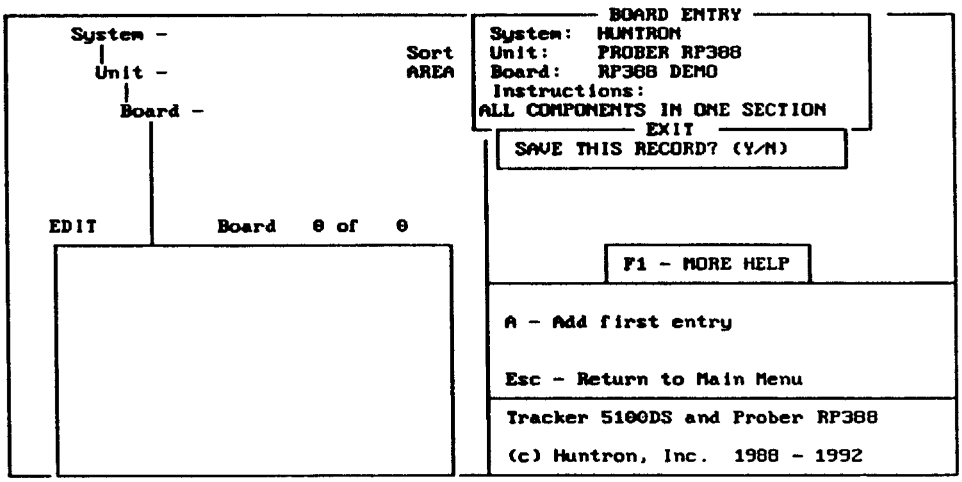


Figure 6-7. RP388 Demo Board EDIT Board Screen.

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

6-5. ENTERING THE SECTION INFORMATION

You will enter a single section for the RP388 Demo board. To enter section information, make sure the selector is on RP388 DEMO and press ↵. Notice that the board window changes to section and the board counter changes to section. Since this is the first entry for this board, 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 Application Note 2 in the back of this manual.

NOTE

Max # of Samples - this field sets the upper limit for the number of times the 5100DS will attempt to capture an analog signature during LEARN or TEST. Normally, the 5100DS will 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 and the signature is marked as unstable. 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, H and the Application Notes in the back of this manual for more information about "Max".

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

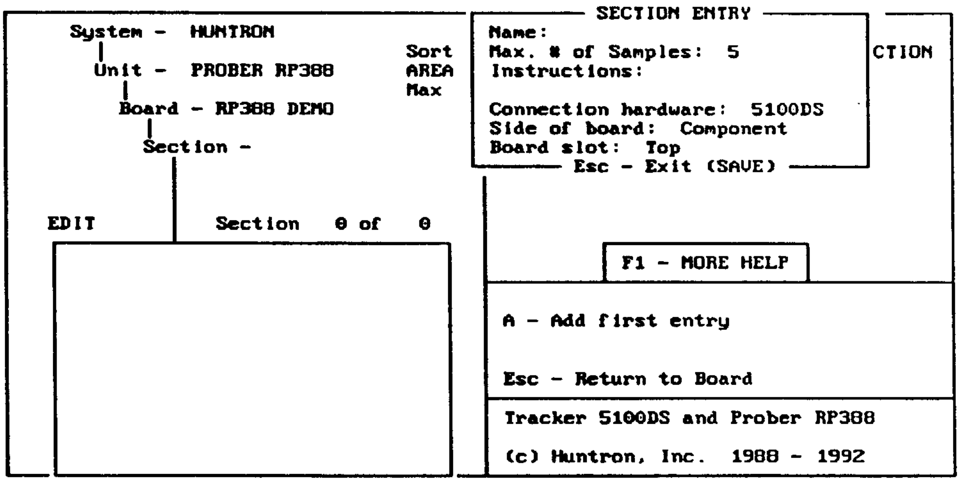


Figure 6-8. Adding a New Section Pop-Up Window.

For Name: type "DEMO " ↵.

For Instructions: type "CLIP COMMON TO NEGATIVE OF C9" ↵ (30 characters maximum).

For Connection hardware: press the ← or → key to select **RP388** and then press ↵.

This refers to the hardware being used to test this section. It is possible to test one section using the RP388 and another section using the 5100DS. The default connection hardware is 5100DS. You need to set the connection hardware to RP388. To do this press the →key. Then press ↵ to move the cursor to the next field.

For Side of board: press the ← or → key to select **SOLDER** and then press ↵.

This refers to the side of the board which the RP388 probe tip will be making contact with. The solder side or component side can be selected.

For Board slot: press the ← or → key to select **TOP** and then press ↵.

The board slot refers to the slot where the board is mounted. You will be using the TOP slot which is the one closest to the Z Axis mechanism. The board slot choices are TOP, MIDDLE, or BOTTOM.

The completed section entry pop-up window should look like the following figure.

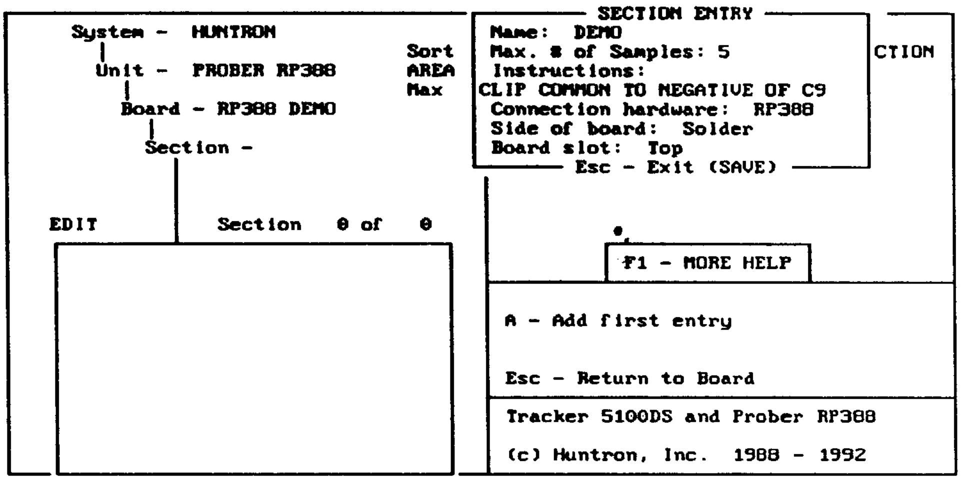


Figure 6-9. Completed Section Entry Pop-Up Window.

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 updated section screen.

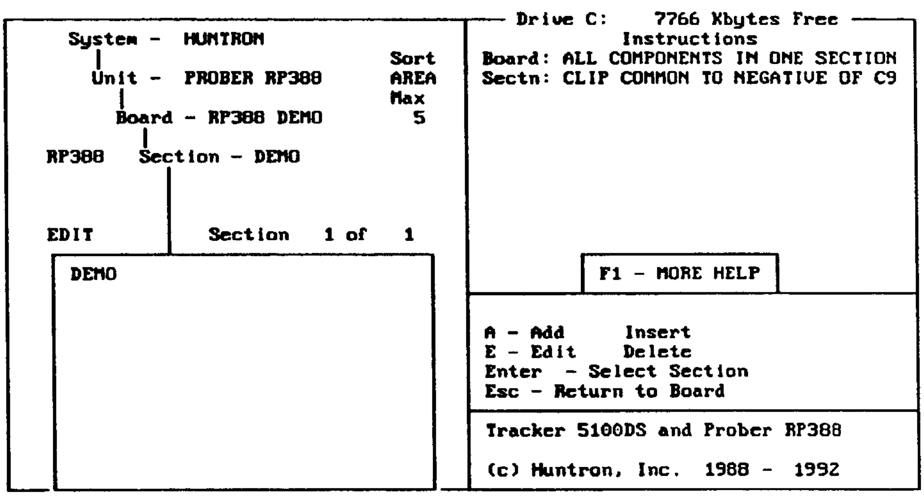


Figure 6-10. EDIT Section Screen with DEMO Section.

6-6. ENTERING THE COMPONENT INFORMATION

The following components on the demo board need to be entered into the database:

Component Name	Type	# of Pins	Type of Package
U1	74161	16	DIP
U2	74162	16	DIP
U5	74LS02	14	DIP
U4	74LS138	16	DIP
U3	74154	24	DIP
U6	NE555	8	DIP
U7	LM340	3	SIP
R14	180 OHM	2	SIP

To enter information for each component in the section, press ↵ since the selector is on DEMO. Notice that the section box changes to the component box.

Press A (Add) to enter the first component. The component entry pop-up window will appear as shown below:

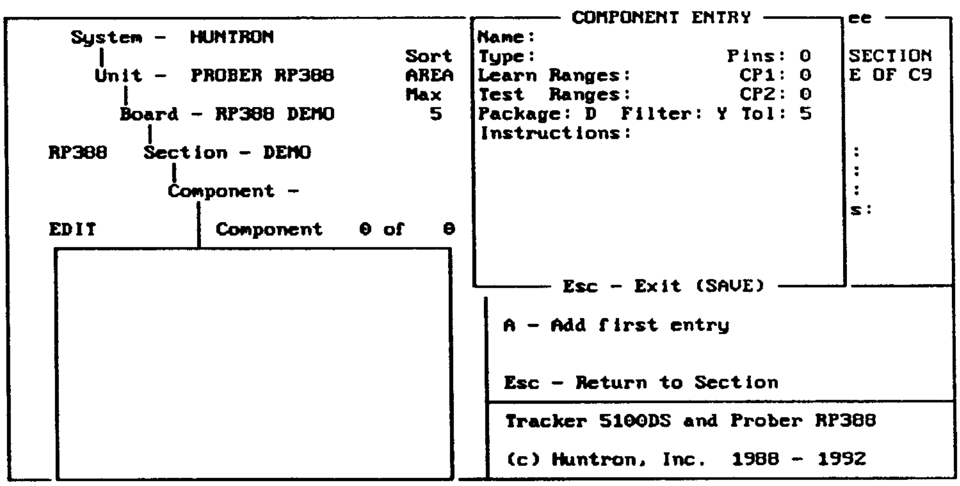


Figure 6-11. Component Entry Pop-Up Window.

U1 Component Entry

For Name: type "**U1**" ↵ (6 characters maximum).

For Type: type "**74161**" ↵ (14 characters maximum).

Use the manufacturer's part number on the component.

For LEARN ranges: type "**L2**" ↵ (4 characters maximum, from the following set: L(ow), (Medium)**1**, (Medium)**2**, **H**(igh), or **A**(ll).

You can learn in any combination of the four impedance ranges: Low, Medium 1, Medium 2 and High.

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 the Application Notes in the back of this manual for more information on range selection for different types of components.

For Test Ranges: type "**L2**" ↵ (4 characters maximum, from the following set: **L**, **1**, **2**, **H** or **A**.

Test ranges must be equivalent to or a subset of the Learn ranges for each component.

For Package: type "**D**" ↵ (one character from the following set: **S**(ingle in-line package or SIP), **D**(ual in-line package or DIP), **P**(robe), **M**(ulti), **F**(ront), or **B**(oth front and back)).

For Package, use these settings for the type of test connection you will use on the component. The choices are **S**(ingle in-line package or SIP), **D**(ual in-line package or DIP), **P**(robe), **M**(ulti), **F**(ront), or **B**(oth front and back). Choose **S** when a component has a single in-line row of pins like a header strip or card edge connector on a board. The pins are scanned in an alternating front and back sequence from left to right of the 5100DS IDC connector when **S** is chosen. Choose **D** when a component has two parallel rows of pins like an IC. The pins are scanned in a counterclockwise sequence starting from the left side of the front row then around to back row of the 5100DS IDC connector when **D** is chosen. Choose **P** if you will be using probes to access component pins that cannot be easily tested by standard test clips. The pins on the 5100DS IDC connectors are not used when **P** is chosen. Instead, a test lead connected to the TEST jack on the front panel is used. Choose **M** for four-sided components with a row of pins on each side. **M** is similar to **P** package type except that **M** is intended to be used with the Prober RP388. Choose **F** for a component (up to a maximum of 32 pins) that is connected to the front row of the 5100DS IDC connector. The pins are scanned from left to right when **F** is chosen. Choose **B** for a component (must have even number of pins up to a maximum of 64) that is connected to the front and back row of the 5100DS IDC connector. The pins are scanned in the following order; front row first, left to right, then back row, left to right. For more information on package types refer to Chapter 7 and the Application Notes in the back of this manual.

For Filter: press ↵ to accept the default **Y**.

This feature removes noise from a certain type of signature. This subject is covered in depth in Application Note 2 in the back of this manual.

For Pins: type "16" ↵ (two digits maximum, 1 to 64).

For C(ommon) P(in) 1: press ↵ to accept the default of 0 for Common Pin 1.

All tests are made with respect to a reference pin which is called a common pin. The RP388 uses a board common that connects directly to the COMMON terminal of the 5100DS. Setting CP1=0 disables the 5100DS's internal common pin relays.

For C(ommon) P(in) 2: press ↵ to accept the default of 0 for Common Pin 2.

The RP388 normally does not need a second common pin.

Refer to Application Notes in the back of this manual for further details on proper common pin selection and multiple commons.

For Tol(erance): press ↵ to accept the default tolerance of 5 (1 or 2 digits, 0 to 99).

Tolerance is the amount of allowable difference between component signatures (learn and test) before the software alerts you that they are different.

IMPORTANT NOTE

This is not a percent 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 catastrophic differences only. Refer to Chapter 7, Section 7-9 and the Appendices in the back of this manual for more information about tolerance.

For Instructions: you can include comments about the common pin location on the board.

Press Esc to return to the EDIT Component screen.

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

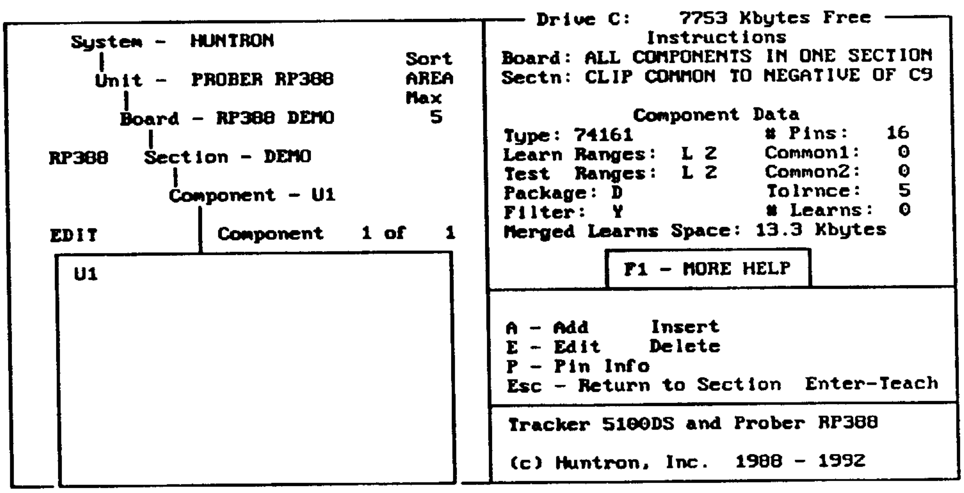


Figure 6-12. Completed EDIT Component Entry for U1.

U2 Component Entry

NOTE

The software provides two 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 copies the current component's information to a new component if the current component name ends with a number. The number is incremented to create the new component's name (e.g. U1 is copied to U2). REPEAT is similar to BUILD in that it adds a new component by copying the current component's information except that no component name is created. The 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 Appendices C and G in the back of 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 end with a number, then BUILD is not available.

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.

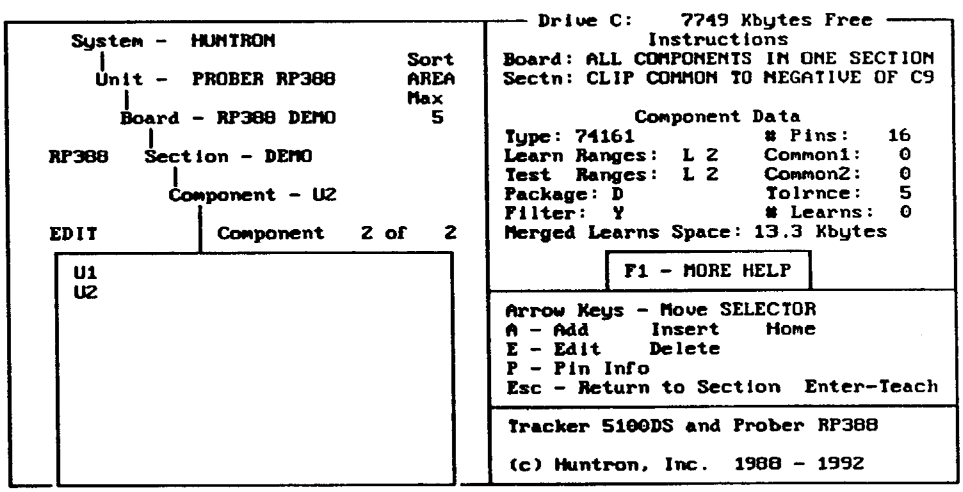


Figure 6-13. Using BUILD Feature for Entry of U2.

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

U5 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 data from 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:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

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.

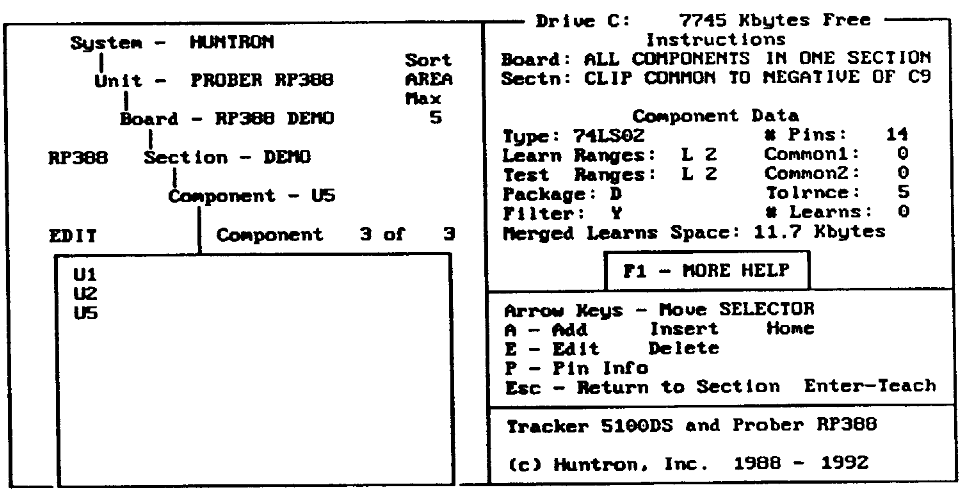


Figure 6-14. Completed EDIT Component Entry for U5.

U4 Component Entry

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 data from 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:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

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.

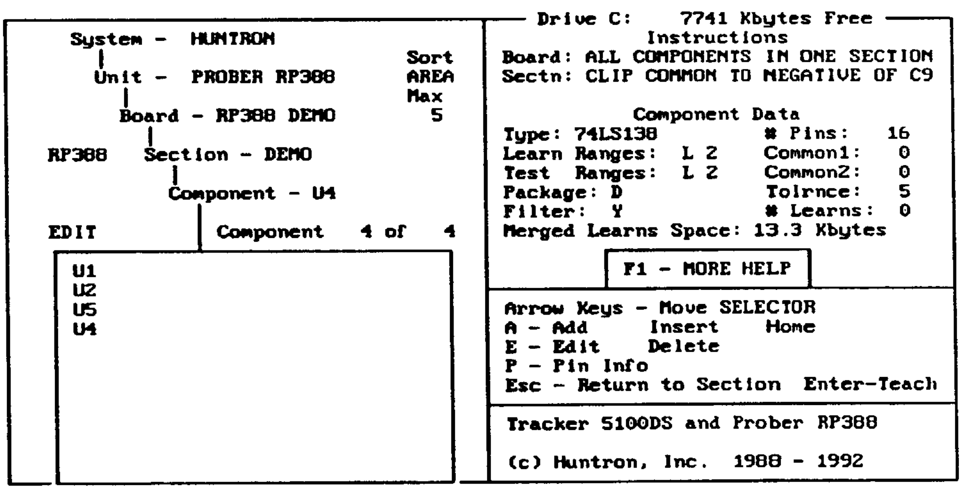


Figure 6-15. Completed EDIT Component Entry for U4.

U3 Component Entry

For the next 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 data from 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:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

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.

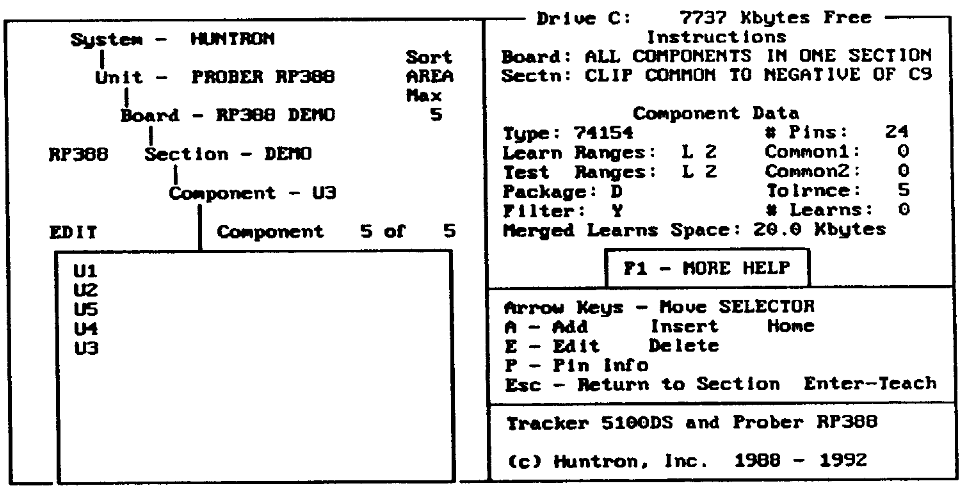


Figure 6-16. Completed EDIT Component Entry for U3.

U6 Component Entry

For U6, use the REPEAT feature. Press **Alt+R** to activate.

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

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 components.

Component Name:	**U6**
Component Type:	**NE555**
Learn Ranges:	**?**
Test Ranges:	**?**
Package:	**D**
Filter:	**Y**
# of Pins:	**8**
Common Pin 1:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

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. At this point the test ranges are set to "???" which indicates that the autorange has not occurred yet. Autorange Select is just one of the features of the Component Pin Info option. To edit the Component Pin Info, 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 the Component Pin Info option, refer to Chapter 7, Section 7-2 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.

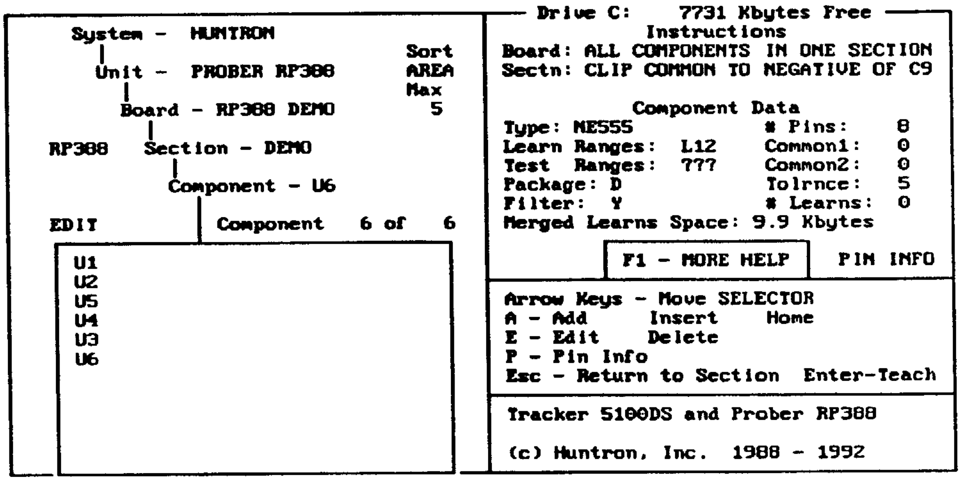


Figure 6-17. Completed EDIT Component Entry for U6.

U7 Component Entry

For U7, use the REPEAT feature. Press **Alt+R** to activate.

At the Component Entry pop-up, type in the following in place of the data from 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:	**U7**
Component Type:	**LM340**
Learn Ranges:	**L1**
Test Ranges:	**L1**
Package:	**P**
Filter:	**Y**
# of Pins:	**3**
Common Pin 1:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

Press **Esc** to exit when finished.

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

The Edit component screen shows what has been entered.

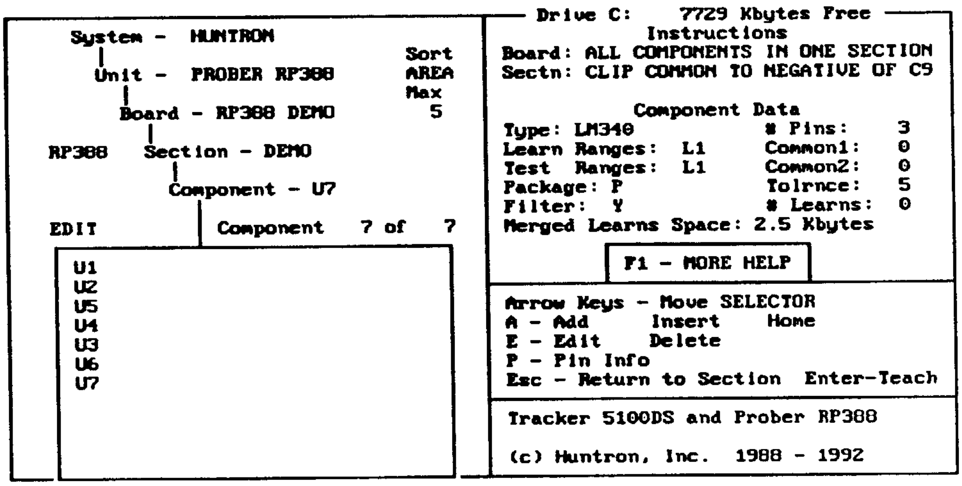


Figure 6-18. Completed EDIT Component Entry for U7.

R14 Component Entry

For the last component R14, press **Alt+R**. Make sure that the following information is included.

Component Name:	**R14**
Component Type:	**180 OHM**
Learn Ranges:	**L1**
Test Ranges:	**L1**
Package:	**P**
Filter:	**Y**
# of Pins:	**2**
Common Pin 1:	**0**
Common Pin 2:	**0**
Tolerance:	**5**
Instructions:	

Press **Esc** to exit when finished.

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

The Edit component screen shows what has been entered.

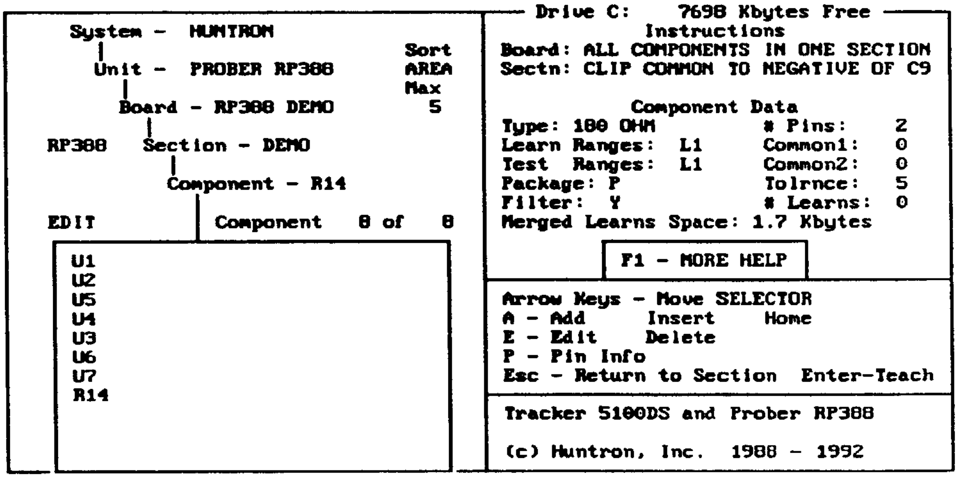


Figure 6-19. Completed EDIT Component Entry for R14.

You have completed entering all the components. You can now generate a TREE REPORT of the demo board for documentation purposes.

Press **Alt+M** to return to the Main menu.

6-7. 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 RP388 DEMO board. Press ↵ to bring up the REPORT pop-up window. There are two choices, T - Tree and P - Pin Info, in this window. Press T to print the TREE report. When REPORT is done, the program will 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 figure for a sample of the TREE report for the single section on the RP388 DEMO board.

```
System: HUNTRON              TREE REPORT                        Page: 1
  Unit: PROBER RP388                                            Date: 11/22/91
 Board: RP388 DEMO      ALL COMPONENTS IN ONE SECTION           Time: 10:33:29
Section: DEMO           CLIP COMMON TO NEGATIVE OF C9

Name  Type          Rang  Tol  F  #P  CP  P  Instructions
-----------------------------------------------------------------------------
U1    74161         L2     5   Y  16  0   D
                    L2                0

U2    74162         L2     5   Y  16  0   D
                    L2                0

U5    74LS02        L2     5   Y  14  0   D
                    L2                0

U4    74LS138       L2     5   Y  16  0   D
                    L2                0

U3    74154         L2     5   Y  24  0   D
                    L2                0

U6    NE555         L12    5   Y  8   0   D
                    ???               0

U7    LM340         L1     5   Y  3   0   P
                    L1                0

R14   180 OHM       L1     5   Y  2   0   P
                    L1                0
```

Figure 6-20. TREE Report for RP388 DEMO Section.

6-8. TEACHING TEST POINT XYZ LOCATIONS

In this section of the tutorial you will learn how to teach the XYZ locations of the test points of each component. You will also learn how to align the RP388 Demo board so that accurate and repeatable testing is maintained on the RP388.

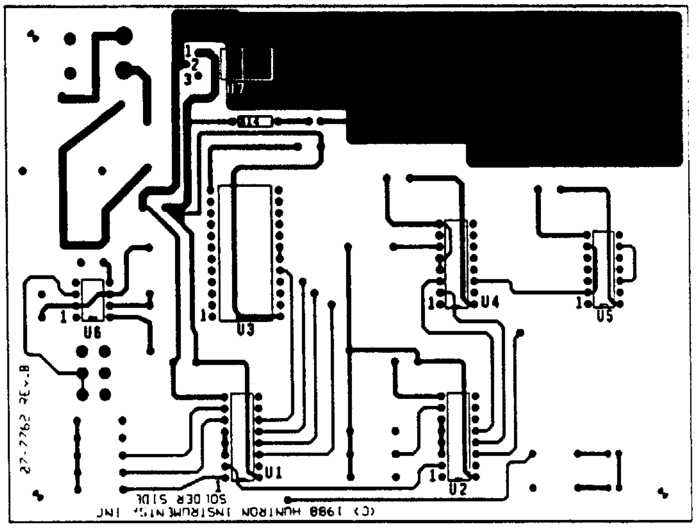


Figure 6-21. Solder Side of RP388 Demo Board.

The RP388 hardware and software makes the teaching of the XYZ locations easy to implement. The RP388 has a camera mounted on the Z Axis which will display a close-up image of the demo board on the PC monitor. Teaching the location of a test point requires placing the trackball cursor on the point and clicking the trackball button.

IDENTIFYING TWO ALIGNMENT POINTS ON THE RP388 DEMO BOARD

Since the board corner fits in one corner of the RP388, it will be impossible to position the next board in exactly the same location because PCBs are not precisely sheared at their edges. Two boards will not be mounted in exactly the same location, therefore it will be extremely difficult to maintain positioning repeatability using data from a known-good board.

The software solves this problem by forcing you to align the board using two alignment points which are more or less diagonal to each other. The alignment points could be datum marks, solder joints or holes. The selection of these points is left to the user.

Once the XY locations of those points are stored, you simply have to align the new board before testing. The Z Axis mechanism will move to the first alignment point and if the center of the camera image is not exactly superimposed over the center of the alignment point, move the trackball cursor to the center to set the new position. The Z Axis mechanism will then move to the second alignment point for a similar adjustment. The software is designed to compensate for the offset between the known-good board and the suspect board.

IMPORTANT NOTE
The two alignment points should be as far apart as possible. Make sure that the two points are diagonal from each other. Select alignment points that are approximately 0.6 in. (15 mm) away from the rear wall and the right wall.

GETTING INTO XY TEACH

At the EDIT component screen use the arrow keys to make sure that the selector is at U1.

CAUTION
The RP388 will move to the Home position when you press ↵ at this point.

Press ↵ to start the XY TEACH process.

The following screen is displayed:

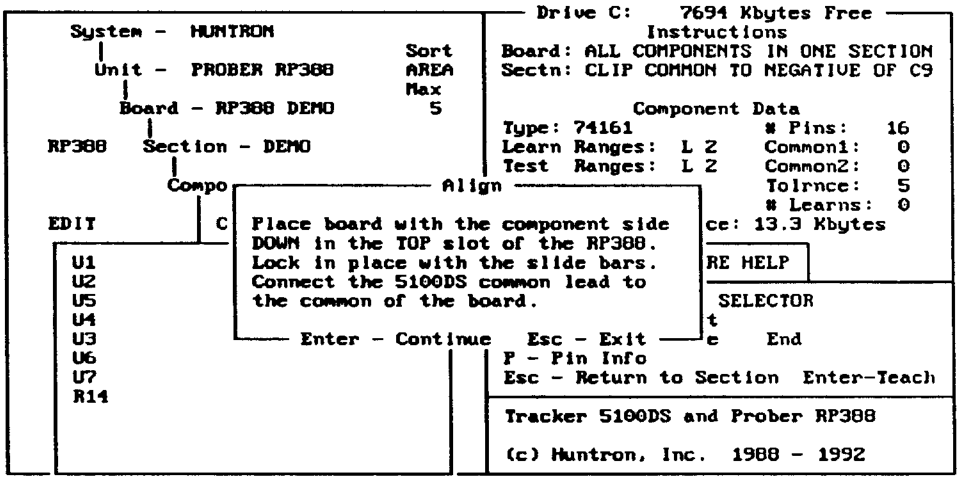


Figure 6-22. Align Pop-Up Window Screen.

MOUNTING THE DEMO BOARD

With the solder side of the demo board up, slide it into the RP388 making sure that the board is seated firmly into the rear right hand corner of the TOP slot. Also make sure that the common lead is clipped to the negative terminal of C9. To clamp the demo board, slide the long cross bar into the TOP slot until the grooved side fits into the edge of the demo board. This should slip easily into the slot if the left and right thumb levers on the cross bar are all the way up.

When the cross bar is firm against the edge of the demo board, press the two thumb levers all the way down. Now slide the slide bar towards the corner of the demo board until it is firmly griping the left-front corner. Tighten the thumb screw on the slide bar.

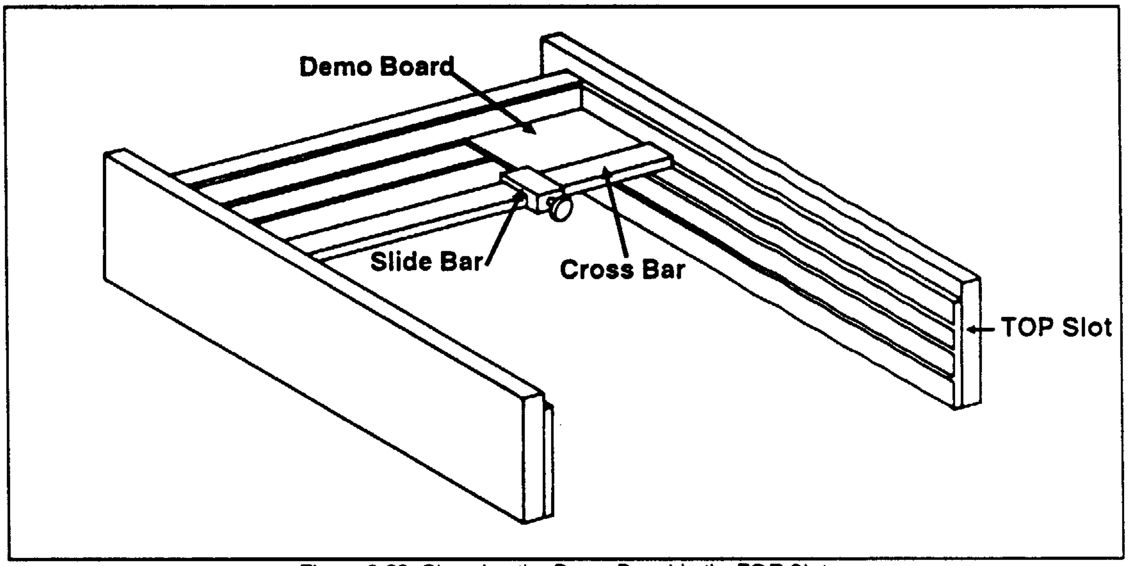


Figure 6-23. Clamping the Demo Board in the TOP Slot.

Press ↵ to continue.

The following screen appears showing the actual image of the corner of the RP388 demo board.

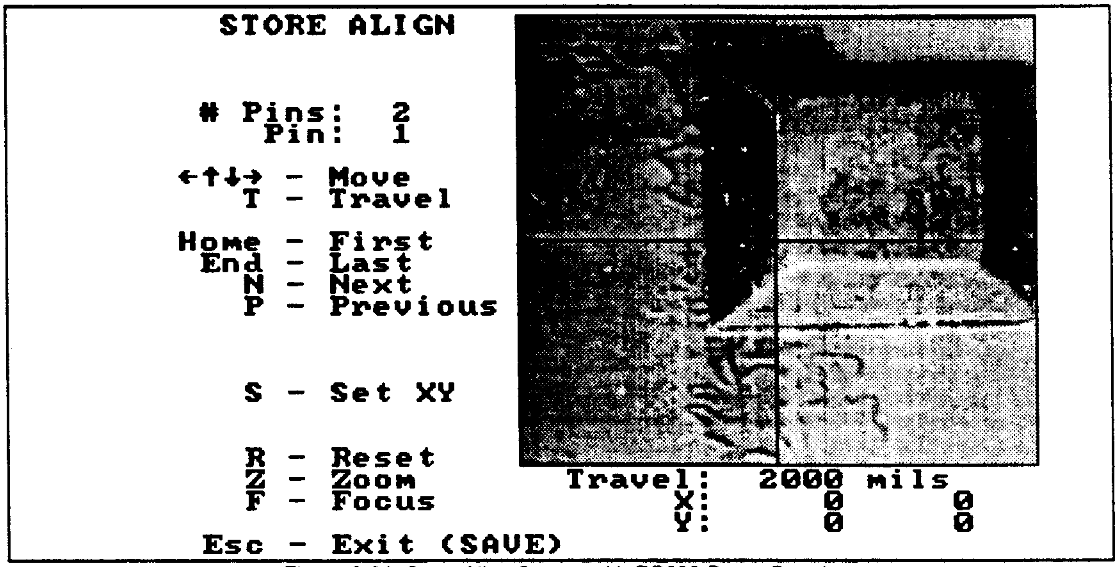


Figure 6-24. Store Align Screen with RP388 Demo Board.

You are now about to start the actual alignment procedure. The camera image represents one square inch of board area when the board is in the TOP slot. Notice that since two alignment points need to be set, "# Pins:" = 2. "Pin: 1" indicates that the first alignment point needs to be set.

Notice that the "Travel" is set to 2000 mils (50.8mm). This is the distance the camera head will move if you press any of the ← ↑ ↓ → keys. The camera head will move in the X direction using the ← →keys or Y direction using the ↑ ↓ keys.

You will now locate the first alignment point on the RP388 demo board. The various key stroke options on the Store Align screen will be explained as this tutorial progresses. The figure below identifies the two alignment points to be used for this exercise.

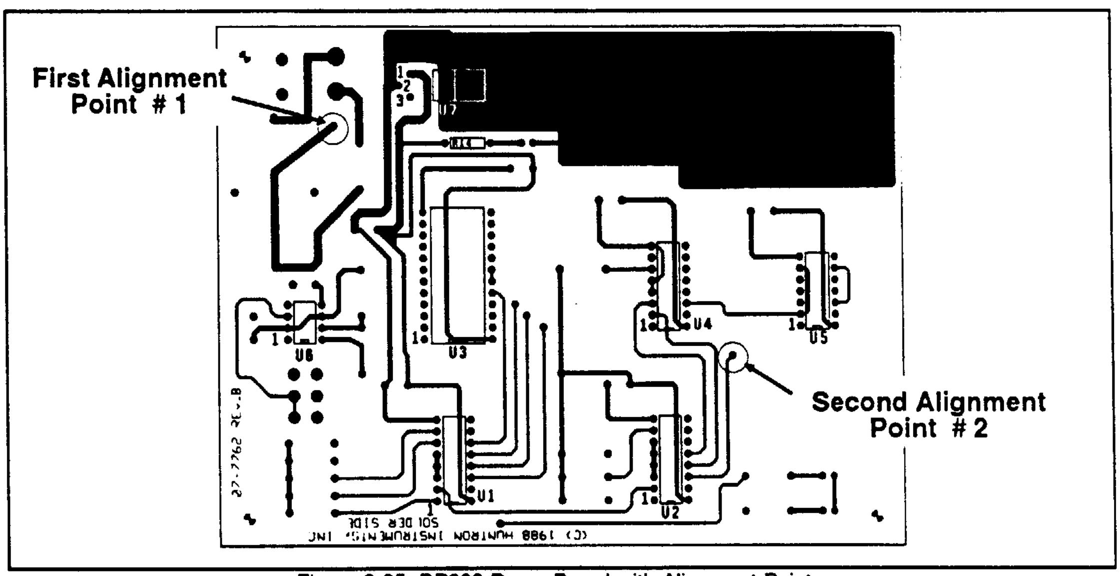


Figure 6-25. RP388 Demo Board with Alignment Points.

MOVING THE CAMERA HEAD USING THE ARROW KEYS

To move the camera head 2000 mils (50.8mm), which is set by the Travel distance, press the ←key once. Notice that the Z Axis Mechanism moved and the camera image was updated. To move the camera head toward you by 2000 mils (50.8mm), press the ↓ key once. To move the camera head within the area shown on the screen, you can either change the Travel setting and then press an arrow key, or move the trackball to the desired place and then click the LEFT trackball button.

CHANGING THE TRAVEL SETTING

To change the Travel setting to 500 mils (12.7 mm), press **T**. Notice the screen cursor is at the first digit of the Travel setting. Type "500" ↵. The screen will now indicate the Travel setting is 500 mils (12.7 mm). Now press any arrow key. Notice that the camera head moved in the direction of the arrow key you pressed. The trackball cursor automatically positions itself at the center of the image momentarily and then disappears until the trackball is moved.

MOVING THE CAMERA HEAD USING THE TRACKBALL

An easier way to travel small distances is to use the trackball. Rotate the trackball. The trackball cursor moves exactly in the direction of the rotation. The XY position of the trackball cursor gets updated as you rotate the ball. To move the camera head, position the cursor over a visible test point in the camera image and press the LEFT trackball button. The camera head moves to that test point and the image is updated. Reposition the trackball and click the LEFT button a number of times for practice.

NOTE

When the board is mounted in the top slot, moving the trackball cursor one pixel represents 4 mils(0.1mm) of travel. The ZOOM feature zooms the center of the image so that one pixel in the zoomed window represents 2 mils of travel.

Press Z to zoom the image. Zoom mode should be used for fine pitch devices and for accurately centering the trackball cursor over the test point.

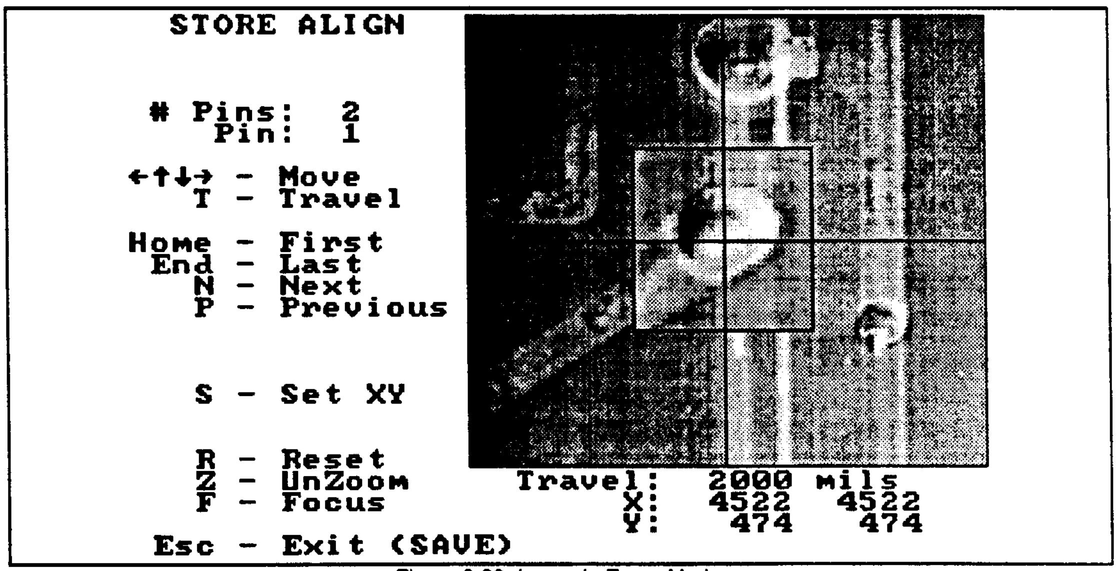


Figure 6-26. Image in Zoom Mode.

Press **Z** again to "unzoom" the image.

FOCUSING THE CAMERA IMAGE

If the image displayed on the monitor is not clear, you may need to focus the camera. Focusing will be needed whenever a different slot is used.

To focus the image, press **F**. The camera image is now live. Turn the camera focus knob until the image is focused. Only a slight rotation may be required. Notice the focus numbers changing as you turn the knob. The actual value of the number depends on the image displayed. The image will be focused if the numbers are at their maximum value. If the image is in focus and you continue to turn the focus knob, the focus number will decrease. So just adjust the knob until the focus number is at it's maximum value.

Hit **Z** to zoom the center of the image. This may aid in proper focusing. Pressing **Z** again will unzoom the image. When the image is in focus, press **Esc** to return to the Align screen.

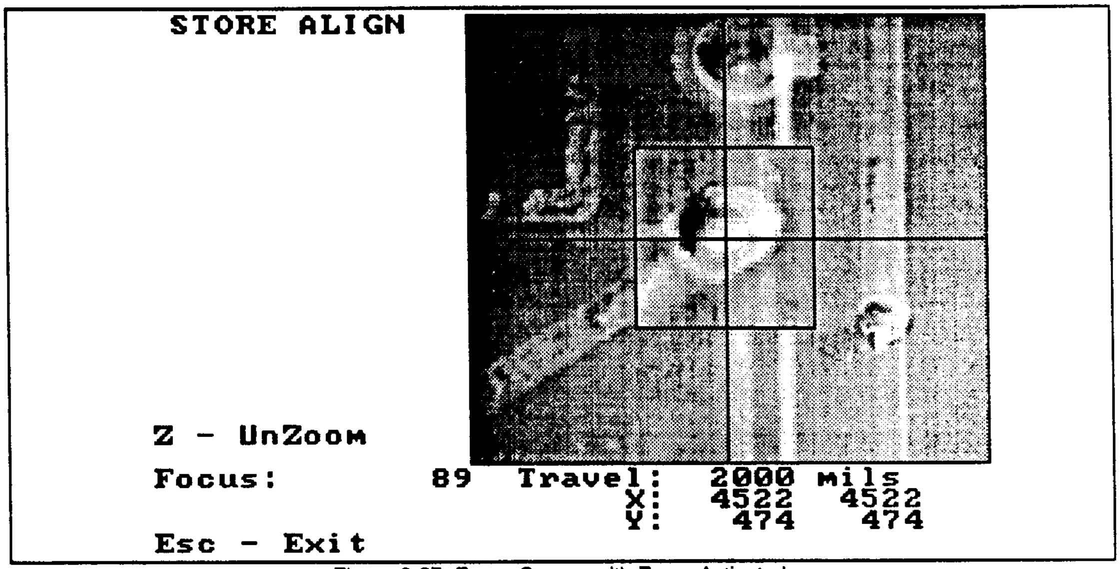


Figure 6-27. Focus Screen with Zoom Activated.

LED LIGHT SOURCE

The camera lens system is specifically designed to be sensitive to red light. The red LED is a light source with sufficient brightness to enable the camera to produce an illuminated image on the PC monitor. The brightness of the LED can be adjusted by rotating the black knob mounted on the right wall of the Z Axis mechanism. This knob is marked "INTENSITY". If needed, the angle of the light source can be adjusted to give a better image by loosening the black thumb-screw on the light source swivel clamp. Tighten the thumb-screw after adjusting.

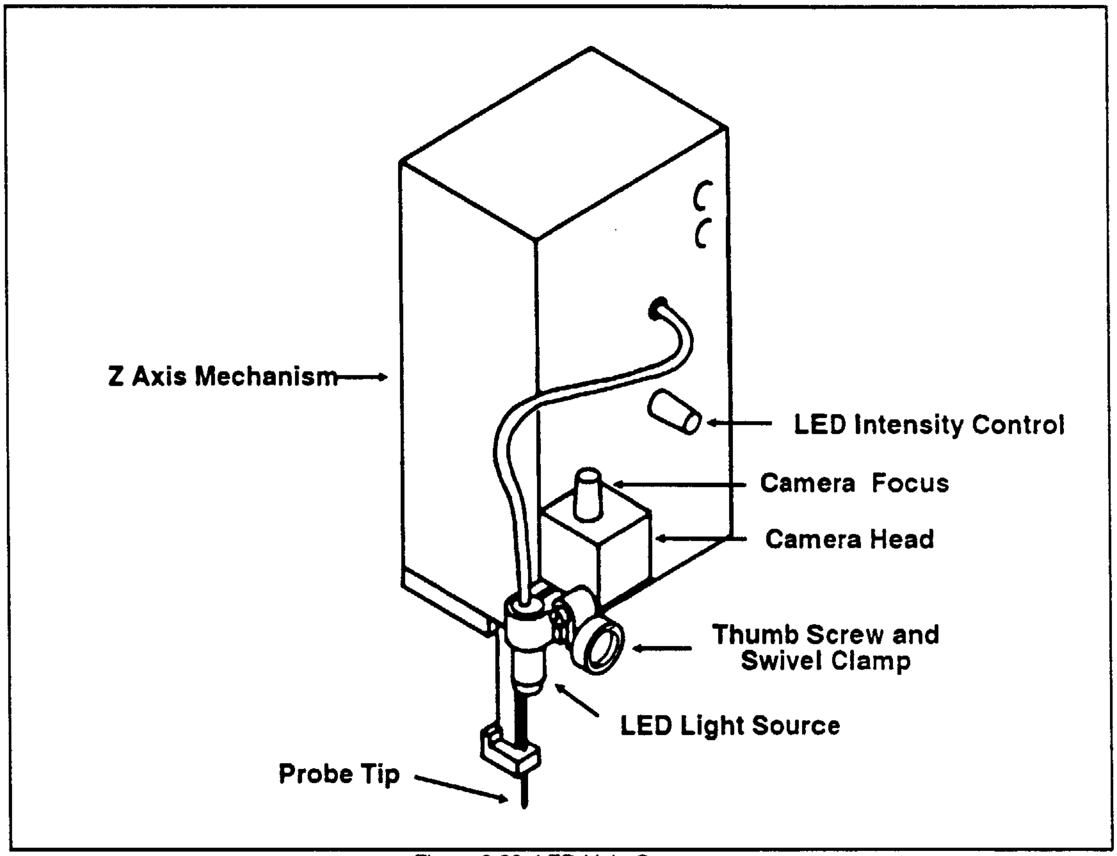


Figure 6-28. LED Light Source.

SETTING UP THE FIRST ALIGNMENT POINT

Now use the trackball to position the camera head over the first alignment point shown in Figure 6-25. You may have to look at the demo board and see where the camera is pointing to. The probe tip position does not really matter for now since we are using the camera's position to locate the alignment points.

Locate the first alignment point. When the first alignment point is visible on the screen, use the trackball to move to the exact position of the center of the first alignment point image. Click the LEFT trackball button when the trackball cursor is at the center of alignment point. The first point is now set.

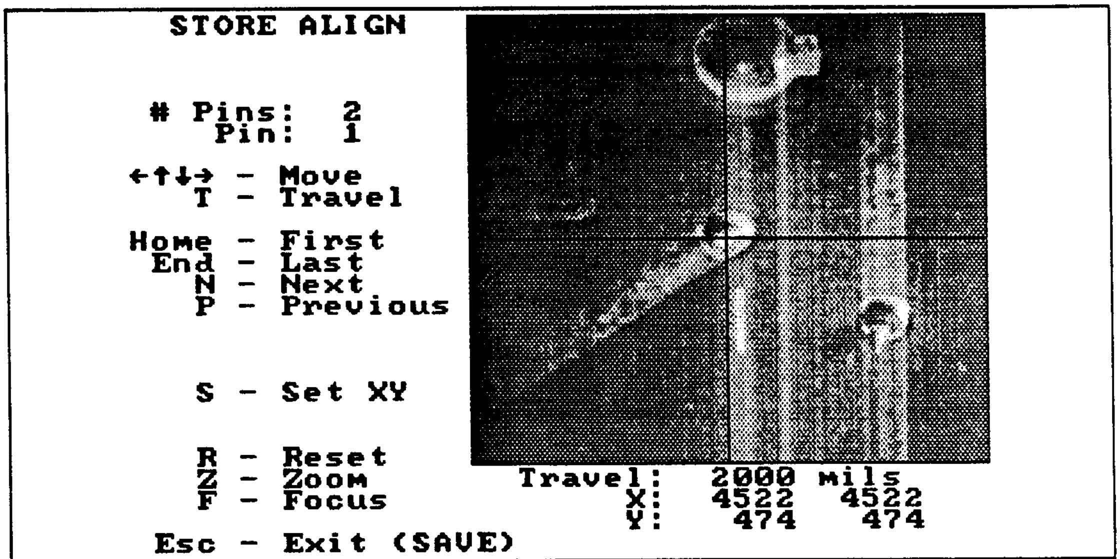


Figure 6-29. RP388 Demo Board First Alignment Point.

SETTING UP THE SECOND ALIGNMENT POINT

Press **End** to do the second alignment point. Notice that the pin number has changed to "2".

Locate the second alignment point (refer to Figure 6-25). Set Travel back to 2000 mils (50.8 mm) by pressing T then typing "2000" ↵ . Hit the appropriate arrow keys to get the camera head positioned in the area of the second alignment point. When the second alignment point is visible on the screen, use the trackball to move to the exact position of the center of the second alignment point image.

Click the LEFT trackball button when the trackball cursor is at the center of the alignment point. The second alignment point is now set.

The XY coordinates are also displayed below the camera image. The first column shows the current setting of the cross hairs of the camera image. The second column shows the position of the trackball cursor. These numbers are displayed for your reference.

Press **Home** - the camera head will move to the first alignment point.

Press **End** - the camera head will move to the second alignment point.

If these are now the correct alignment points, you are ready to save these positions permanently.

NOTE
If you want to reset both alignment points to zero, press R. This will enable you to start over.

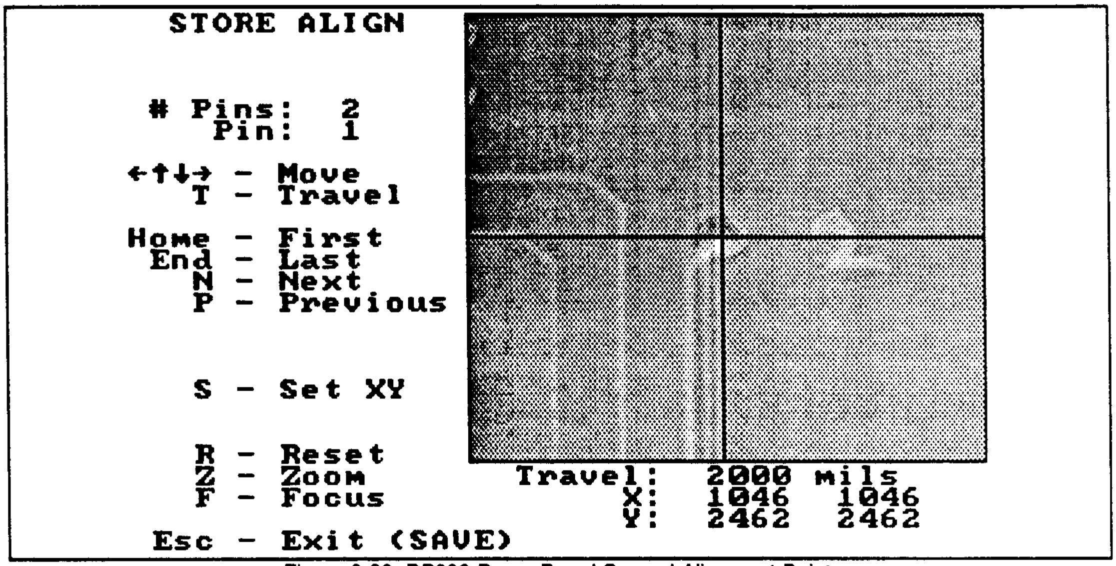


Figure 6-30. RP388 Demo Board Second Alignment Point.

Press Esc to exit and press Y to save.

You are now ready to teach the XYZ locations of the first component.

6-9. TEACHING THE XYZ LOCATIONS OF THE TEST POINTS

If the alignment points were setup correctly, the following screen will be displayed.

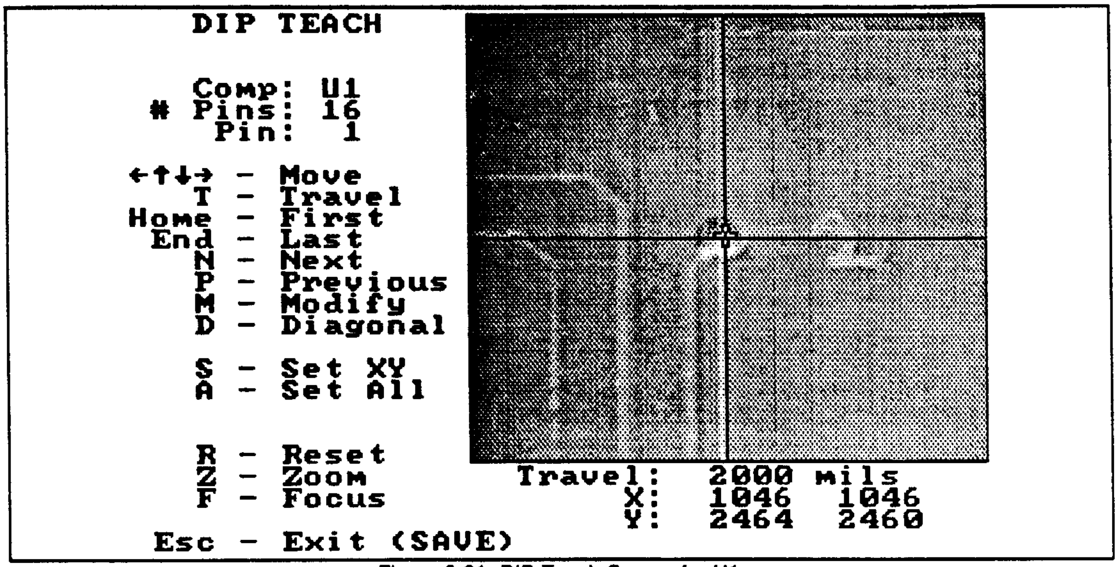


Figure 6-31. DIP Teach Screen for U1.

For DIP type ICs, it is NOT necessary to teach the XYZ location for every pin. It is only necessary to teach the first, last and diagonal pin (i.e. pin diagonally across from pin 1). The software calculates the other pin coordinates. For more detail on DIP TEACH, refer to Chapter 7, section 7-14.

LOCATE PIN 1 OF U1

You will now locate pin 1 of U1 by moving the camera head using the arrow keys and the trackball. Looking at the Demo board mounted in the RP388, you will notice that U1- pin 1 is to the left and forward of the second alignment point. Move the head 2000 mils (50.8 mm) to the left by pressing the ← key. The camera image gets updated upon completion of a XY move. Ignore the position of the probe tip since the camera head is used to digitize the XY position of test points. The software will automatically calculate the probe tip position.

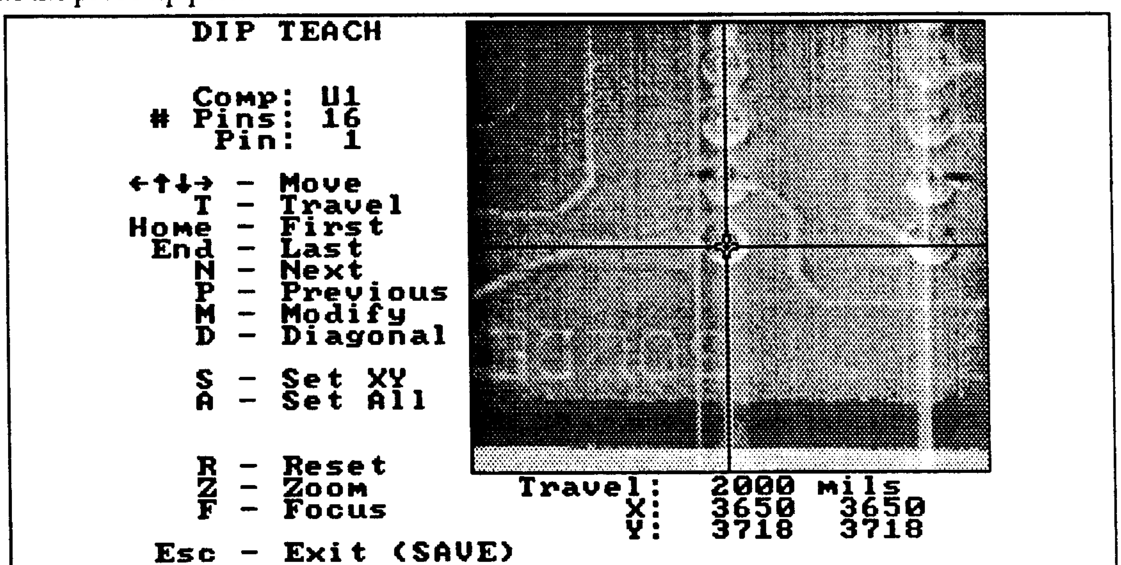


Figure 6-32. Image of U1.

Notice that pin 1 of U1 is only about 1.5 inches away. Use the trackball to get closer to pin 1 by rotating the trackball until the cursor is at the bottom left corner of the image. Press the LEFT trackball button. Repeat this procedure until pin 1 becomes visible on the PC monitor.

When pin 1 is visible, move the trackball cursor to pin 1 and click the LEFT trackball button. Make fine adjustments until the trackball cursor is directly over the center of pin 1. Click the LEFT trackball button. Clicking the LEFT button always saves the XY position, so there is no need to press S on the keyboard.

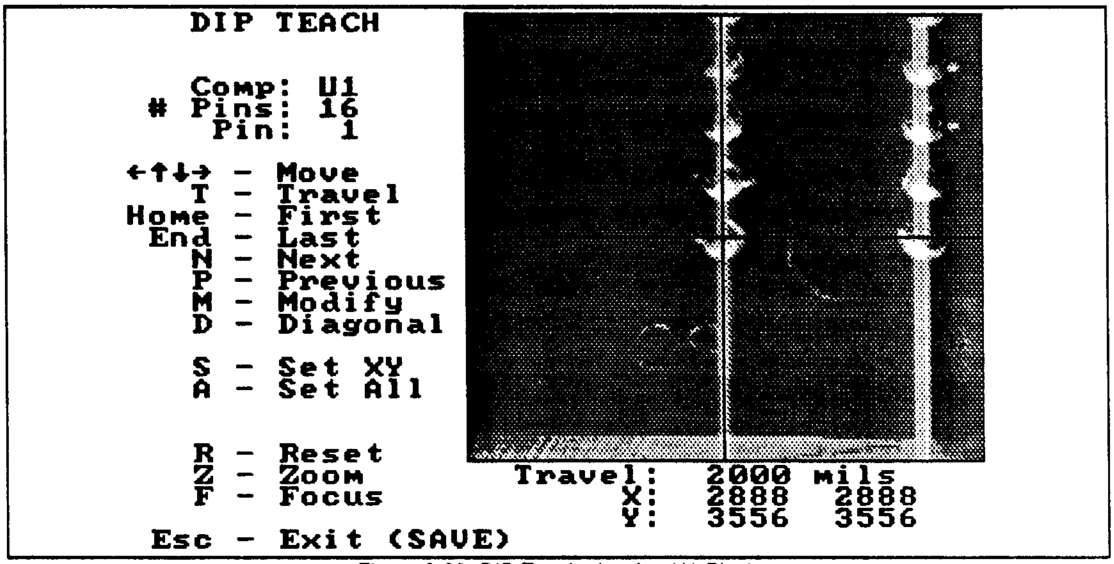


Figure 6-33. DIP Teach showing U1 Pin 1.

LOCATE THE LAST PIN OF U1

The next pin to TEACH is pin 16, the END pin of U1. Notice that the next suggested key to press is highlighted in white. This serves as a guide to the normal order of keys used.

Press the End key. Notice that the Travel setting has changed to 300 mils (7.62mm). This is the default distance between the last and first pin of most DIPs. Also notice that the pin number has changed to 16. The simplest way to move the camera head over the END pin is to press the → key because the Travel setting is 300 mils (7.62mm).

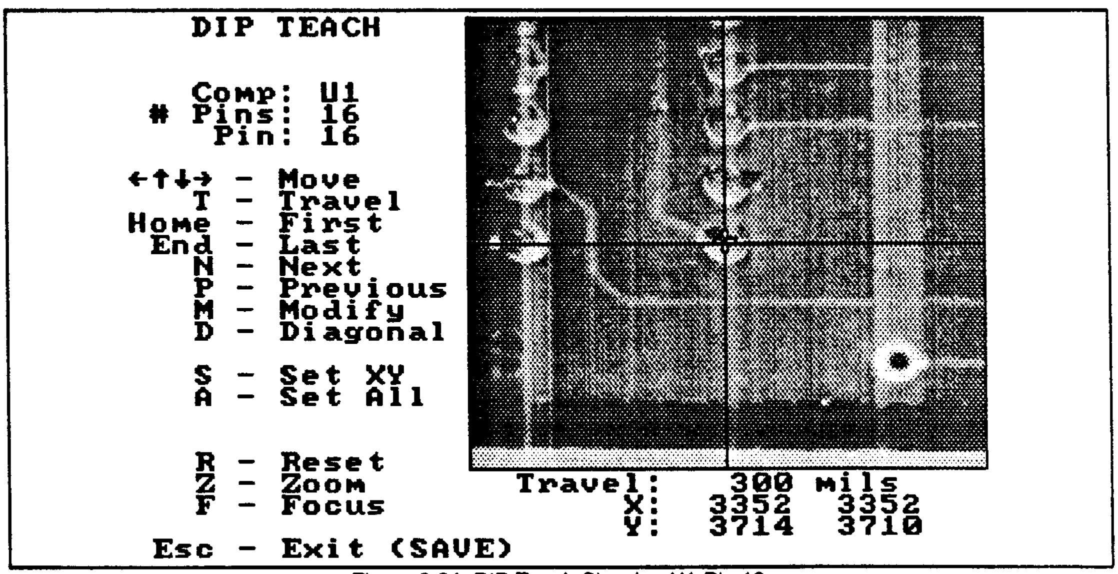


Figure 6-34. DIP Teach Showing U1 Pin 16.

Press the → key once. The image gets updated. If the trackball cursor is not directly over the center of pin 16, rotate the trackball for fine tuning. Click the LEFT trackball button or press **S** to set the XY location. Notice that **D** is now highlighted in white.

LOCATE THE DIAGONAL PIN OF U1 (Pin 9)

The next pin to TEACH for a DIP IC is the diagonal pin which is always diagonally across from pin 1.

Press **D**. The pin number is changed to 9 which is the pin diagonally across from pin 1. The Travel setting changed to 700 mils (17.78mm). To move the camera head to pin 9, press the ↑ key. The camera image gets updated. If the trackball cursor is not directly positioned over the center of pin 9, rotate the trackball to fine tune and press the LEFT trackball button to set the XY location. You can also press S to set it if there was no need to use the trackball. Notice that **A** is highlighted in white.

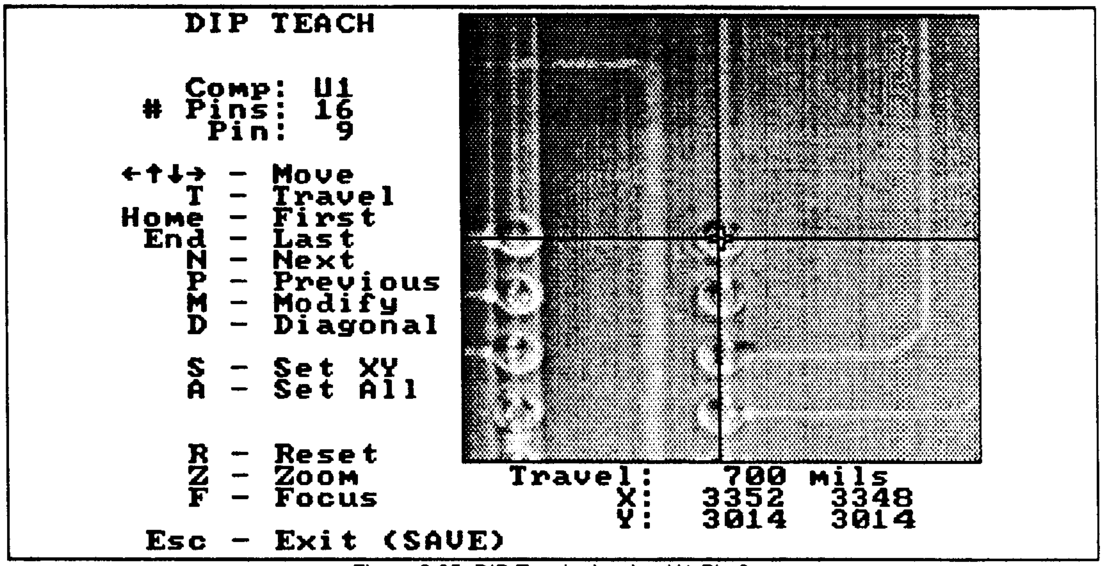


Figure 6-35. DIP Teach showing U1 Pin 9.

Press **A** to allow the software to calculate the other pin coordinates. Notice that Esc is highlighted.

Press the **Esc** key and press **Y** to save.

QUICK SUMMARY OF DIP XY TEACH

1. Move to pin 1 so that the center of the cross hair is placed over the image of pin 1.
2. Click the LEFT trackball button or press **S** to set it.
3. Press **End** for the last pin.
4. Press the appropriate cursor key which points to the last pin.
5. Adjust the trackball if necessary and click the LEFT button or press S to set it.
6. Press **D** for the diagonal pin.
7. Press the appropriate cursor key pointing to the diagonal pin.
8. Adjust the trackball if necessary and click the LEFT button or press **S** to set it.
9. Press **A** to set the remaining pins automatically.
10. Press **Esc** to exit and press **Y** to save the data to hard disk.

The Z AXIS TEACH menu will be displayed next.

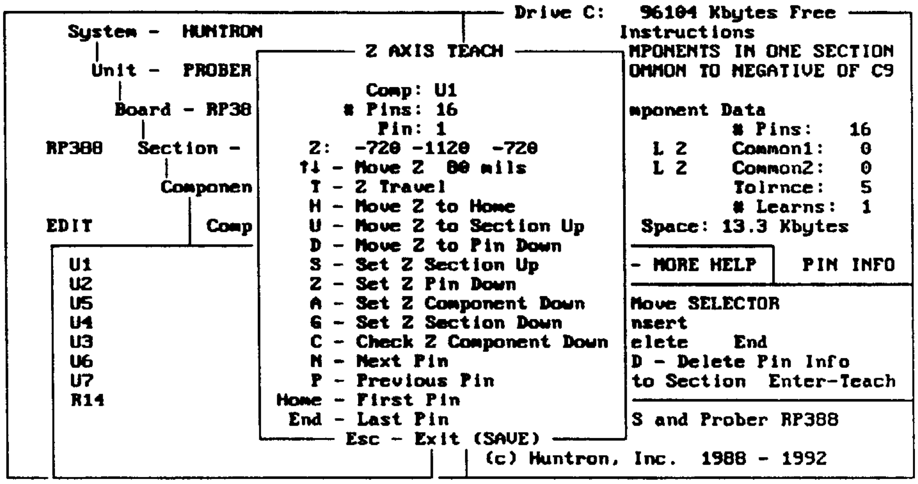


Figure 6-36. Z Teach Screen.

SETTING UP/DOWN POSITIONS FOR AN IC

The Z AXIS TEACH screen will only appear for the first component of a section. Other component Z data will automatically default to that of the first component unless changed by the user.

The Z TEACH procedure is necessary to set the downward travel distance. Also an intermediate upward travel distance can be set so that the probe does not need to move all the way up during the test. A maximum travel distance is set automatically depending on which slot was selected in the EDIT section screen.

NOTE

The camera is not used for Z TEACH. Instead the probe tip is manipulated until it makes contact with the actual test point. That position is the DOWN position.

SETTING THE INTERMEDIATE UP POSITION OF THE SECTION

The UP position is the intermediate position between the DOWN and uppermost position of the probe tip. The uppermost position is called the Z HOME position. The UP position is set for all the components of the section. This means that when this position is set, the probe tip will not move to the uppermost position. It will move from the DOWN position to the UP position between pins of a component. Between components, the probe tip will go all the way up to the Z HOME position.

To set the UP position from the current Z HOME position, press the ↓ key repeatedly until the probe tip is higher than the highest part on the Demo board. Press **T** to change the probe tip vertical travel from the default of 80 mils (2.03mm) to 160 or 8 or 40 mils (4.06 or 0.203 or 1.02 mm) if needed. To set the UP position, press **S**.

SETTING THE DOWN POSITION OF ALL THE PINS OF U1

The ↓ key moves the probe tip 80 mils (2.03mm) down. Press **T** to change the probe tip vertical travel from the default of 80 mils (2.03mm) to 160 or 8 or 40 mils (4.06 or 0.203 or 1.02 mm) if needed.

Press the ↓ key repeatedly until the probe tip just touches the test point (i.e. pin 1).

To make sure you have good contact, press the ↓ key one more time. You should observe a non-open signature on the 5100DS CRT. This is the suggested DOWN position.

To set the down positions of the pins of all the components of this section, press G.

VERIFYING THE Z POSITIONS

Press **U** to move the probe tip to the UP position. The probe tip will move up (but not all the way up).

Press **H** to move the probe tip all the way up to the Z Home position.

To check the UP/DOWN movement, press **D**. The probe tip will move vertically down so that it touches the pin. The same signature as before should be displayed on the 5100DS CRT.

To check the positions of all the pins, press **C**. This does not digitize component signatures but simply moves the probe tip to access one pin at a time.

To save the Z positions, press **Esc** to exit and **Y** to save.

Refer to Chapter 7, Section 7-15 for more detailed information on Z Teach.

QUICK SUMMARY OF Z TEACH

Follow the procedure below to set the Z Axis travel profile for a DIP component.

1. Press the ↓ key until the probe tip clears the highest component or part on the board. This would be the desired UP position instead of the uppermost probe tip position (the Z HOME position).
2. Press **S** to set the UP position of all the components of that section.
3. Press the ↓ key until the probe tip just makes contact with the component pin and press ↓ one more time to ensure good contact.
4. Make sure that a signature appears on the 5100DS CRT.
5. Press **G** to set the DOWN positions of all the pins of the components.
6. Press **U** to check the UP position.
7. Press **D** to check the DOWN position.
8. Press C to check all the component pin XYZ positions.
9. Press **H** to move the probe tip all the way up to the Z Home position.
10. Press **Esc** to exit Z TEACH and press **Y** to save the Z data to hard disk.

The Z TEACH procedure is now complete.

XY TEACH FOR THE REST OF THE SECTION

The EDIT component screen will appear with the next component highlighted.

The camera head will automatically move to the last pin of U1.

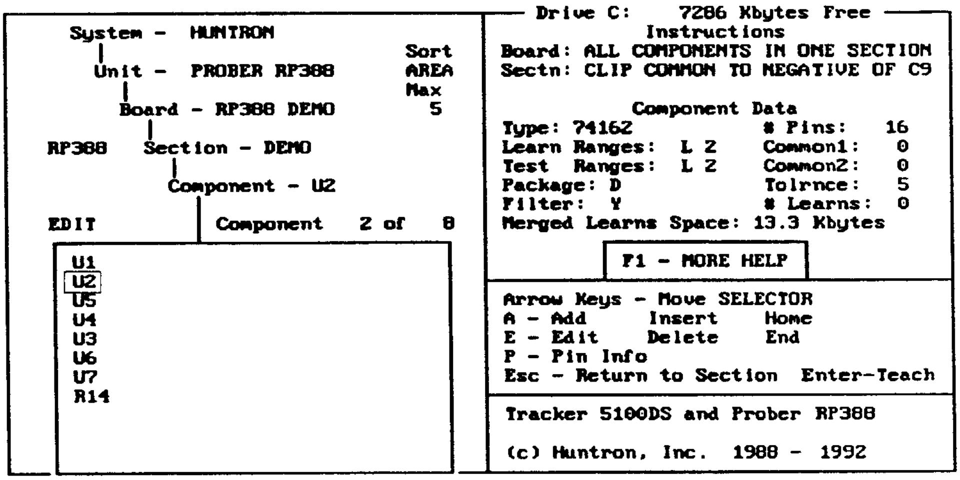


Figure 6-37. Component Screen with U2 Highlighted.

Notice that U2 is highlighted in the EDIT component screen.

Press ↵ to teach the XY locations of U2. The DIP TEACH screen is displayed.

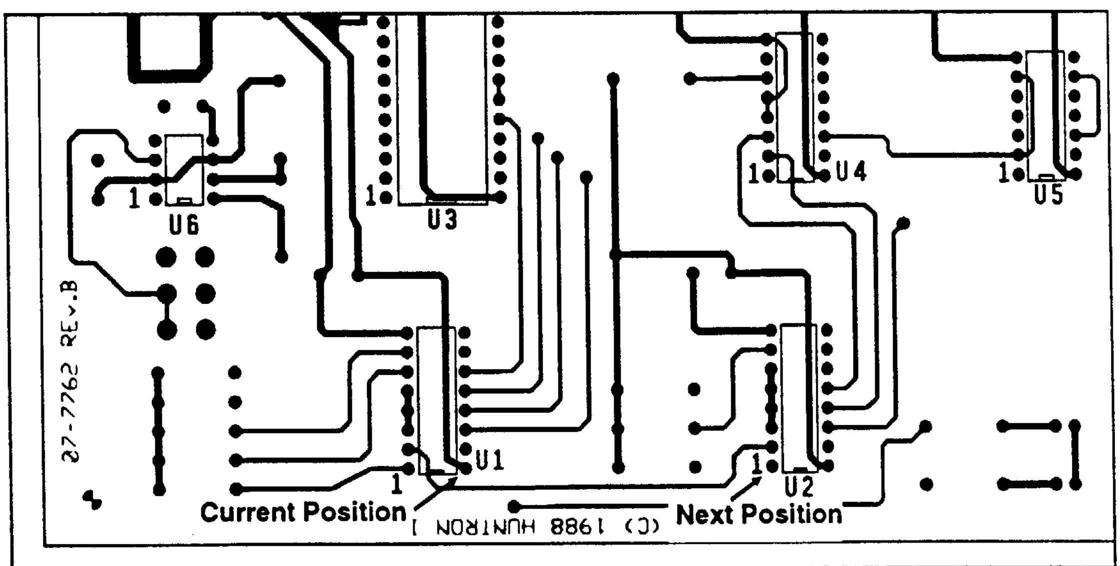


Figure 6-38. Moving from U1 to U2.

Look at the Demo board mounted in the RP388. Notice that U2 is about 2000 mils (50.8 mm) to the right of U1. You must now move the camera head to pin 1 of U2.

Press the → key.

NOTE
The XY TRAVEL setting carries over from the XY TEACH for the previous component. In this case, the last setting was 700 mils (17.78mm) for U1 XY TEACH.

To get to pin 1 of U2, manipulate the trackball until the trackball cursor is directly over the center of pin.

Click the LEFT trackball button to set it.

The next pin to XY TEACH is the END pin. Press the **End** key, then press the → key to move to pin 16. Adjust the trackball if necessary and click the LEFT trackball button when the cursor is over the center of pin 16.

The next pin to teach is the DIAGONAL pin. Press **D**, then press the ↑ key to move to pin 9. Adjust the trackball if necessary. To set this position, click the LEFT trackball button or press S.

Press **A** to set all the other pins.

Press **Esc** to exit and **Y** to save the XY information for U2.

The Edit component screen will be displayed with U5 highlighted.

The camera head is at the END pin of U2.

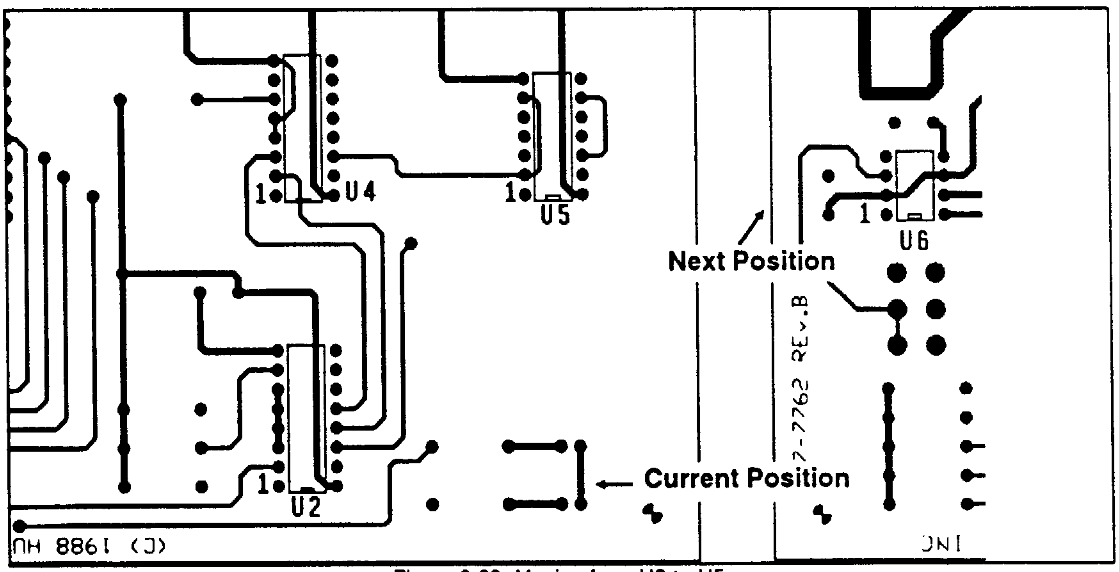


Figure 6-39. Moving from U2 to U5.

Press ↵ to do XY TEACH for U5.

Use the arrow keys and the trackball to get the camera head near pin 1 of U5. Adjust the trackball, if necessary, until the cursor is directly over the center of pin 1. Click the LEFT trackball button or press **S** to set it.

Press the **End** key to teach pin 14 of U5.

Press the → key to move there and adjust the trackball, if necessary, until the cursor is directly over the center of pin 14. Click the LEFT trackball button or press **S** to set it.

Press **D** to change the pin number to pin 8.

To move to the Diagonal, pin press the ↑ key.

Adjust the trackball if necessary. Press S or click the LEFT trackball button to set it.

To allow the software to calculate the other pin coordinates, press **A** to set all the pins of U5.

Press **Esc** to exit and **Y** to save the XY information for U5.

The camera head will move to pin 14 of U5 and the component entry screen will be displayed with U4 highlighted.

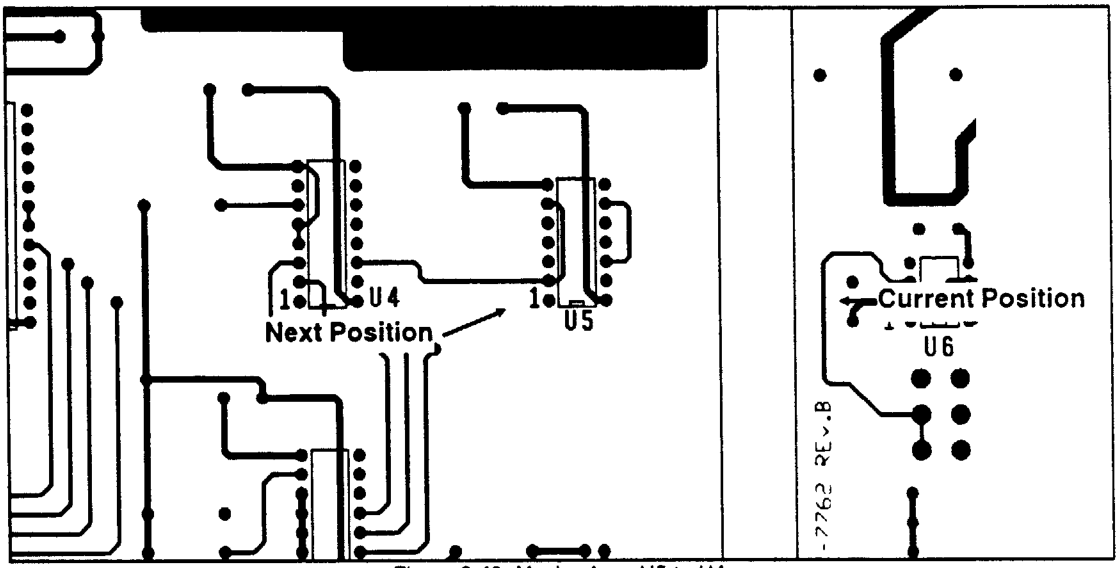


Figure 6-40. Moving from U5 to U4.

Press ↵ to do XY TEACH for U4.

Press the ← key once and use the trackball to go LEFT towards pin 1 of U4.

Adjust the trackball, if necessary, until the cursor is directly over the center of pin 1. Click the LEFT trackball button or press **S** to set it.

Press the **End** key to setup pin 16 of U4.

Press the → key to move there and adjust the trackball, if necessary, until the cursor is directly over the center of pin 16. Click the LEFT trackball button or press **S** to set it.

Press **D** to change the pin number to pin 9.

To move to the Diagonal pin, press the ↑ key.

Adjust the trackball if necessary. Press **S** or click the LEFT trackball button to set it.

To allow the software to calculate the other pin coordinates, press **A** to set all the pins of U4.

Press **Esc** to exit and Y to save the XY information for U4.

The camera head will move to pin 16 of U4 and the component entry screen will be displayed with U3 highlighted.

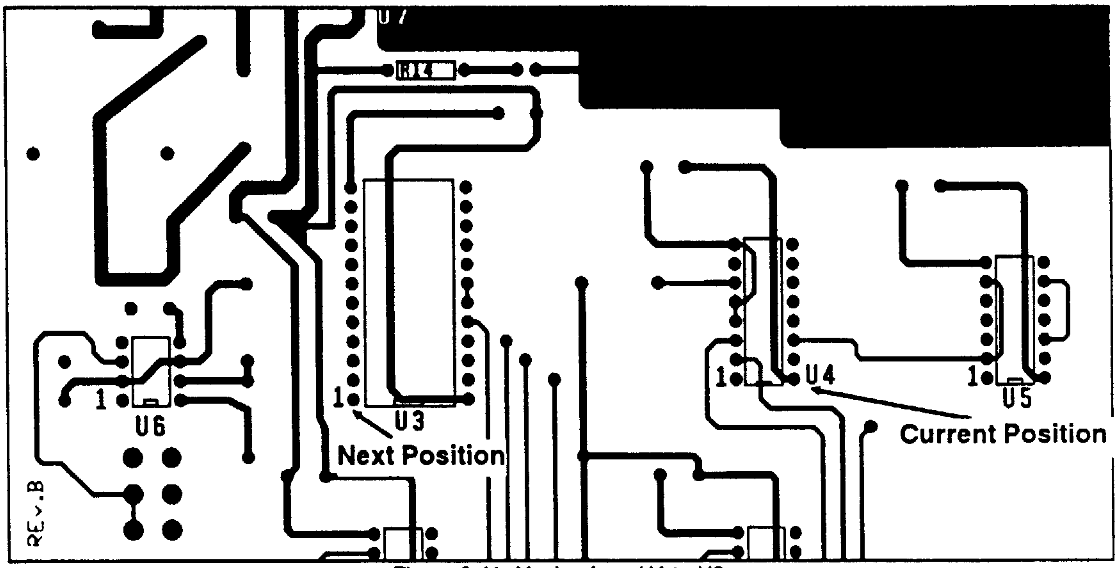


Figure 6-41. Moving from U4 to U3.

Press ↵ to do XY TEACH for U3.

Use the arrow keys and the trackball to get the camera head close to pin 1 of U3.

Rotate the trackball until the cursor is directly over pin 1 of U3. Click the LEFT trackball button or press S to set it.

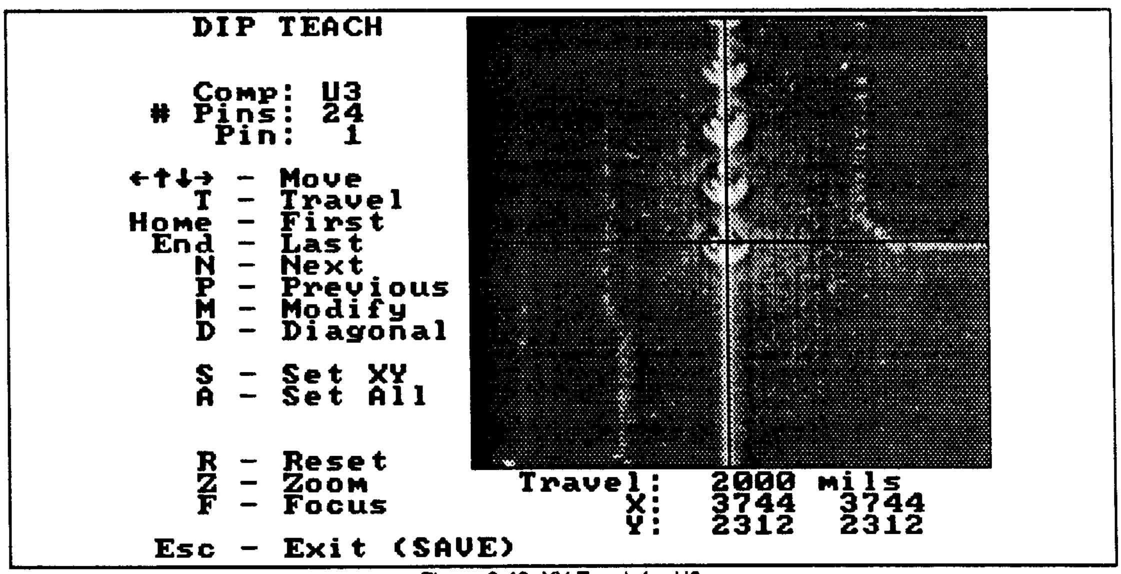


Figure 6-42. XY Teach for U3.

Press the **End** key to set pin 24 of U3.

Press the → key to move there and adjust the trackball, if necessary, until the cursor is directly over the center of pin 24. Click the LEFT trackball button or press **S** to set it.

Press **D** to change the pin number to pin 13.

To move to the Diagonal pin, press the ↑ key.

Adjust the trackball if necessary. Press **S** or click the LEFT trackball button to set it.

To allow the software to calculate the other pin coordinates, press **A** to set all the pins of U3.

Press **Esc** to exit and **Y** to save the XY information for U3.

The camera head will move to pin 24 of U3 and the component entry screen will be displayed with U6 highlighted.

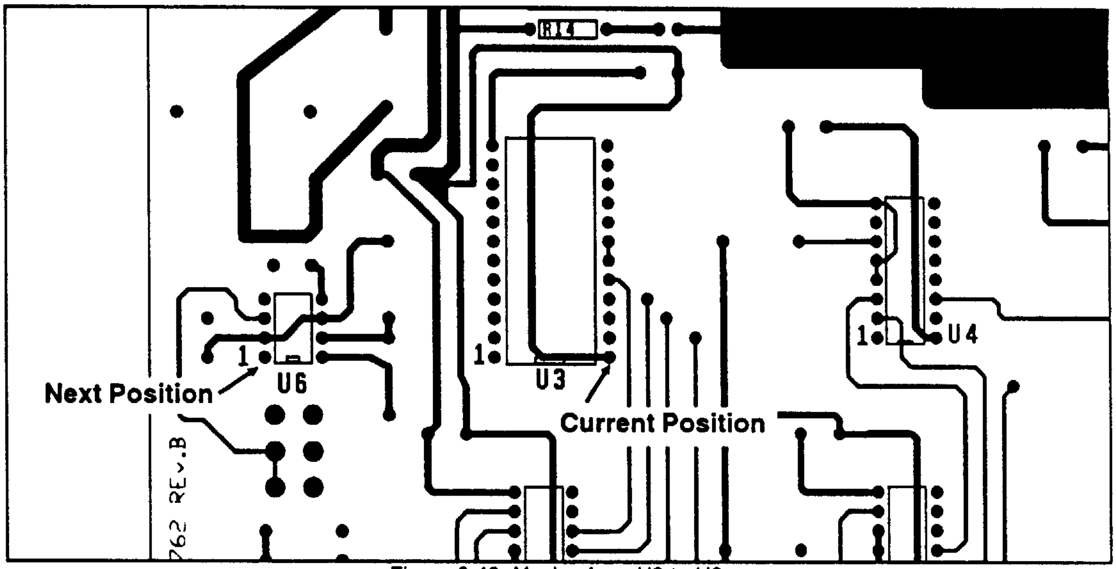


Figure 6-43. Moving from U3 to U6.

Press ↵ to do XY TEACH for U6.

Press the appropriate arrow keys and use the trackball to get close to pin 1 of U6.

Adjust the trackball, if necessary, until the cursor is directly over the center of pin 1. Click the LEFT trackball button or press **S** to set it.

Press the **End** key to prepare to move to pin 8 of U6.

Press the → key to move there and adjust the trackball, if necessary, until the cursor is directly over the center of pin 8. Click the LEFT trackball button or press **S** to set it.

Press **D** to change the pin number to pin 5.

To move to the Diagonal pin, press the ↑ key.

Adjust the trackball if necessary. Press **S** or click the LEFT trackball button to set it.

To allow the software to calculate the other pin coordinates, press **A** to set all the pins of U6.

Press **Esc** to exit and **Y** to save the XY information for U6.

The camera head will move to pin 8 of U6 and the component entry screen will be displayed with U7 highlighted.

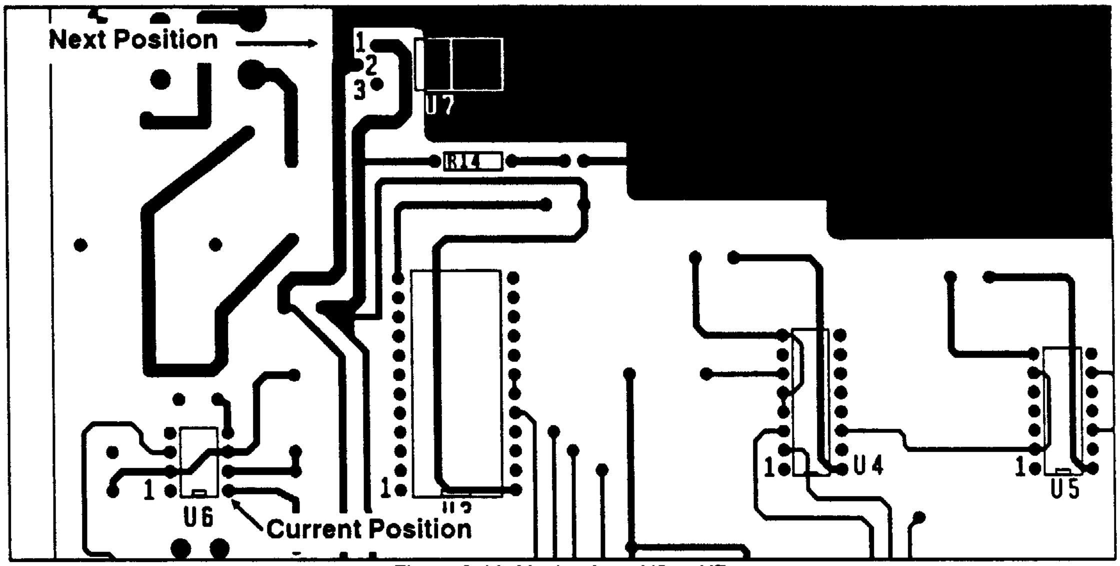


Figure 6-44. Moving from U6 to U7.

Press ↵ to do XY TEACH for U7.

Notice that U7 has only three pins and is a P(robe) package.

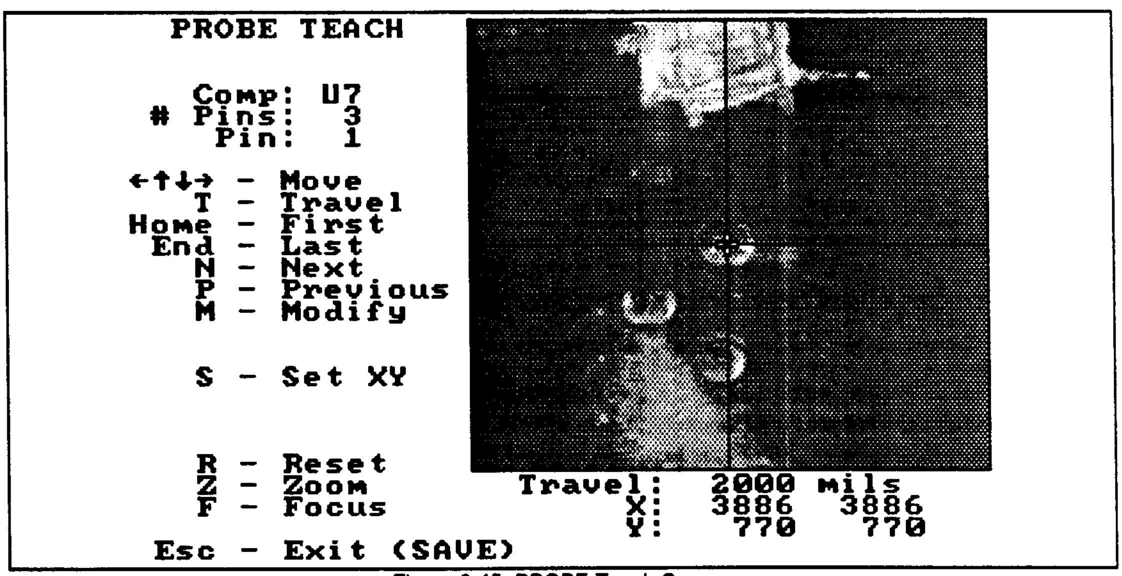


Figure 6-45. PROBE Teach Screen.

The pins of U7 are not evenly spaced in a single row. You will have to teach U7 one pin at a time.

Press ↑ and rotate the trackball until pin 1 of U7 is visible on the monitor. Click the LEFT trackball button when the trackball cursor is directly positioned over the center of pin 1 of U7.

To do pin 2, press **N** for the next pin.

Rotate the trackball and position the cursor so that it is directly positioned over the center of the middle pin of U7. Click the LEFT trackball button to set it.

Press **N** to change the pin number to 3.

IMPORTANT NOTE

If you do not press N and if you position the trackball to pin 3 and click the LEFT trackball button you have then set a new position for pin 2, not pin 3.

Position the trackball cursor over pin 3 and set it by clicking the LEFT trackball button.

Press **Esc** to exit and **Y** to save the XY information for U7.

The camera head will move to pin 3 of U7 and the component screen will be displayed with R14 highlighted.

Press ↵ to do XY TEACH for R14.

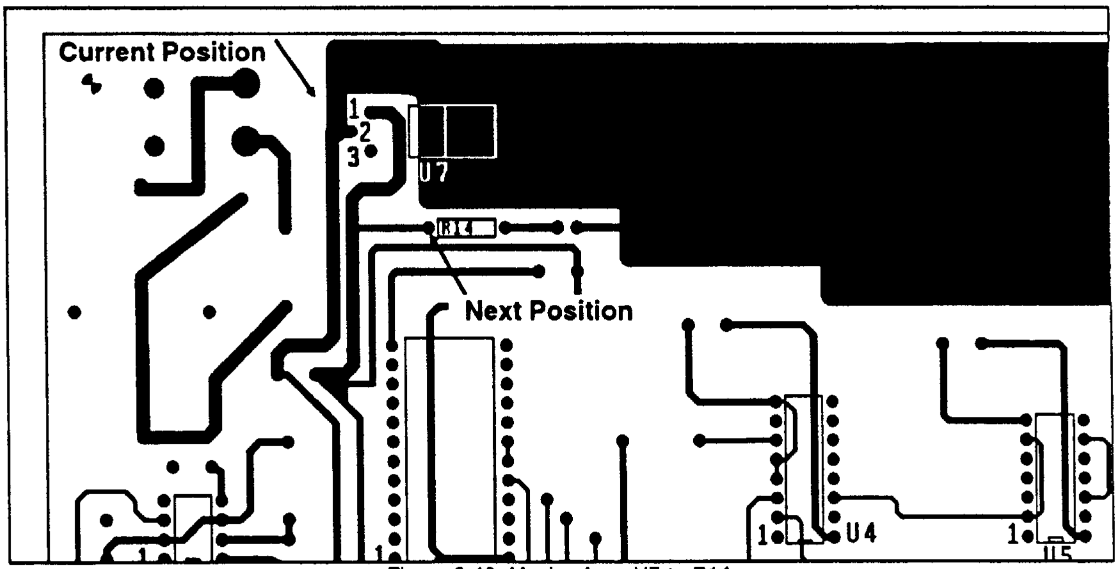


Figure 6-46. Moving from U7 to R14.

Notice that R14 has only two pins and is a P type package.

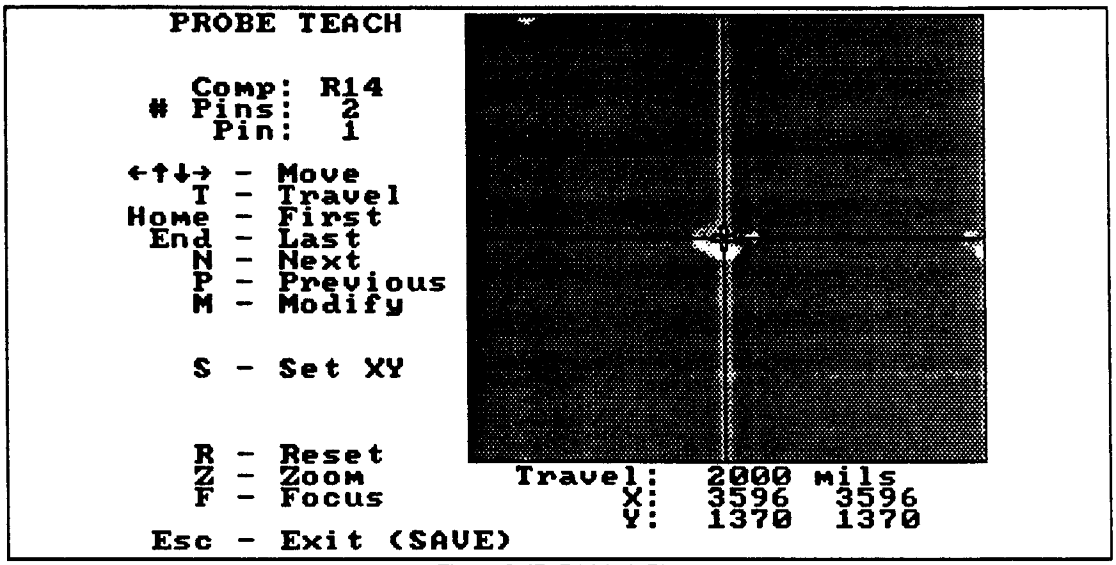


Figure 6-47. R14 Left Pin.

You will have to teach R14 one pin at a time.

Press ↑ and use the trackball to move the camera head until the left pin of R14 is visible on the monitor. Click the LEFT trackball button when the trackball cursor is directly positioned over the center of the left pin of R14 to set it.

To do the right pin of R14, press N for the next pin.

Rotate the trackball and position the cursor so that it is directly positioned over the center of the right pin of R14. Click the LEFT trackball button to set it.

Press Esc to exit and Y to save the XY information for R14.

The camera head will move to pin 2 of R14 and the component entry screen will be displayed with U1 highlighted.

You have now completed the XYZ TEACH of all the components of this section. For detailed information on XYZ TEACH, refer to Chapter 7, Section 7-14 in this manual.

6-10. LEARNING COMPONENT SIGNATURES USING THE RP388

IMPORTANT NOTE

Before starting the next step, make sure you switch the toggle switch to the CLOCK ON position. You can do this without removing the Demo board from the clamping system. Locate the toggle switch and push it toward you. You will be changing the switch setting in Test Mode to simulate fault conditions. Check that the black common lead is connected to the negative terminal of C9 and that it is plugged into the COMMON terminal of the 5100DS. Also check that the short red banana lead is connected between the red TEST jack on the 5100DS and the red unmarked jack on the RP388.

To enter the LEARN screen, press Alt+L from the component screen.

```
                                        Drive C:    7245 Kbytes Free
  System - HUNTRON                              Instructions
    |                       Sort    Board: ALL COMPONENTS IN ONE SECTION
    Unit - PROBER RP388     AREA    Sectn: CLIP COMMON TO NEGATIVE OF C9
      |                     Max
      Board - RP388 DEMO     5              Component Data
        |                          Type: 74161          # Pins:    16
RP388   Section - DEMO             Learn Ranges:  L 2   Common1:   0
          |                        Test  Ranges:  L 2   Common2:   0
          Component - U1           Package: D           Tolrnce:   5
                                   Filter:  Y           # Learns:  0
LEARN        Component   1 of  8   Merged Learns Space: 13.3 Kbytes

  U1                                       F1 - MORE HELP    PIN INFO
  U2
  U5                               Arrow Keys - Move SELECTOR
  U4
  U3                                                    End
  U6                               Enter  - Learn
  U7                               Esc - Return to Section
  R14
                                   Tracker 5100DS and Prober RP388

                                   (c) Huntron, Inc.   1988 - 1992
```

Figure 6-48. LEARN for the Demo Board.

LEARNING ONE COMPONENT AT A TIME

Make sure that U1 is the highlighted component (press the Home key if it is not). To learn the signatures of a single component, press ↵. The ALIGN option pop-up window will be displayed. Press ↵ to continue since the Demo board has not been moved.

```
                                        Drive C:    96141 Kbytes Free
  System - HUNTRON                              Instructions
    |                       Sort    Board: ALL COMPONENTS IN ONE SECTION
    Unit - PROBER RP388     AREA    Sectn: CLIP COMMON TO NEGATIVE OF C9
      |                     Max
      Board - RP388 DEMO     5              Component Data
        |                          Type: 74LS162         # Pins:   16
RP388   Section - DEMO             Learn Ranges:  12     Common1:  0
          |                        Test  Ranges:  12     Common2:  0
          C ------------ Align ------------------        Tolrnce:  5
                                                         # Learns: 0
LEARN     If the board has been moved or replaced,     e: 13.3 Kbytes
          alignment should be performed to ensure
  U1      proper positioning of the probe tip.         E HELP   PIN INFO
  U2
  U5      Enter - Continue   A - Align   Esc - Exit    SELECTOR
  U4                                                   Home
  U3                                                   End
  U6                               Enter  - Learn
  U7                               Esc - Return to Section
  R14
                                   Tracker 5100DS and Prober RP388

                                   (c) Huntron, Inc.   1988 - 1992
```

Figure 6-49. ALIGN Option Pop-up Window.

IMPORTANT NOTE

Board alignment is extremely critical for maintaining the accuracy between test points and the RP388. If the board has been physically disturbed after the initial alignment, it must be aligned again. The ALIGN option pop-up window allows the user to bypass the board alignment procedure if the board has not been moved since the last alignment. Press ↵ to bypass alignment, press A to align the board or press Esc to cancel the current operation and return to the previous step. The ALIGN option pop-up window appears after an Alt+E(EDIT), Alt+L(LEARN), Alt+T(TEST), Alt+V(VIEW) or before an Alt+U(AUTOLEARN or AUTOTEST) mode is selected. This pop-up window also appears if the component level has been exited.

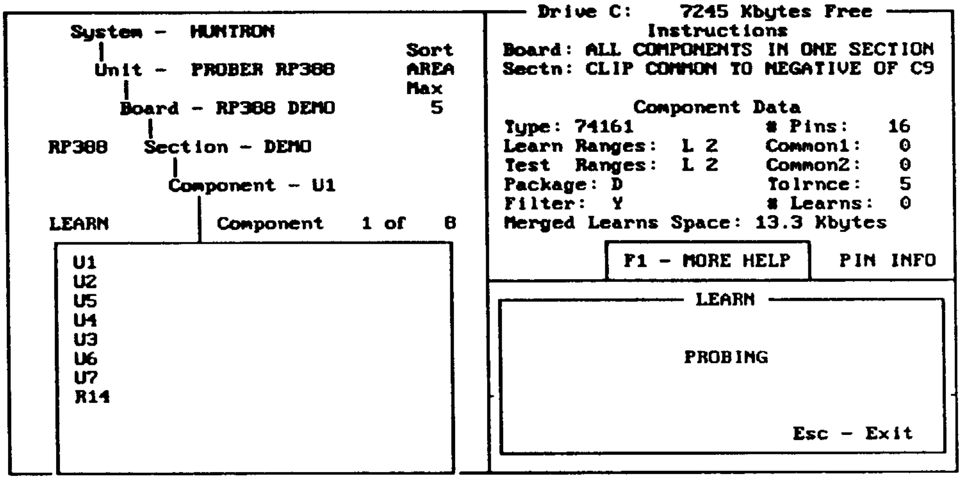


Figure 6-50. LEARN Screen for U1.

SEQUENCE OF EVENTS

The following events will take place:

The Z Axis mechanism will move to the location of pin 1 of U1.

The probe tip will move down to pin 1.

The 5100DS will learn the signatures in the LOW and MED 2 ranges.

While the probe tip is in contact with the test point the 5100DS CRT will display the signatures being digitized.

The probe tip will move to the UP position.

The probe tip will move to pin 2.

The probe tip will move down to make contact with pin 2 and the signatures will be digitized.

This process will be repeated for the rest of the pins of U1.

When the last pin is done, the probe tip moves to the Z Home position.

The program then displays the Learn results window showing that this is the "First Learn". At this point you can either store or display the signatures.

The following figure shows the "First Learn" screen.

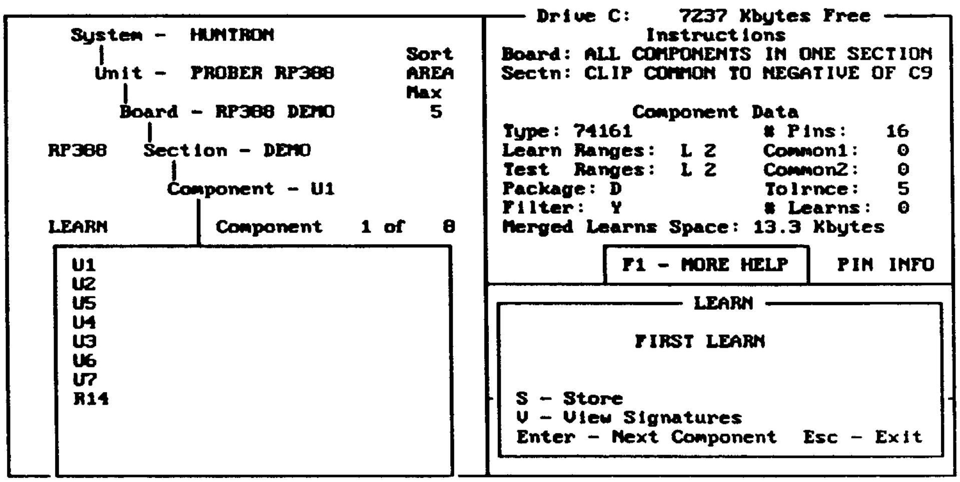


Figure 6-51. First Learn Screen for U1.

To display the component signatures on the PC monitor, press V.

The LEARN SIGNATURES screen is displayed.

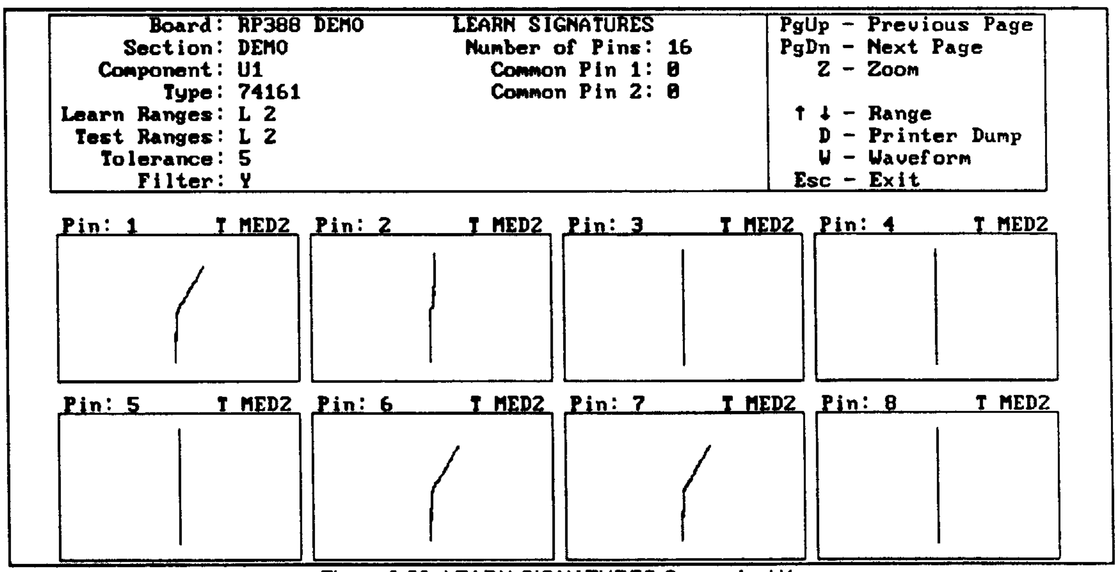


Figure 6-52. LEARN SIGNATURES Screen for U1.

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 mode in this manual where it is necessary for clarity. Alt+G toggles the graticule on/off.

The LEARN SIGNATURES screen displays up to eight pins of a component at one time. To view the next group of eight pins, press the **PageDown** key. Press the **PageUp** key to view the previous pins.

You can also view the other ranges in the LEARN SIGNATURES screen by pressing the ↑ and ↓ keys.

Press the ↓ key to see the pin signatures in the 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, on-line, 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 7, Section 7-8 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 250% of the original size.

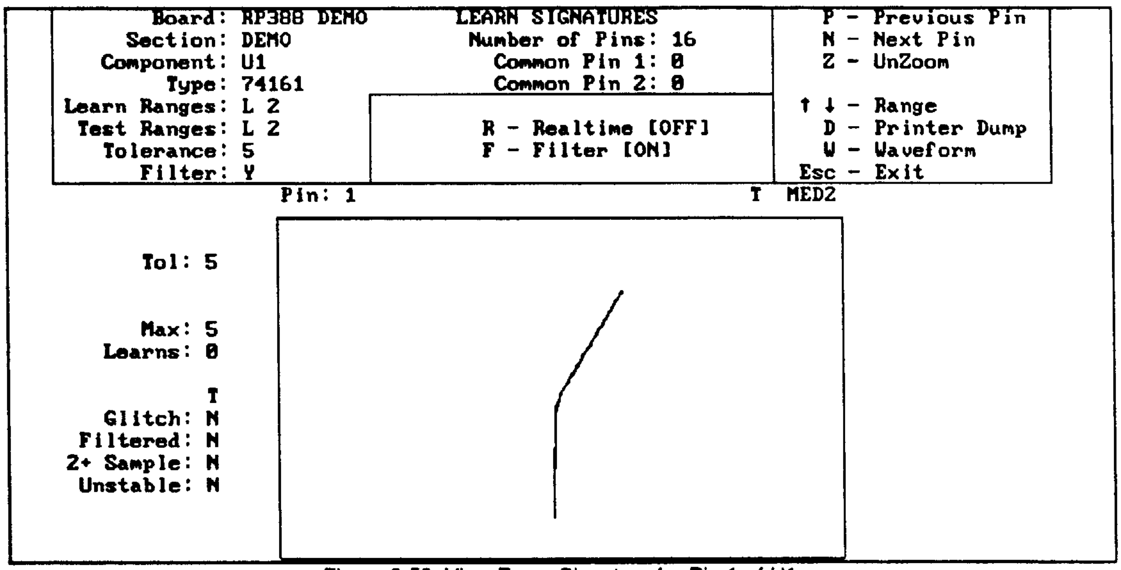


Figure 6-53. View Zoom Signature for Pin 1 of U1.

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 ↓ keys to view another range that was learned.

D (Printer Dump) if you want to print this single signature (but make sure you have your printer configured properly 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 only useful for explaining how an analog signature is derived. It is never used for troubleshooting. Refer to Chapter 1 and the appendices in this manual for further information about analog signatures.

Z to unzoom and return to the multiple signatures screen.

R (Real Time) to enable or disable signature updates on your monitor. When enabled, the signature on your monitor is updated in real time. When disabled, the original learn signature is displayed on the monitor.

F (Filter) to enable or disable the digital filtering routine which removes oscillations (spider webbing) from certain types of signatures.

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 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.

The "T" column above Glitch means TEST status since no LEARNs have been stored yet.

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 (i.e. more than one 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.

Press **Esc** to return to the LEARN results screen and press **S** to store the signatures for U1.

The program will save the signatures and the next component will be highlighted.

LEARNING THE REST OF THE COMPONENTS ON THE DEMO BOARD

You can learn all the component signatures just as you have for U1, i.e. one component at a time. However, you may want to speed up the learning process by pressing **Alt+U** to learn the rest of the section automatically. This activates the AUTOLEARN feature.

AUTOLEARN will start at the highlighted component and begin to learn signatures and save them one component after another until the entire section is done.

Make sure that U2 is highlighted and press **Alt+U** to start AUTOLEARN.

The ALIGN option window appears. Press ↵ to bypass alignment and continue.

NOTE

If any open pins are detected on a particular IC, AUTOLEARN will pause and display all the open pin numbers. This component may have opens that are part of the circuit or the opens may be caused by poor electrical contact between the test point and probe tip so you need to verify the open pins. Press ↵ after checking the opens to continue, or Esc to abort AUTOLEARN.

When all the components have been learned, the PC will beep five times if the AUDIO feature is enabled (in SETUP) and the LEARN Results window will display the number of learns and merges for the section.

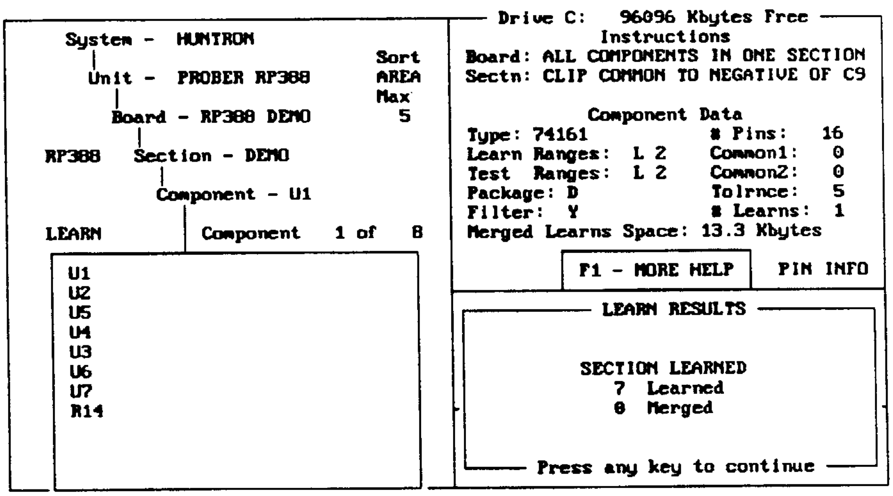


Figure 6-54. LEARN Results Pop-up Window.

You are ready to test the Demo board.

6-11. 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, it is necessary to simulate faults on the Demo board. This is done by setting the CLOCK SWITCH to OFF. It is not necessary to remove the Demo board from the RP388 clamping system. Simply push the CLOCK SWITCH away from you, i.e. towards the back wall of the RP388.

To quickly get to the TEST screen without exiting the LEARN screen, press Alt+T. If you did not remove the Demo board from the RP388 clamping system, it is not necessary to align the board again.

Pressing **Alt+T** will display the following screen:

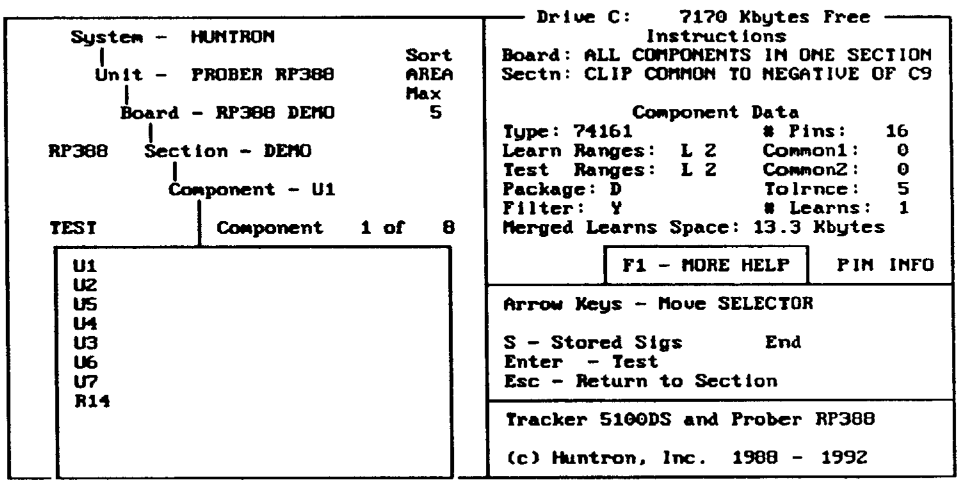


Figure 6-55.TEST Component Selection for Demo Board.

TESTING ONE COMPONENT AT A TIME

Make sure that U1 is highlighted. To test U1, press ↵. The ALIGN option pop-up window will be displayed. Press ↵ to continue since the Demo board has not been moved.

When the test is done, the TEST results window will display "1 DIFFERENT PINS".

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

VIEWING COMPONENT SIGNATURES

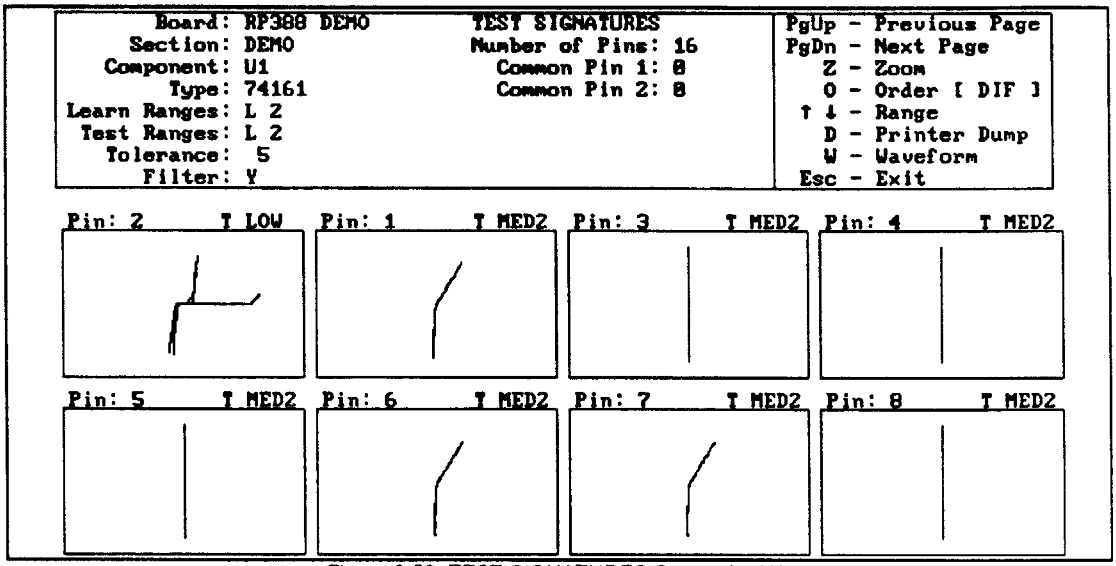


Figure 6-56. TEST SIGNATURES Screen for U1.

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

The indicators above each signature box are color coded to help in quick visual analysis of signatures. The pin number, which appears to the right of "Pin:", is green if the pin was equivalent in all selected test ranges. The pin number is red if any selected test range was different. The range indicator (above the right side of the box) is red if the signature of that range was different and green if the signature was equivalent. So you can tell which pins are different by looking for red pin numbers and then see exactly which ranges were different by looking for red range indicators.

Signature order is set to DIF so signatures of the pins are displayed in order of difference, from greatest to least. Since U1 only has one 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 ↓ to see how the signatures change in the other ranges.

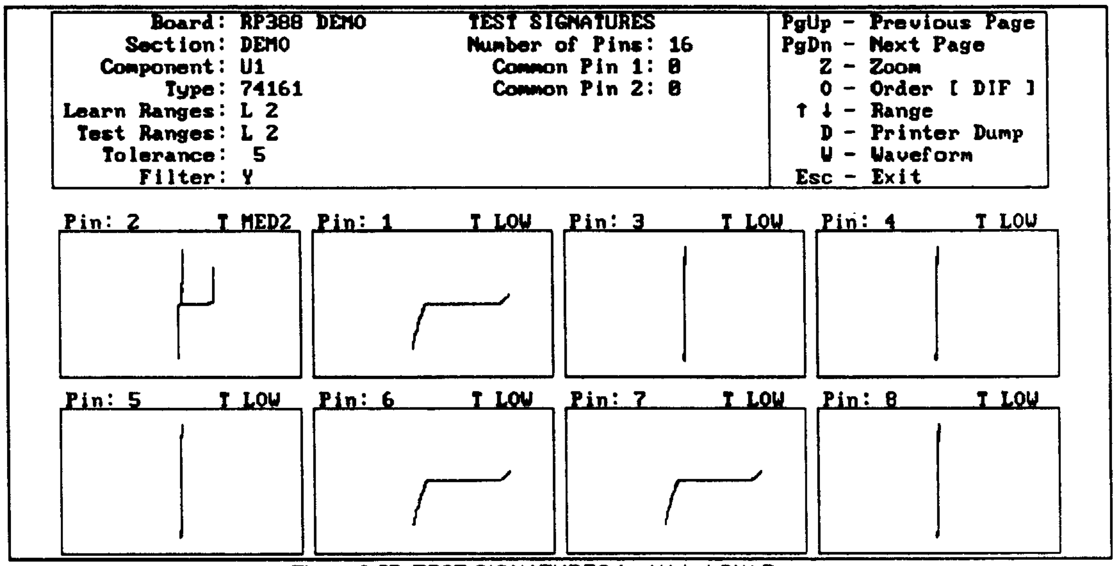


Figure 6-57. TEST SIGNATURES for U1 in LOW Range.

NOTE

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

ANALYZING A SIGNATURE IN THE ZOOM SCREEN

Press Z to magnify the signature of Pin 2 to 250% of the original size.

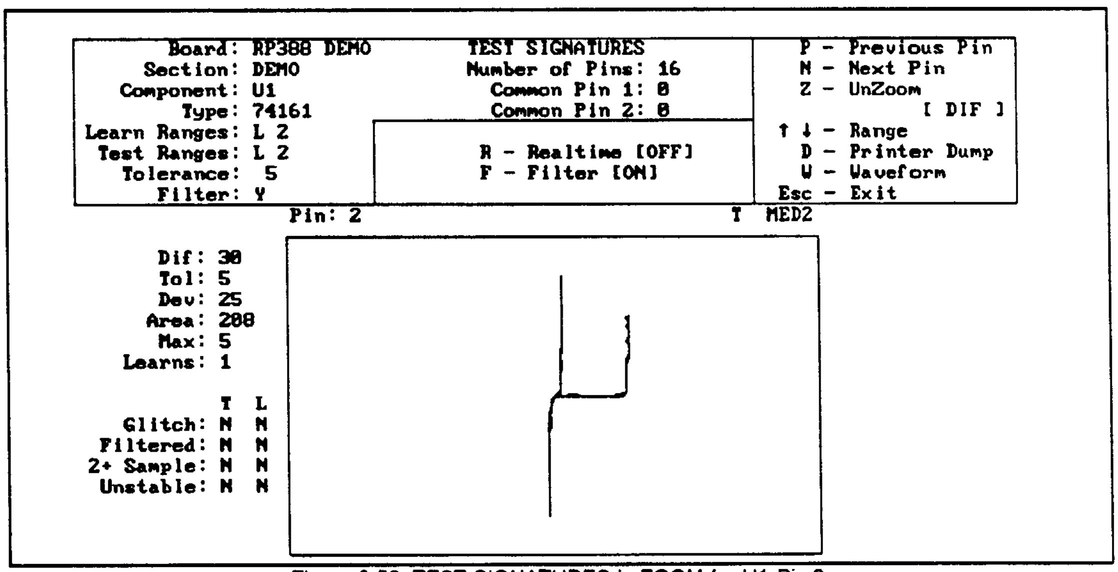


Figure 6-58. TEST SIGNATURES in ZOOM for U1-Pin 2.

NOTE

When performing a TEST on your own Demo Board, the test results may not be the same as in this tutorial. This may be due to variations in components used in the manufacturing of the board. Refer to Section 6-15 in 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:

Dif: 30

This number indicates the largest difference between the LEARN and TEST signature data points. If the pin/range was equivalent this number shows how close it was to being marked DIFFERENT (i.e. when DIF is greater than TOL).

Tol: 5

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

Dev: 25

This number is the amount that DIF exceeds TOL and is the value that determines whether a signature is DIFFERENT or EQUIVALENT. When DIF is equal to or less than TOL, DEV is zero and the signature is EQUIVALENT because no data points have "deviated" outside the band of acceptable values formed by the LEARN signature and the value of TOL. When DIF is greater than TOL, DEV is equal to DIF minus TOL and the signature is DIFFERENT. In this example DIF was 30 and TOL was 5 so DEV is 25. 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: 208

This number shows the total sum of all the deviations of the TEST signature data points 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 = 208 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 (i.e. more than one 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.

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

Press **Esc** to return to the TEST results screen.

Press **Esc** again to return to the TEST component selection screen.

TESTING THE REST OF THE COMPONENTS ON THE DEMO BOARD

You can test each of the remaining components, one component at a time, just as you did for U1. However, you may want to speed up the testing process by pressing **Alt+U** to test the rest of the section automatically. This activates the AUTOTEST feature.

AUTOTEST will start at the highlighted component and begin to test one component after another until the entire section is done. The test results are stored in memory and the next component will be tested without requiring any input from the keyboard.

Make sure that U2 is highlighted and press **Alt+U** to start AUTOTEST.

The ALIGN option window appears. Press ↵ to bypass alignment and continue.

While testing, the TEST window will display "PROBING". The program will not display individual component test results.

NOTE
While the RP388 is probing, you can stop and abort by pressing Esc. The program will return to the TEST component screen.

For this tutorial, do not interrupt this test.

After all the components are tested, the TEST results window will display "SECTION DIFFERENT", "1 Different", and "4 Tested". This means that one of the four omponents tested in that section has different signatures.

You can view the signatures of the "Different" component in the section troublesheet. Press Esc twice to return to the section level.

6-12. VIEWING THE SECTION TROUBLESHEET

At the Section selection screen, press **T** to look at the Troublesheet.

This feature asks for the serial number of the board. Type in a serial number (20 characters maximum) or press ↵ if no serial number is desired.

Now you can view the Troubleshoot on the PC monitor, print it or store it to the hard disk. To view the Troublesheet, press **V**.

```
System: HUNTRON              SECTION TROUBLESHEET
  Unit: PROBER RP388                              Serial #: 1234567
 Board: RP388 DEMO                                  Status: DIFFERENT

V - View Signatures           R - Remove Component     ←↑↓→ PgUp PgDn Home End
D - Detailed Information      S - Summary              F1 - Help    Esc - Exit

Section        Comp    #D  #P   Area   | Section        Comp    #D  #P   Area
DEMO           U1       1  16   356    |
DEMO           U2       1  16   356    |
```

Figure 6-59. Section Troublesheet.

The Troublesheet is sorted so that the component with the most different signature appears first in the listing.

Press **V** to view the signatures of the first highlighted component. At the ALIGN option window, press ↵ to bypass the alignment procedure. The following screen is displayed:

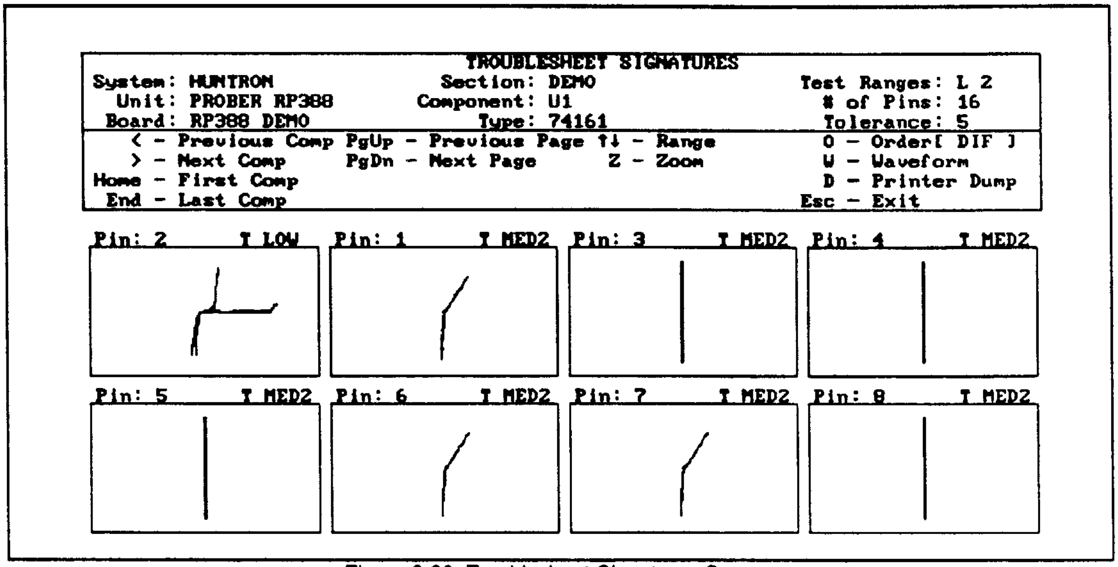


Figure 6-60. Troublesheet Signatures Screen.

Press **Z** to look at the first different signature magnified 250%.

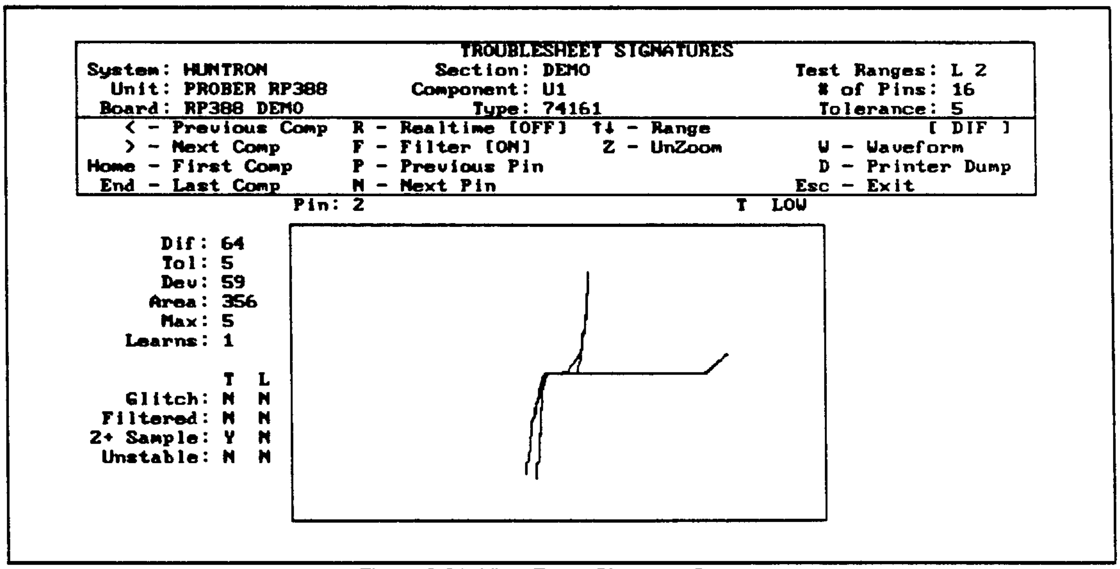


Figure 6-61. View Zoom Signature Screen.

Press **Z** to unzoom. To look at the signatures of the next most different component, press the **>** key.

When you are finished examining signatures, press **Esc** to return to the SECTION TROUBLESHEET display.

REMOVING A COMPONENT FROM THE TROUBLESHEET

In some cases, you may see components with slightly different signatures. These minor differences most likely do not indicate faulty components. These components can be removed from the troublesheet such that only the significant components are printed.

For example, remove the last component of the listing by pressing the ↓ key until it is highlighted.

Press **R** to remove it from the Troublesheet.

A warning pop-up window is displayed. Press ↵ and notice that the last component is removed from the Troublesheet listing.

```
System: HUNTRON          SECTION TROUBLESHEET
  Unit: PROBER RP388                          Serial #: 1234567
 Board: RP388 DEMO                              Status: DIFFERENT

V - View Signatures        R - Remove Component     ←↑↓→ PgUp PgDn Home End
D - Detailed Information   S - Summary              F1 - Help     Esc - Exit

Section          Comp    #D  #P  Area  | Section          Comp    #D  #P  Area
DEMO             U1       1  16   356  |
```

Figure 6-62. Troublesheet Component Removal.

Press **Esc** to exit and return to the SECTION TROUBLESHEET display.

6-13. 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 **P** to activate the Print Troublesheet mode.

You can choose between two types of reports. The Simple Troubleshet 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 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.

```
--------------------------------- TROUBLESHEET --------------------------------
                                     SECTION
   Date: 12-2-1991        Serial No.: 1234567                        Page: 1
 System: HUNTRON
   Unit: PROBER RP388
  Board: RP388 DEMO        ALL COMPONENTS IN ONE SECTION

                 Component      * SIMPLE PRINTOUT *                  Sort: AREA
Section          Name    Type          #P C1 C2 Ranges F Pins
--------------------------------------------------------------------------------
DEMO             U1      74161         16  0  0 L 2    Y 2

DEMO             U2      74162         16  0  0 L 2    Y 2
```

Figure 6-63. Simple Troublesheet for Demo Section.

```
--------------------------------- TROUBLESHEET --------------------------------
                                     SECTION
   Date: 12-2-1991        Serial No.: 1234567                        Page: 1
 System: HUNTRON
   Unit: PROBER RP388
  Board: RP388 DEMO        ALL COMPONENTS IN ONE SECTION

                 Component      * DETAIL PRINTOUT *                  Sort: AREA
Section          Name    Type          #P Ranges Pin  F C1 C2 Range Tol  Dev  Area
--------------------------------------------------------------------------------

DEMO             U1      74161         16 L 2    2    Y  0  0 LOW    5   59   354

DEMO             U2      74162         16 L 2    2    Y  0  0 LOW    5   59   354
```

Figure 6-64. Detailed Troublesheet for Demo Section.

6-14. STORING THE TROUBLESHEET

This feature allows you to store the Troublesheet into a file which you can print later or display using standard DOS commands. A default file name gets created if you do not give it a different name. Every time you store the Troublesheet, even on different type of boards, this file gets appended. So after a day of testing, you could print this file which can be passed on to a technician for analysis and repair. This file could also be stored in ASCII format for use by your own database system or word processor. The following screen is displayed:

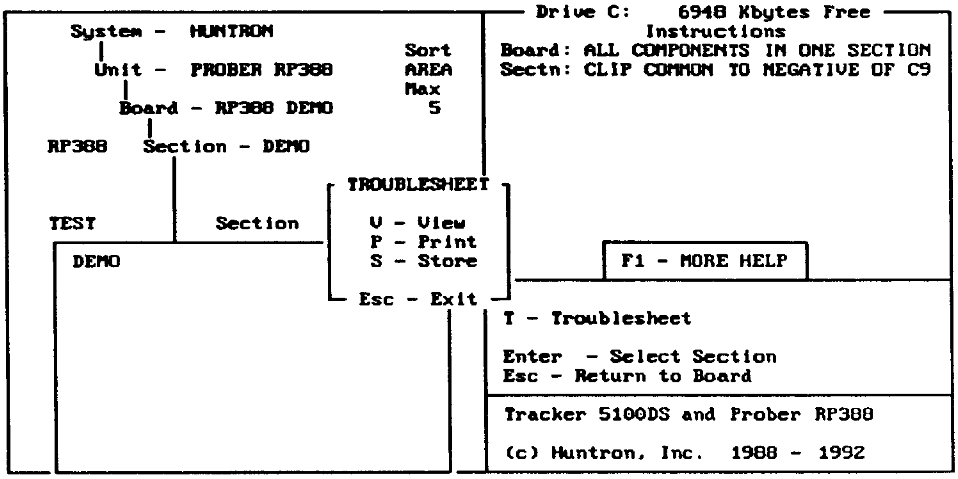


Figure 6-65. Troublesheet Pop-up Window.

Press **S** to store.

Press **S** to select a simple Troublesheet. The following screen prompts you to type in a file name or accept the default.

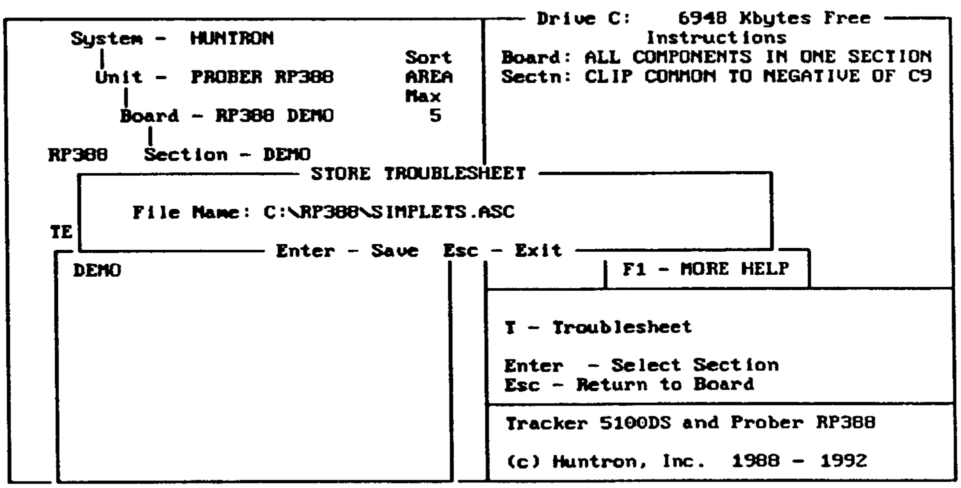


Figure 6-66. Store Troublesheet Screen.

Press ↵ to accept the default file name. The file is now saved.

Press **Esc** twice to return to the component selection screen.

6-15. 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 5100DS/RP388 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/RP388 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 fine. 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.

To "MERGE" signatures, return to the LEARN mode by pressing Alt+L.

Press ↵ to get to the LEARN component selection screen.

```
                                          Drive C:    6940 Kbytes Free
  System -  HUNTRON                                Instructions
    |                              Sort    Board: ALL COMPONENTS IN ONE SECTION
    Unit -  PROBER RP388           AREA    Sectn: CLIP COMMON TO NEGATIVE OF C9
      |                            Max
      Board - RP388 DEMO            5              Component Data
        |                                  Type: 74161            # Pins:    16
RP388   Section - DEMO                     Learn Ranges:  L 2     Common1:   0
          |                                Test  Ranges:  L 2     Common2:   0
          Component - U1                   Package: D             Tolrnce:   5
            |                              Filter:  Y             # Learns:  1
LEARN       | Component     1 of   8       Merged Learns Space: 13.3 Kbytes
  U1                                               F1 - MORE HELP    PIN INFO
  U2
  U5                                       Arrow Keys - Move SELECTOR
  U4
  U3                                       S - Stored Sigs        End
  U6                                       Enter   - Learn
  U7                                       Esc - Return to Section
  R14
                                           Tracker 5100DS and Prober RP388

                                           (c) Huntron, Inc.  1988 - 1992
```

Figure 6-67. LEARN Component Selection Screen.

CREATE MERGED LEARN SIGNATURES FOR U1

The stored signatures for U1 were created with the CLOCK SWITCH set to ON. To create different learn signatures set this switch to the CLOCK OFF position. If the Demo board is still mounted to the RP388 clamping system, the CLOCK OFF position is the position away from you, i.e. towards the RP388 back wall.

Make sure that U1 is the selected component to learn. Notice that the "# of Learns: 1" since this was done earlier.

To learn U1, press ↵. Press ↵ to bypass the alignment procedure since the Demo board has not been disturbed.

The LEARN window will display "PROBING" and the RP388 will begin to learn signatures. When done, the LEARN results window will display "1 DIFFERENT PINS". The program will always displays the number of different pins if the second learn is different from the first learn.

Press V to view these signatures.

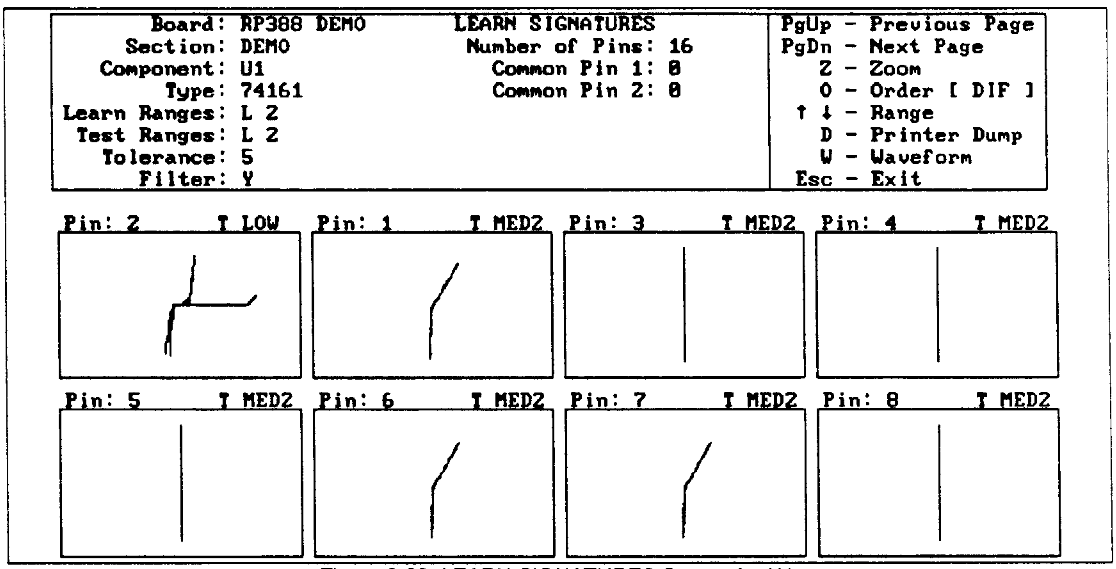


Figure 6-68. LEARN SIGNATURES Screen for U1.

Notice that pin 2 has two distinct signatures. Press Esc to return to the LEARN results screen.

To MERGE signatures, press **M**. The troublesheet delete warning pop-up window appears on the screen.

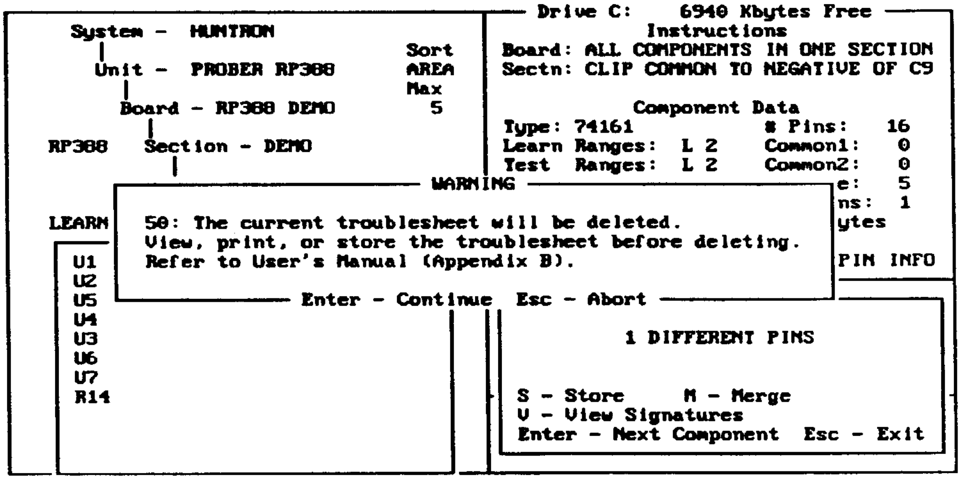


Figure 6-69. Troublesheet Delete Warning Pop-Up Window.

The troublesheet must be deleted before a signature merge so press ↵ to continue. Next, the signature merge warning pop-up window appears on the screen. Press ↵ to perform the signature merge. After the signatures are merged, the LEARN component selection screen will appear with U2 highlighted.

Press the ↑ key to select U1 again and notice that the # of Learns = 2.

Press **S** to look at the stored signatures and observe that the stored signature of pin 2 is a composite.

To verify the merged signature feature, you need to retest U1. The TEST signature should be equivalent to the stored signature in either switch position.

Press **Esc** to return to the LEARN component selection screen, then press Alt+T to go to the TEST signature screen.

Press ↵ to test U1. The ALIGN options window is displayed, so press ↵ to bypass the alignment procedure and start testing.

The Test results window should display "EQUIVALENT" for either setting of the CLOCK switch.

IMPORTANT NOTE

Signatures for known good components can be merged multiple times to form a better model of a composite equivalence band to take into account the normal variations due to manufacturing processes. When merging signatures, if the new signature falls within the equivalence band defined by the stored merged signature, 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.

AutoLearn (Alt+U) will merge signatures of components with # of Learns > 1 and store automatically if each signature is within the Merge tolerance. If open signatures or differences are found, the AutoLearn process will pause to allow verification.

NOTE

Before merging signatures, be sure to make a copy of your original data using the BACKUP feature of TRANSFER mode since the merged data will permanently overwrite all existing data.

6-16. CONTINUOUS TESTING

When AUTOTEST (Alt+U) is used, the software allows a CONTINUOUS section test. This feature may be useful when testing for intermittent faults.

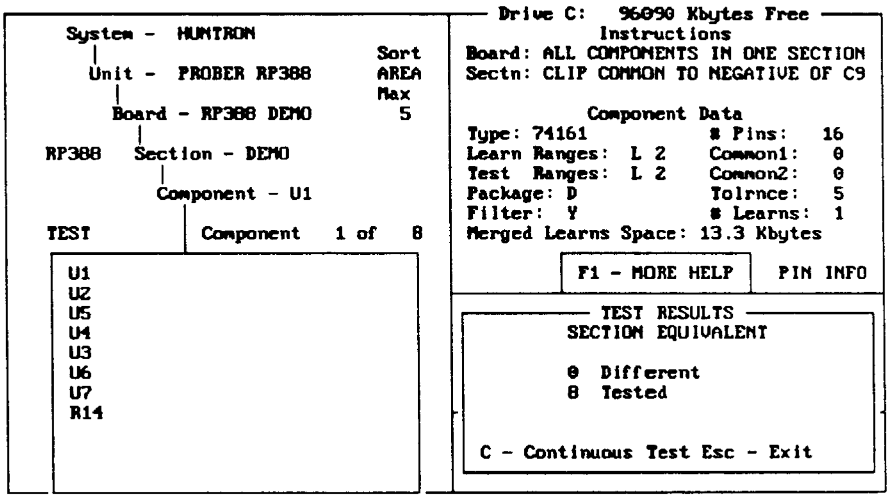


Figure 6-70. "C" - Continuous Test Pop-Up Window.

Select the section to be tested and press **Alt+U** to begin. Press ↵ to bypass the alignment procedure and start testing. After the test has been completed, the Test results window will display "C - Continuous" option. Press **C** to start continuous testing of the entire section. The RP388 will only stop when a difference is found. A loop counter showing the current test pass is displayed while CONTINUOUS test is active.

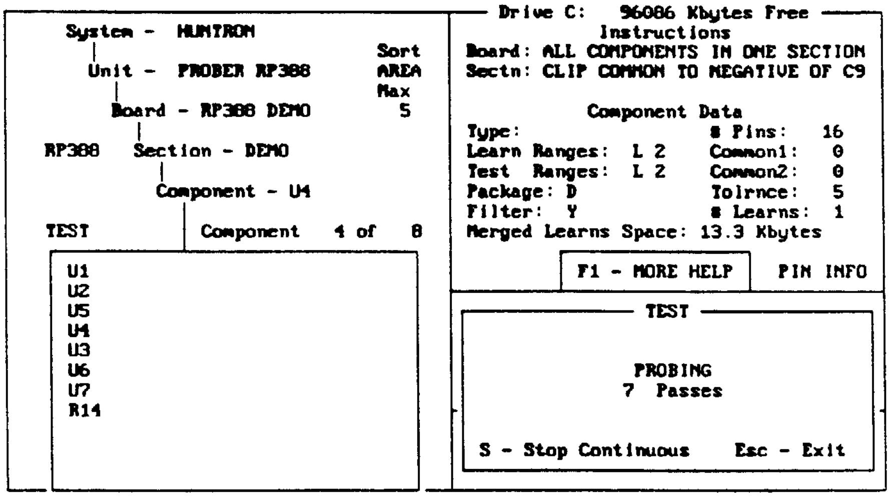


Figure 6-71. Continuous Section Test Loop Counter.

You can also use the CONTINUOUS test feature on a single component. Select the component to test and press ↵ to begin a single component test. After the test has been completed, the Test results window will display "C - Continuous" option. Press C to start CONTINUOUS testing. The RP388 will stop when a difference is found. A loop counter showing the current test pass is displayed while CONTINUOUS test is active.

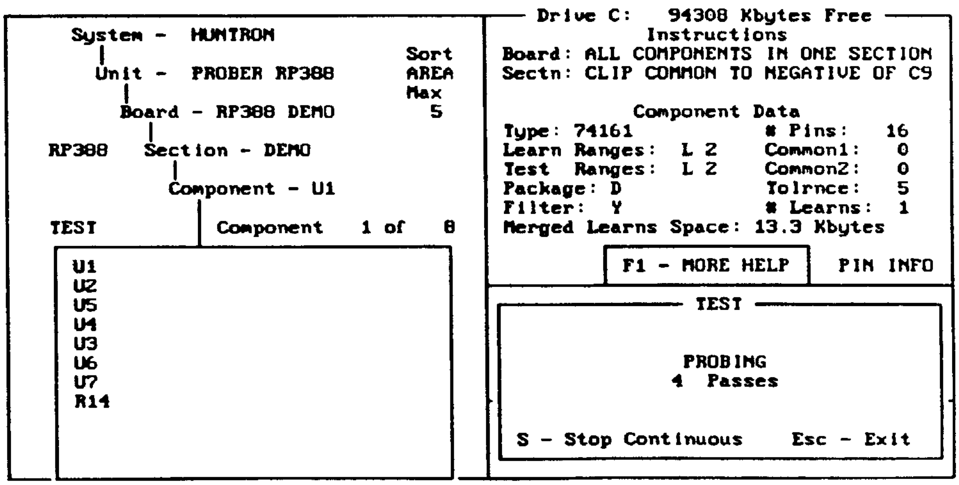


Figure 6-72. Continuous Component Test Loop Counter.

Press **S** to temporarily stop continuous testing. The TEST RESULTS window will display the current test status and the loop counter will be reset to zero. Press **C** to restart testing.

Press **Esc** to abort testing and return to the TEST component selection screen.

6-17. SUMMARY

This tutorial has covered most of the pertinent features of the 5100DS/RP388. The following is a brief summary of the complete tutorial. For other detailed information, refer to Chapter 7 in this manual.

1. Select the two alignment points on the Demo board.
2. Select the board COMMON, i.e. negative terminal of C9.
3. Select the components that need to be tested on the solder side of the board which will be inserted into the TOP slot. Check that the CLOCK switch is set to ON and clamp the board into the RP388 XY table.
4. Use EDIT to enter the BOARD name.
5. In the EDIT Section screen, enter the SECTION name and make sure that the CONNECTION HARDWARE is set to RP388. Also make sure that the Solder Side and TOP Slot are selected.
6. In the EDIT Component screen, type in the component information for all the components of the SECTION. Make sure that the COMMON pins are set to 0.
7. After all the component information is entered in the database, do XY TEACH from the EDIT Component screen (i.e. press ↵ to get into XY TEACH starting at U1).
8. Move the camera head to the first alignment point using the keyboard cursor keys and/or the trackball. Click the LEFT trackball button to set it.
9. Move the camera head to the second alignment point using the keyboard cursor keys and/or the Trackball. Click the LEFT trackball button to set it.
10. Save the alignment point XY locations.
11. In the DIP TEACH screen, move to pin 1 of U1. Set the XY location. Press the arrow key in the direction of the last pin of U1. Set the XY location of the last pin. Press the Arrow key in the direction of the Diagonal pin. Set the XY location of the diagonal pin. Press **A** to set all the pin locations. Press Esc to exit and save the data.
12. In the Z TEACH screen, set the DOWN and UP positions of the SECTION.
13. Repeat step 11 for all the other DIP components.
14. In the PROBE TEACH screen, do one pin at a time for U7 and R14.
15. When all the component's XY locations are stored, press **Alt+L** to learn signatures without leaving the component level.
16. Press **Alt+U** to start learning at the first component and automatically continue with the next until all the component signatures are stored.
17. Set the CLOCK switch to OFF and press **Alt+T** to enter the TEST Component screen.
18. Press **Alt+U** to start the test at the first component and automatically continue with the next until all the components of the Section are tested.
19. Press **T** and then **V** to view the Troubleshheet.
20. Press **V** to view the signatures.
21. Press **S** to store the Troubleshheet.

CHAPTER 7
REFERENCE

7-1. INTRODUCTION

This chapter serves as the 5100DS/RP388 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 or Prober RP388, refer to other chapters or the appendices in this manual or contact Huntron.

7-2. COMPONENT PIN INFORMATION

This feature allows separate settings of some of the component data fields enabling 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. Eight pins are then shown in one window and the arrow keys plus the Tab key can be used to select which information to change. Use the **PageUp** and **PageDown** keys to select the page to edit when the component has more than eight pins. The lowest active LEARN range, 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 "???" and no component data field is set to "*", 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 default to the corresponding pin number of a component if no symbolic name is used. Pin names must be unique so that you can distinguish which pin is being referred to.

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, 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. It is also good for testing the common pin that all the rest of the component's pins are referenced to. Without pin info a common pin is always a short.

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.

PIN INFORMATION EXAMPLE

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 the following into the component entry window until it matches what is shown in Figure 7-1.

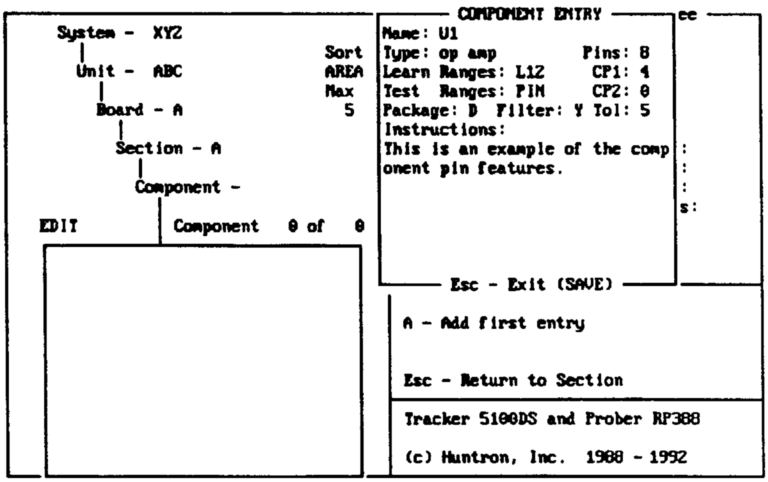


Figure 7-1. Component Entry Pop-up Window.

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 the LEARN ranges and that range will be used in TEST. If you select PIN LEARN ranges, then the pin entry "Range:" will be the same single 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 eight pins at a time. Note that the defaults are shown on the line under the column headings and that all eight pins are set to the default component data (see Figure 7-2).

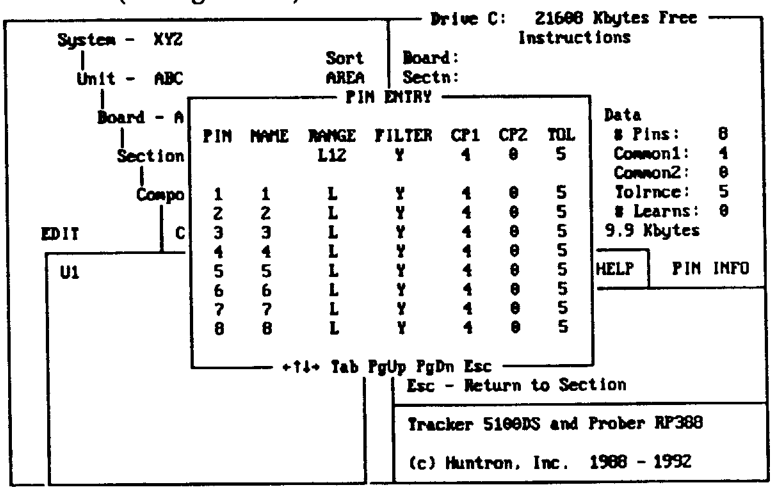


Figure 7-2. Pin Entry Pop-up Window for U1.

9. Note that the cursor is at the NAME field for Pin 1. Type in "**OS1**" (offset pin #1) and then press **Tab** (or ↵). The cursor will move to the RANGE column. Type in "1" to select the Medium 1 range for this pin and press **Tab** again. For the last four columns, type in "Y", **Tab**, "4", **Tab**, "0", **Tab**, and "5" (note that all you really need to do is press **Tab** three times to accept the default values). This completes pin information entry for Pin 1. Press **Tab** to move the cursor back to the NAME column and then press ↓ to move the cursor to the NAME field of Pin #2.

10. In the same manner as step #9, type in the following data for pins 2 through 8 (the comma will denote the **Tab** key):

    Pin 2: IN+, 2, Y, 4, 0, 5,↓

    Pin 3: IN-, 2, Y, 4, 0, 5,↓

    Pin 4: V-, L, Y, 7, 0, 10,↓

    Pin 5: OS2, 1, Y, 4, 0, 5,↓

    Pin 6: OUT, 2, Y, 4, 0, 5,↓

    Pin 7: V+, L, Y, 4, 0, 10,↓

    Pin 8: NC, 2, Y, 4, 0, 5

Figure 7-3 shows the pin entry window after entering the data above.

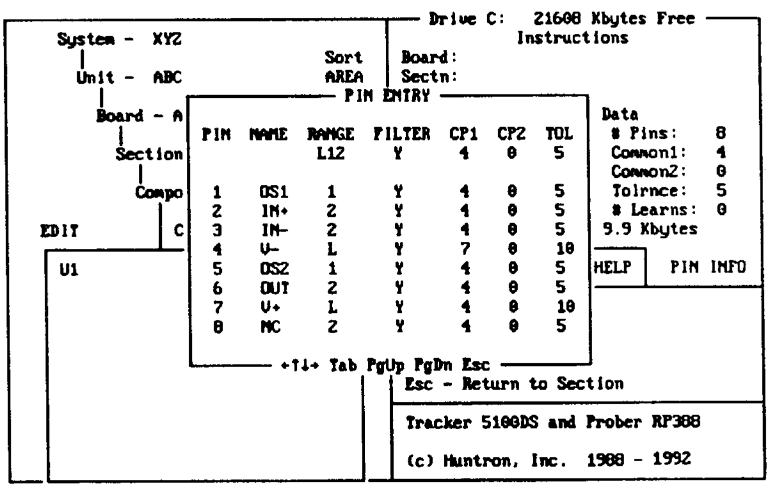


Figure 7-3. Pin Entry Pop-up Window after Data Entry.

If this had been a component with more than eight pins, you would press **PageDown** at this point to go to the next set of eight pins.

11. Press **Esc**, then **Y** to save and exit.

At this point if you were to learn U1 the following would happen: the 5100DS would learn all the pins in L12 (since the pin entry for range only controls the TEST range in this example) and all pins would have Common Pin #1 set to 4 and Tolerance set to 5. In other words, the component pin information that you just entered would be ignored. This is because there is one more step to activate the use of PIN INFO. You must go back into the EDIT COMPONENT ENTRY window and change Common Pin #1 and Tolerance to an asterisk (*).

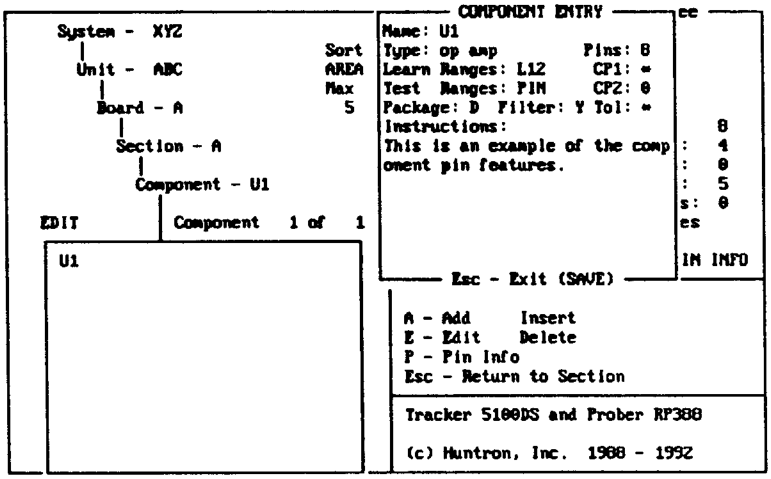


Figure 7-4. Pop-up Windows with Asterisks.

The asterisk tells the software to look in the PIN INFO file for the setting per pin instead of using one setting for all the pins. If at a later time you want to go back to a global setting, you can edit the component and change the "*" back to a letter or a number. This does not change the PIN INFO file at all so you can essentially turn each one ON and OFF. Keep in mind that only the test ranges and the tolerance can be changed in PIN INFO (just as with global settings) without the need to relearn the component. In the TEST range field it is "PIN" that activates the PIN INFO file so that editing "PIN" to "L2" for example will cause the test range per pin information to be ignored.

Another method of component pin information entry is to put the asterisks in the component data fields when you are first adding the component to the section. When you do this, the default values that all pins are set to are: Range - 2 (Medium 2), Filter - Y, CP1/CP2 - 0 and Tol - 5. In the previous example these settings would be a good place to start entering the unique information for each pin except for Common Pin #1. That column has all pins set to 0 but we wanted all pins set to 4 except for one pin. You could type in each 4 but there is an easier way - just change the 0 under CP1 to a 4 and then press the Shift key and the ↓ key at the same time. This combination sets the rest of the column (up to the number of pins) to the current value. So after pressing **Shift + ↓**, the whole column under CP1 will be set to 4. Now the only value that needs to be changed is for Pin 4 which should be set to 7.

If you were on Pin 5 in any column, then **Shift + ↓** would not affect pins 1 through 4 but would change pins 6 through 8 to the current setting of Pin 5. In a similar way **Shift + ↑** would change pins 1 through 4 to the setting of Pin 5 and leave pins 6 through 8 unchanged. So the **Shift + ↓** and **Shift + ↑** key combinations allow you to change a whole column from the current position to the last pin or to the first pin, respectively.

A helpful feature during pin information entry is **Alt+V** which activates the VIEW mode without returning to the main menu. This allows you to try various settings for ranges, common pins, filter, etc. and see the actual signatures from your board. This is quite helpful when you do not know ahead of time which settings to use.

7-3. 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):

Table 7-1. Floppy Disk Storage for the 5100DS.

IC SIZE	RANGES	PIN INFO	NUMBER OF IC's PER DISK			
			FLOPPY DISK TYPE			
			5.25" 1.2MB	5.25" 360KB	3.5" 1.44MB	3.5" 720KB
64 pins	4	YES	11	3	13	6
16 pins	2	NO	92	27	110	55

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. Press **D** which tells the program to switch to a different drive/path.
4. A pop-up window will appear as follows:

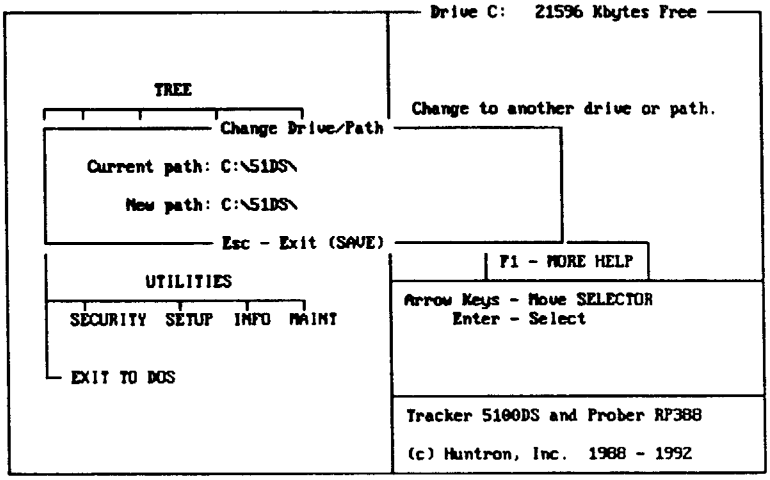


Figure 7-5. DRIVE Pop-up Window.

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.

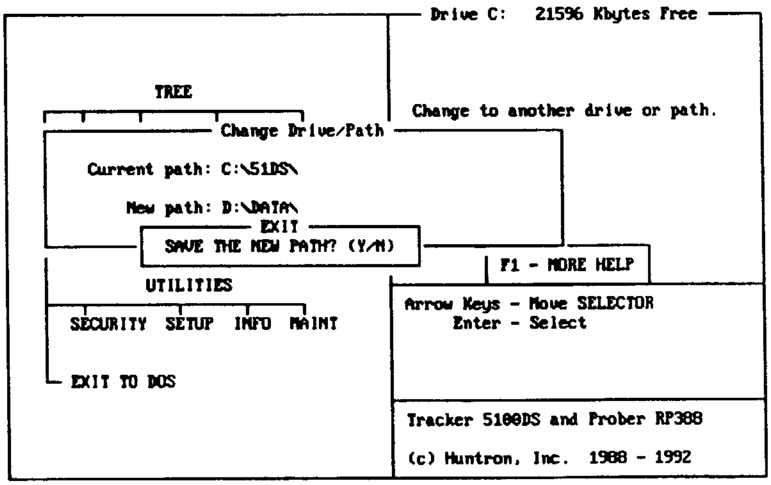


Figure 7-6. Save the New Path Prompt for DRIVE.

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 Chapters 5 and 6 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.

7-4. 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 5100DS/RP388 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:

```
---------------- 5100DS/RP388 Computer System Information ----------------

                 Current System                        System Requirements

         Operating System - DOS 5.00                   DOS 3.30 or later
    Coprocessor Present - YES
            Serial Ports - 2                           0 (1 for RP388)
          Parallel Ports - 1                           1
         Diskette Drives - 2                           1
       Fixed Disk Drives - 1                           1
     Conventional Memory - 640 Kbytes                  640 Kbytes
               Available - 244 Kbytes
   Expanded (LIM) Memory - 1472 Kbytes
           LIM Available - 1088 Kbytes
           XMS Available - 1088 Kbytes
         Extended Memory - 0 Kbytes
           Video Display - VGA                         EGA (VGA for RP388)
               Video RAM - 256 Kbytes                  256 Kbytes or more
              Video Mode - 3                           3
   GPIB Driver Installed - YES                         YES

------------------------------ Esc - Exit ---------------------------------
                                   | (c) Huntron, Inc.  1988 - 1992
```

Figure 7-7. Typical INFO Screen.

The INFO screen displays the current state of your computer configuration and the computer system requirements that are needed in order to run the 5100DS (and the RP388, if present). If any of the items displayed do not meet the system requirements, they will be highlighted.

When you need assistance from Huntron Technical Support on the 5100DS or RP388, run INFO and print this screen on your printer by pressing the **Print Screen** (or **Prt Sc**) 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 or Prober RP388.

7-5. 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.

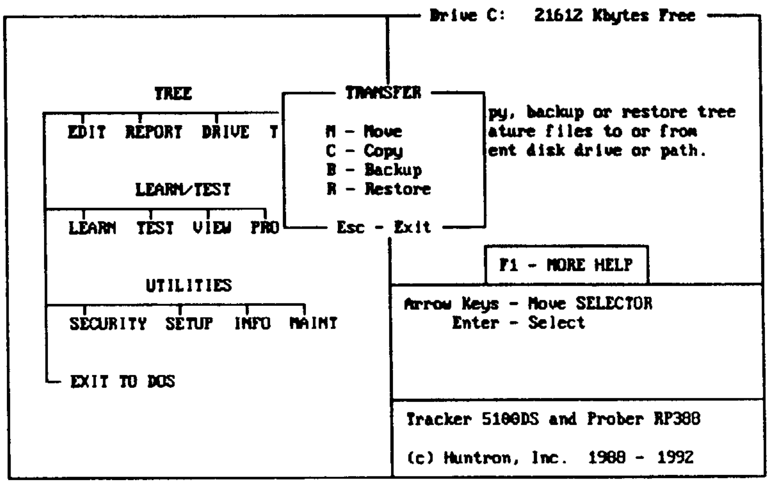


Figure 7-8. Transfer Pop-up Screen.

NOTE

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

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.

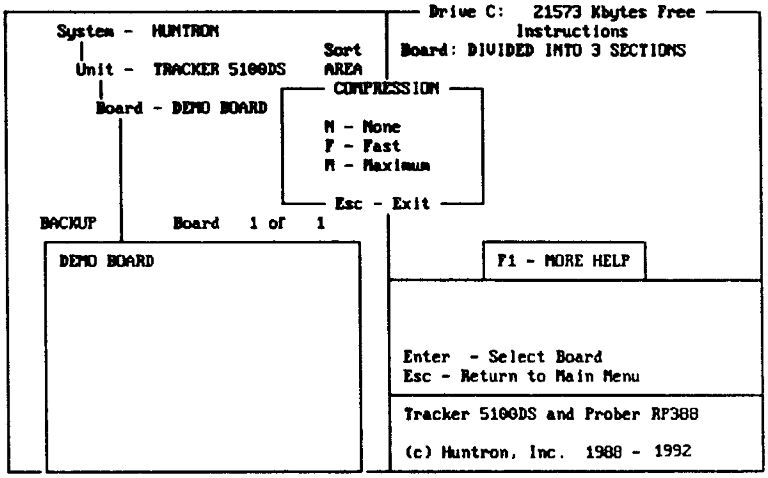


Figure 7-9. COMPRESSION Screen.

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 a 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:

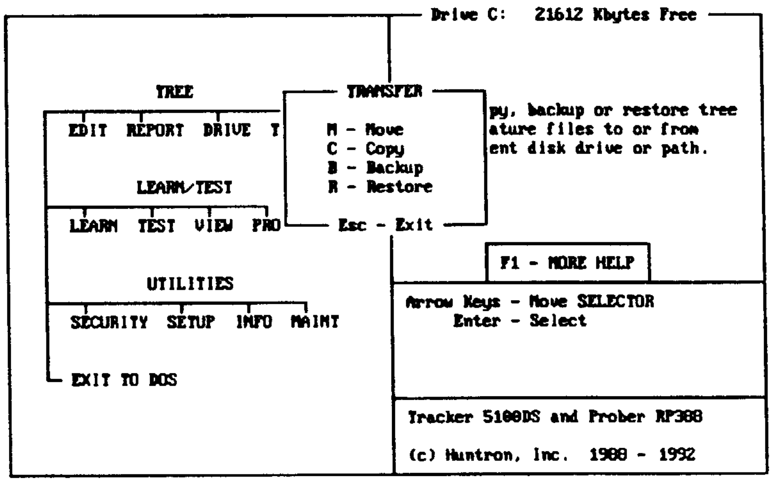


Figure 7-10. TRANSFER Screen.

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. Next, BACKUP displays the "insert disk" pop-up window. Insert a blank disk in drive B and press ↵.

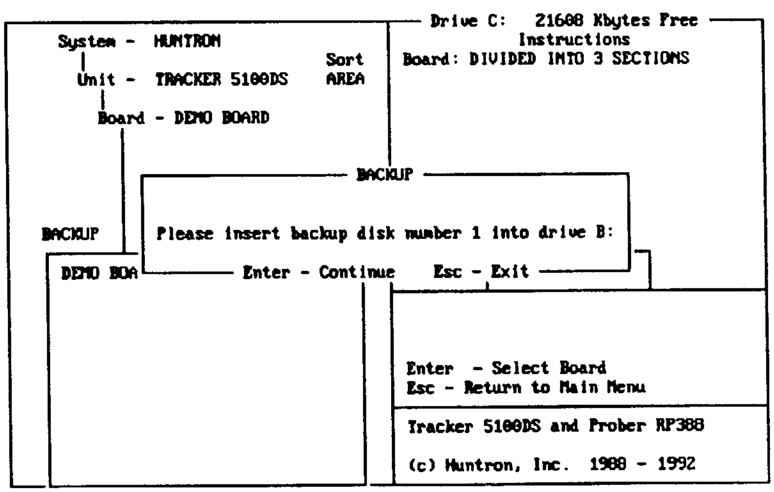


Figure 7-11. BACKUP Insert Disk Pop-up Window.

7. The transitional message "Checking the path. Please wait..." is displayed.

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

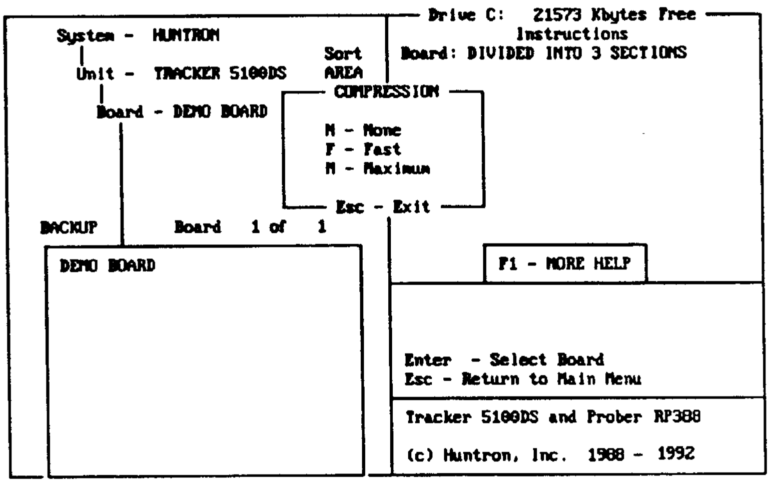


Figure 7-12. BACKUP Compression Options.

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

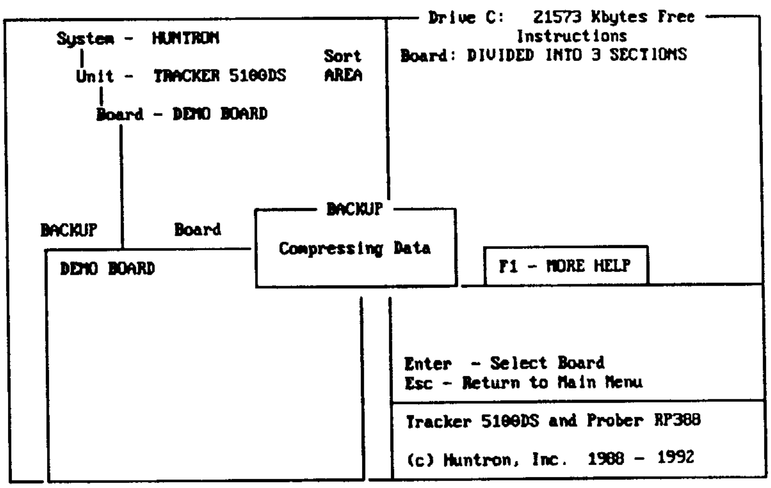


Figure 7-13. BACKUP Compressing Data Pop-up Window.

10. BACKUP displays the transitional message "Please wait..." while the backup operation is being done.

11. When BACKUP is done, the "Backup has been completed" pop-up window will appear. Press Esc to return to the BACKUP board selection screen.

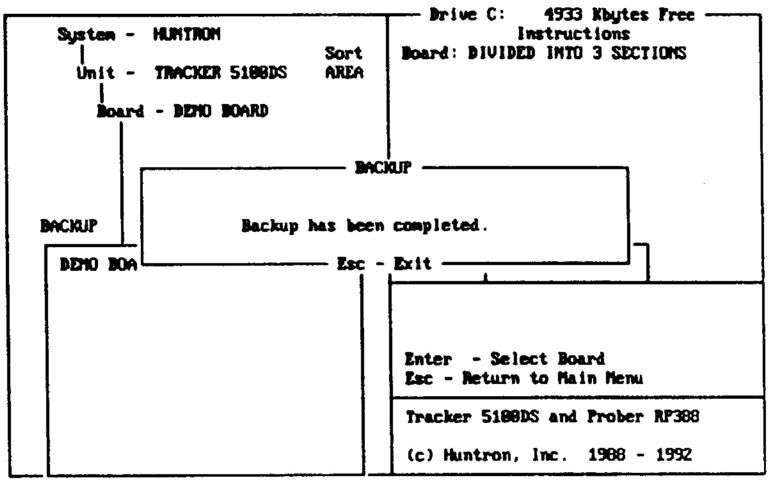


Figure 7-14. BACKUP Completed Window.

12. 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.

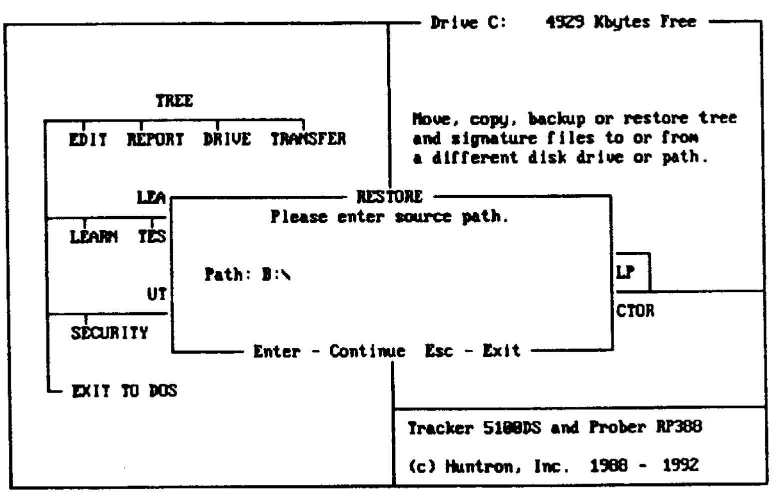


Figure 7-15. RESTORE Source Path Pop-up Window.

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 ↵.

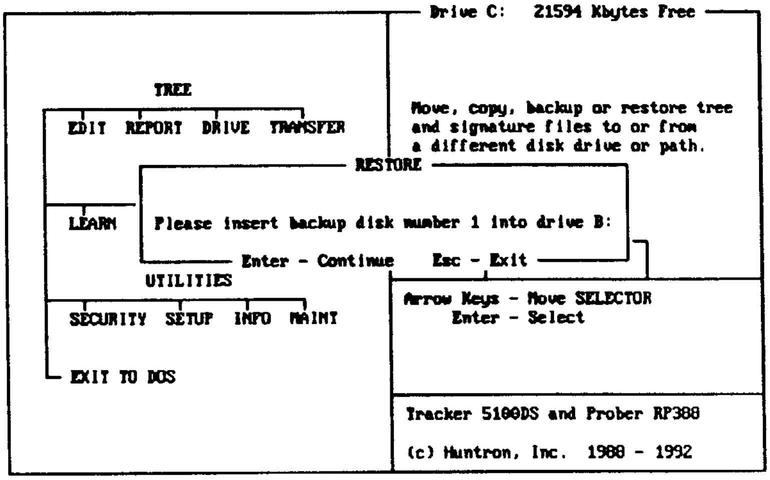


Figure 7-16. RESTORE Insert Disk Pop-up Window.

4. RESTORE displays the transitional message "Checking the path. Please wait..."

5. Next, the transitional message "Please wait" is displayed while the board is being restored. RESTORE will read the floppy disk and decompress the data if it was compressed in BACKUP. In this event, the transitional message "Decompressing Data" appears.

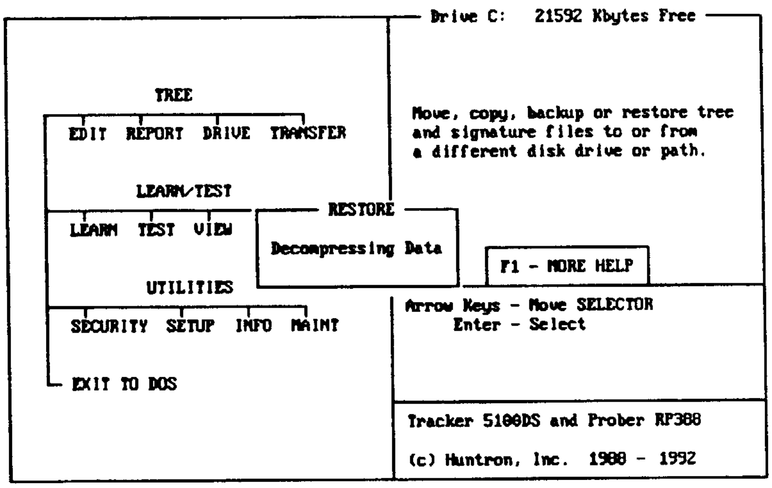


Figure 7-17. RESTORE Decompressing Data Pop-up Window.

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 board 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 and you want the same name.

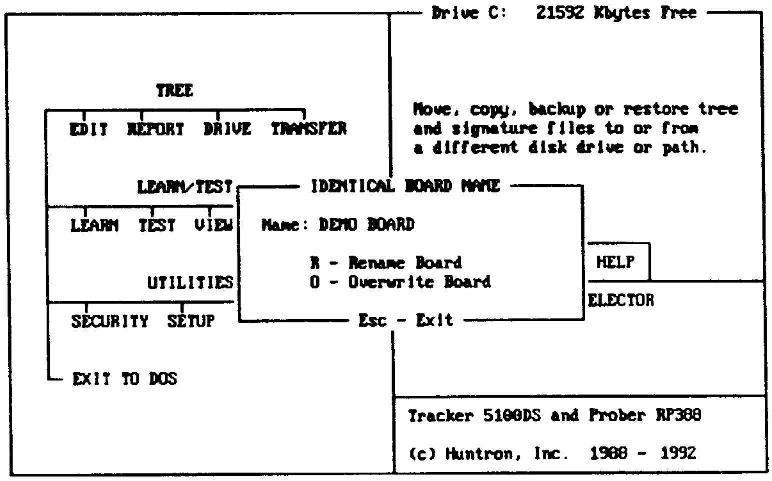


Figure 7-18. RESTORE Identical Board Name Warning.

6. When the RESTORE operation has been completed, the program will display the "Restore has been completed" pop-up window. Press Esc to return to the Main menu.

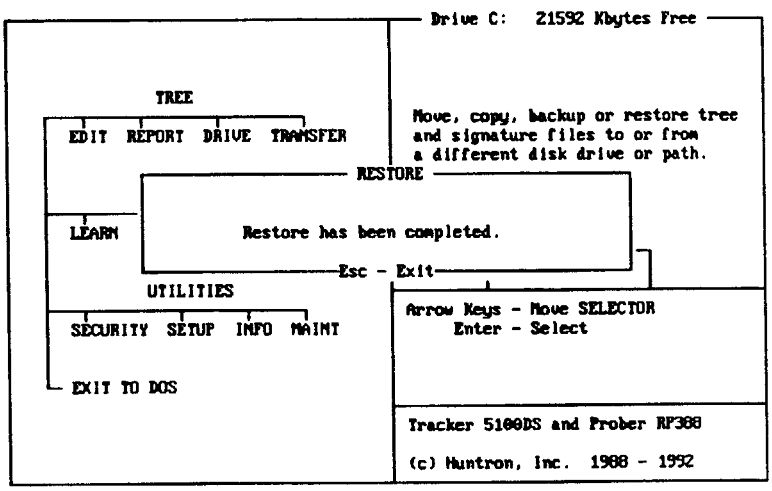


Figure 7-19. RESTORE Completed Window.

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

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

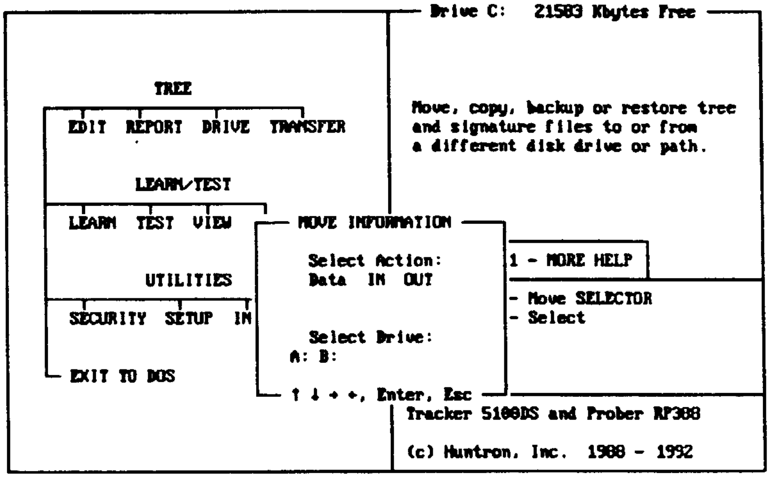


Figure 7-21. MOVE Screen.

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 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.

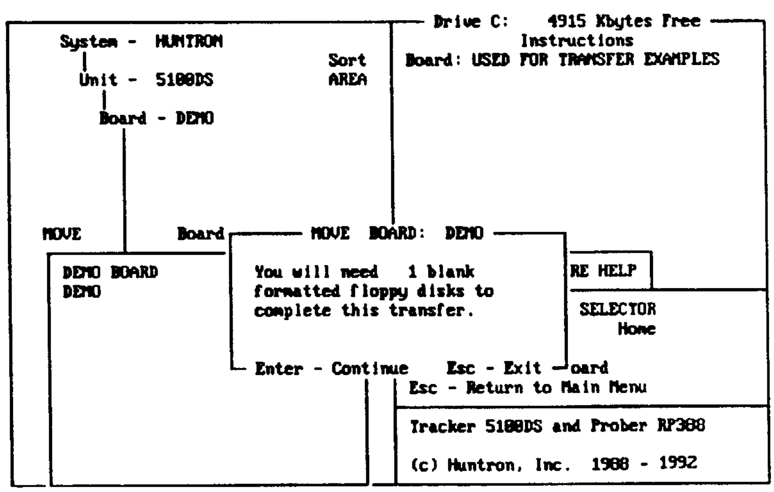


Figure 7-20. Number of Floppy Disks Needed for MOVE.

IMPORTANT NOTE

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

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

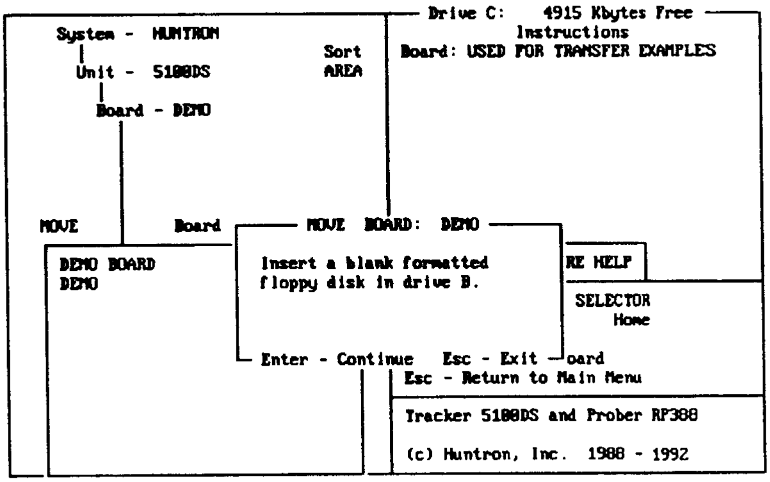


Figure 7-22. Disk #1 Prompt for MOVE.

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:

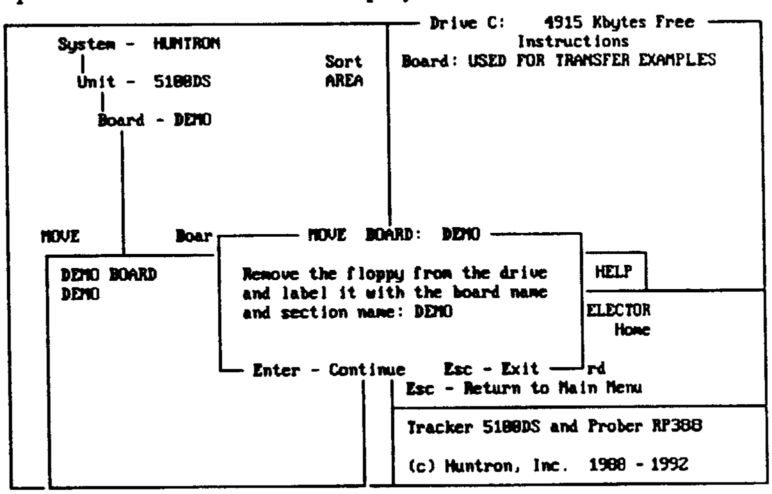


Figure 7-23. MOVE Completed Screen.

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:

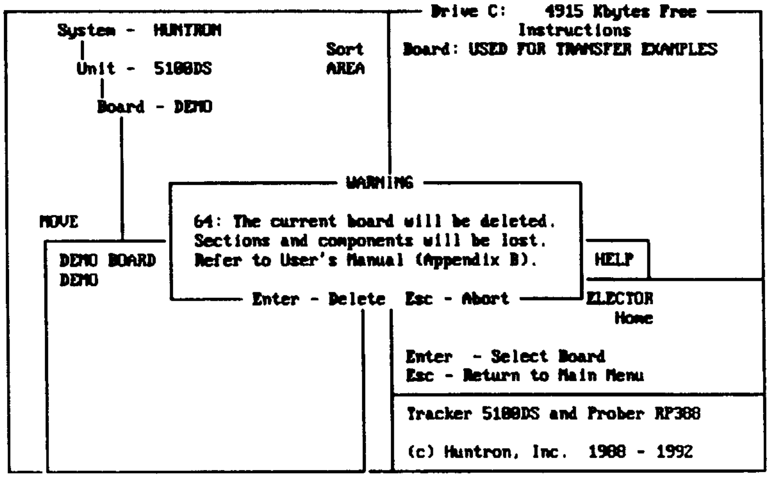


Figure 7-24. OK to DELETE Current Board.

Press ↵ to remove the information from the hard disk.

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

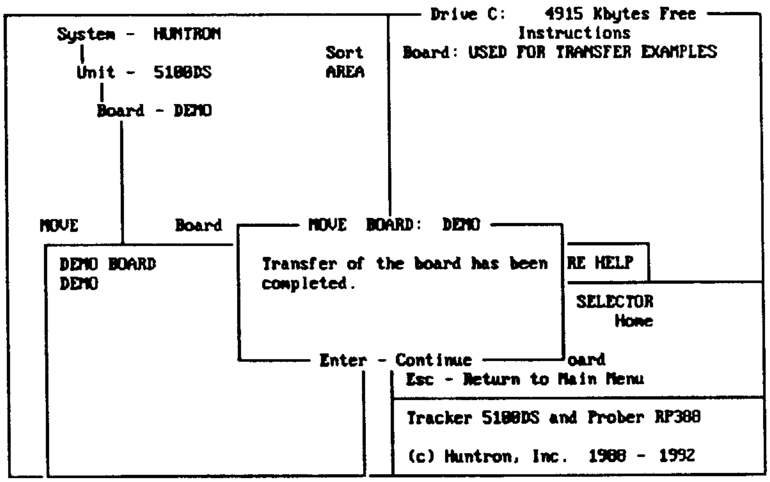


Figure 7-25. Transfer Completed.

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:

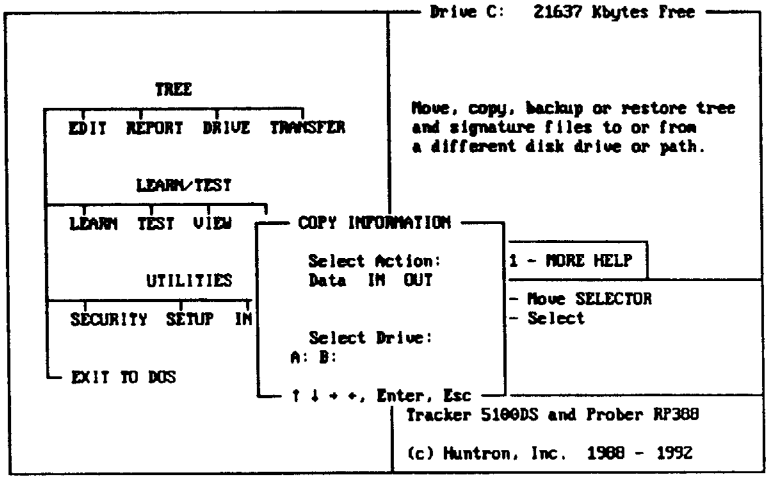


Figure 7-26. COPY Screen.

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:

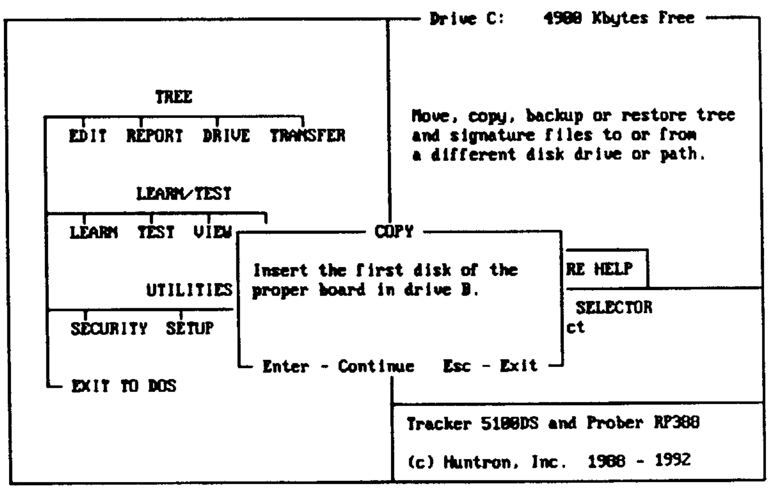


Figure 7-27. COPY In from Floppy to Hard Disk.

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:

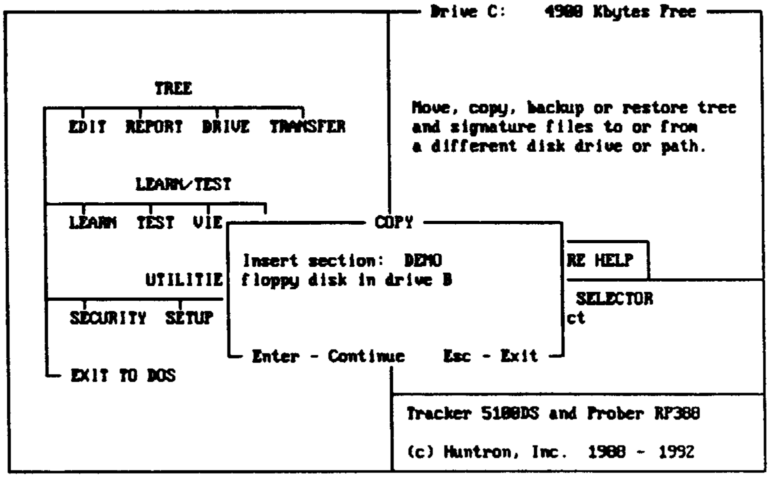


Figure 7-28. COPY Screen.

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:

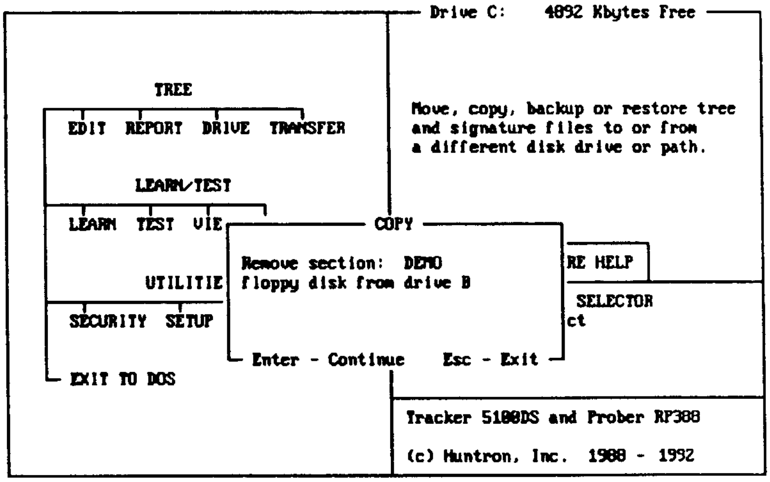


Figure 7-29. COPY In Completed Screen.

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.

7-6. 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 and on your PC's monitor. The user can select the ranges to be enabled for manual or automatic range scanning.

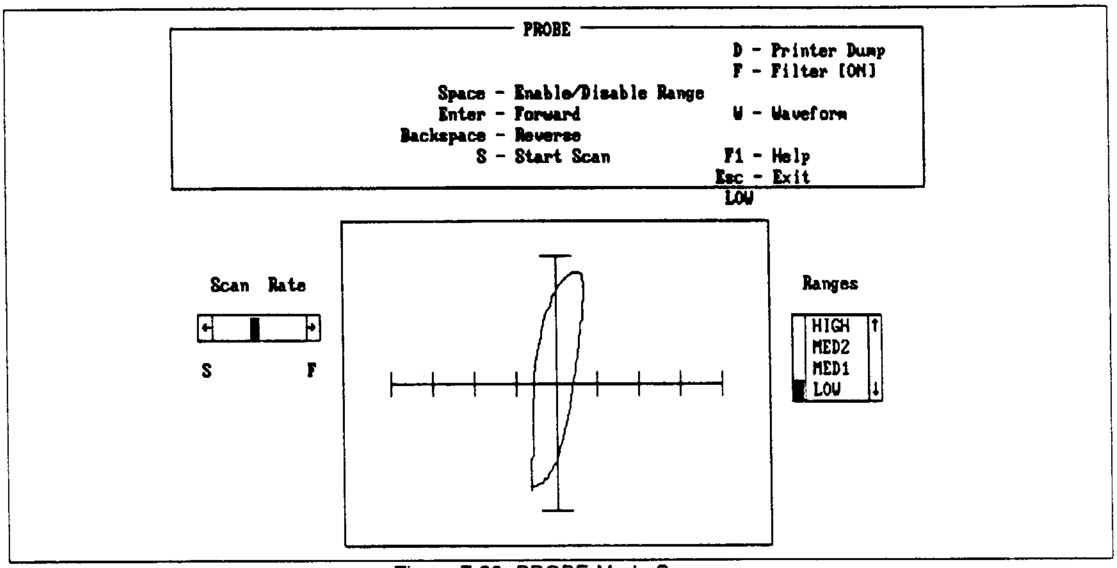


Figure 7-30. PROBE Mode Screen.

ACTIVE KEYS	FUNCTION
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.
↵ 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.
S	Toggles the action that starts or stops automatic range scanning. If you press F1 to display the help screen, scanning will pause while the help screen is active.
D	Activates a printout of the entire PROBE mode graphics screen. Be sure to use SETUP to select the printer you have.
F	Enables or disables the signature filter. This is useful for checking whether the filter should be used on a particular signature. This only affects the digitized signature which is displayed on your monitor. Use the setting of Filter that makes the monitor signature and the 5100DS CRT signature as similar as possible.
W	Switches between signature display and waveform display. Waveform is primarily used for 5100DS familiarization helping new users to understand how analog signatures are created. It has no value during normal ASA troubleshooting.
F1	Displays help information about using the PROBE mode.
Esc	Exits the PROBE mode.
← → Arrows	Controls the SCAN RATE used for automatic scanning.
↑ ↓ Arrows	Controls the range cursor so that each range can be enabled or disabled in the scan sequence.

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 new screen will appear displaying the real time signature, 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 ↑ key twice and then the **Space Bar** to disable the MED 2 range. Press the ↑ key once more and move to the HIGH range. Press the **Space Bar** to disable the HIGH range. Press the ↑ key 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 your monitor and on the 5100DS CRT. While keeping the red probe on the component pin, press the S key to start scanning. Watch the 5100DS CRT or the monitor to see the signature of the resistor change in different ranges. You can increase and decrease the scanning rate with the ← and → keys. Press the S key to stop scanning. Use ↵ 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. This is especially useful in the EDIT mode Component Data and Pin Entry pop-up windows where you are deciding what ranges to use.

7-7. 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 can also 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.

Start 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.

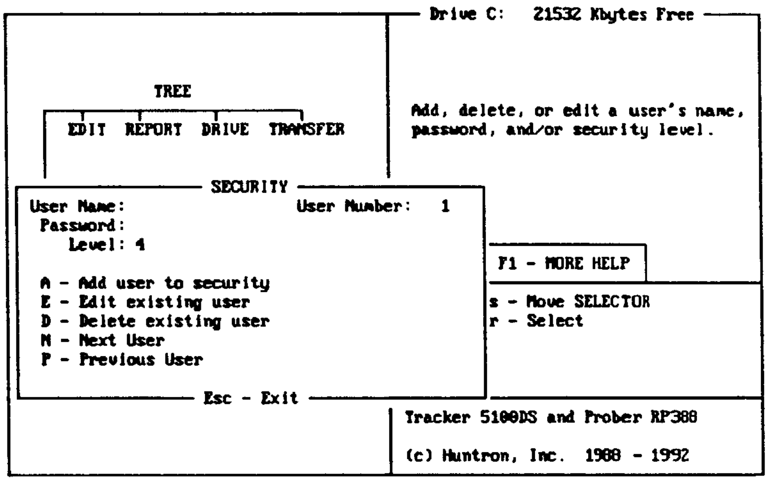


Figure 7-31. SECURITY Mode Screen.

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

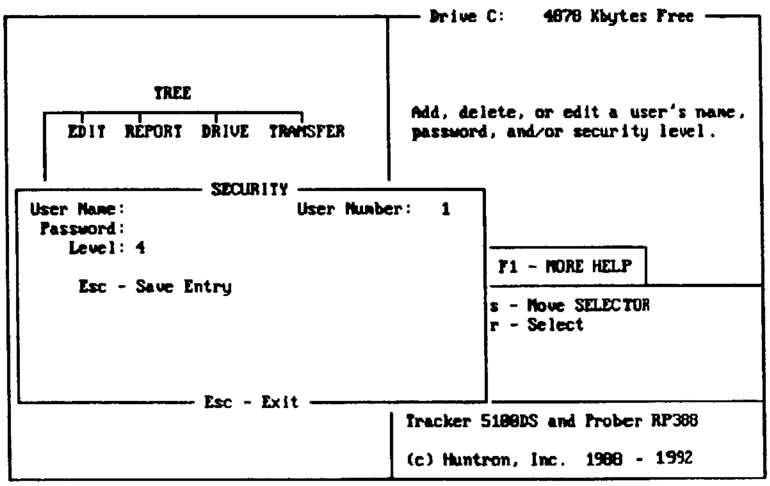


Figure 7-32. SECURITY Mode Level 4 Edit Screen.

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

Type your name (10 characters maximum) on this line. Press ↵ 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:

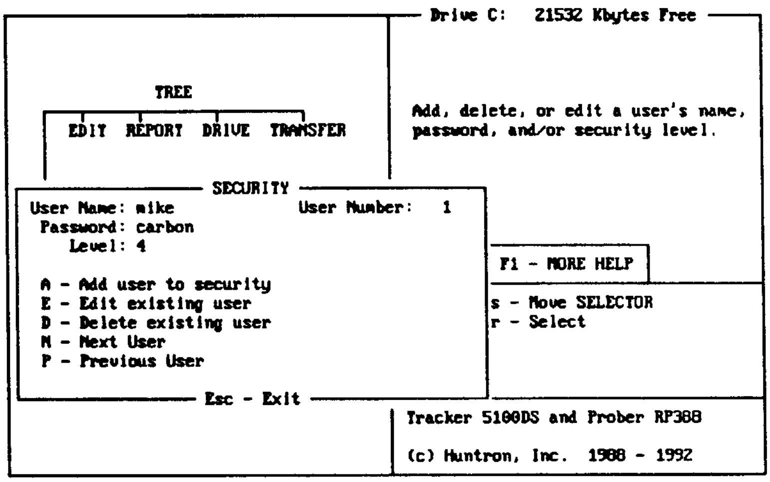


Figure 7-33. SECURITY Edit Level 4 User.

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.

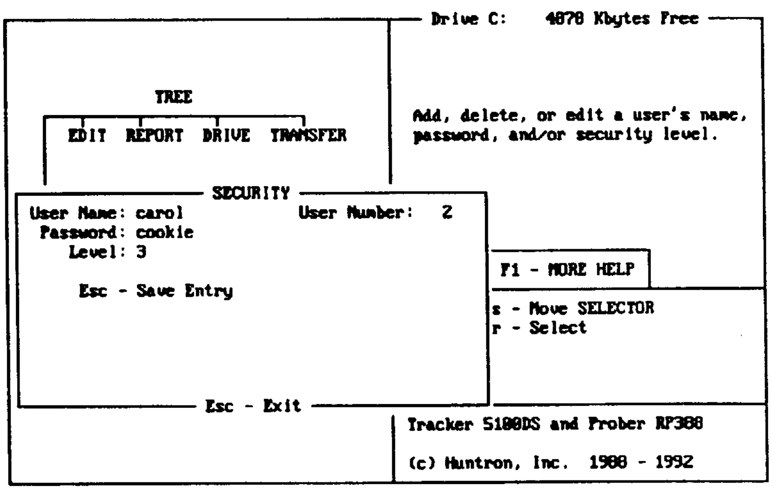


Figure 7-34. SECURITY Add Level 3 User.

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:

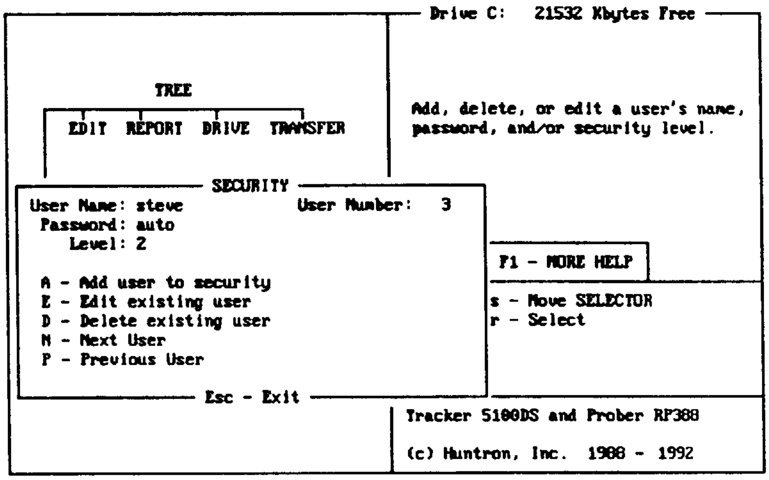


Figure 7-35. SECURITY Add Level 2 User.

An operator with access level 2 will only be allowed to use the TEST function with the ability to look at signatures on the PC monitor. Access level 1 allows the use of the TEST function without being able to view signatures on the monitor.

NOTE

Any number of users can have the same access level.

7-8. 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:

```
                                   Drive C:   92137 Kbytes Free
                      SETUP UTILITY

Learn Signature Color:                      Audio:               YES
Test Signature Color:                       Fuse Checks:         YES
Learn Signature Style:      LINE            Zoom with CRT:       YES
Test Signature Style:       LINE            Short Check - Test:  NO
Signature Box:              ON              Short Check - Learn: NO
Graticule:                  ON              Maximum Short:         2
Signature Order:            DIFF            Minimum Short:         0
Sort Method:                AREA            RP388 In Use:        YES
Merge Tolerance:             5              Cover Installed:     NO
Compare Resolution:         NORMAL          Serial Port:         COM1
Display Comp Instruction:   YES             Measurement Units:   MILS
Troubleshoot Signatures:    YES             Retest Opens:        NO
TS Problem/Solution:        NO              Trackball:           Logitech
File Open/Close:            YES             Camera Exposure:     200

Printer Type:               OKI 192/193 IBM
Startup Path:               C:\51DS\
Temporary File Path:        C:\51DS\

Home End ←↑↓→ - Move selector   < > - Toggle Item   Esc - Exit (SAVE)
```

Figure 7-36. SETUP Screen.

LEARN SIGNATURE COLOR

When SETUP is started, the **Learn Signature Color** is highlighted in white by the selector. 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 selector 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 selector 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 selector 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 selector 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 selector 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 selector to **Signature Order**. The signature order can be changed between DIFF and NUM by pressing the < or > keys. In View Signatures screens (except View stored), NUM(eric) displays the TEST signatures in order by the pin number starting with pin 1. DIFF(erence) displays the signatures starting with the most different pin found when the current and stored signatures were compared (in its most different range). DIFF is recommended for normal troubleshooting use.

SORT METHOD

Press the ↓ key to move the selector 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 selector 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.

COMPARE RESOLUTION

Press the ↓ key to move the selector 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 version 5.00 of the 5100DS 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 selector 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**.

TROUBLESHEET SIGNATURES

Press the ↓ key to move the selector 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.

TS PROBLEM/SOLUTION

Press the ↓ key to move the selector to **TS Problem/Solution**. Use the < or > keys to select YES or NO.

When you are storing an ASCII-Delimited troublesheet to a file, YES enables two text entry fields where you can record the problem which a board had and also the solution that was found. The ASCII-Delimited troublesheet is designed to be used with a database to track boards and look for failure patterns. If you are already using this feature and you do not want to change your database to accept the extra text fields, select NO.

FILE OPEN/CLOSE

Press the ↓ key to move the selector to **File Open/Close**. Use the < or > keys to select YES or NO.

When this selection is set to YES, the software closes and then opens each file as it is written to maintain data integrity if you experience loss of computer power or reboot your computer while in the 5100DS program. You can select NO to disable this feature and increase the performance of the software.

PRINTER TYPE

Press the ↓ key to move the selector 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.

STARTUP PATH

Press the ↓ key to move the selector to **Startup Path**. Then press ↵ to edit the drive and/or path. Type in the desired path and press ↵ to save.

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 selector to **Temporary Files Path**. Then press ↵ to edit the drive and/or path. Type in the desired path and press ↵ to save.

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.

AUDIO

Press the ↓ key to move the selector to **Audio**. Use the < or > keys to select YES or NO.

A YES selection activates attention beeps for various 5100DS and RP388 activities. When using a 5100DS, the PC will beep once after a DIP or SIP component has had signatures gathered in LEARN or TEST. For MULTI or PROBE packages, a beep occurs after each pin is digitized so that you know when to move the probe to the next pin. If you are using an 5100DS/RP388 system, the PC beeps five times after AutoLearn or AutoTest are completed.

FUSE CHECKS

Press the ↓ key to move the selector to **Fuse Checks**. Use the < or > keys to select YES or NO.

A selection of NO disables the checking of the 0.25 Amp Signal fuse and the 1 Amp Common fuse that occurs just before a LEARN or TEST. Huntron recommends that you leave this set to YES.

ZOOM WITH CRT

Press the ↓ key to move the selector to **Zoom with CRT**. Use the < or > keys to select YES or NO.

A setting of YES causes the 5100DS/RP388 hardware to be activated when you zoom in on a pin in the View Signatures mode of LEARN or TEST. For 5100DS only systems, the test and common relays for the selected pin are activated and the signature appears on the CRT of the 5100DS and on the PC's monitor in real time. With a 5100DS/RP388 system, if the component has XYZ information, the RP388 will move to the zoomed pin and show the signature in real time. If this feature is disabled by selecting NO (or if there is no XYZ information when using an RP388), then the signature that was gathered during the LEARN or TEST will be constantly displayed on the monitor in the Test Signature Color and the 5100DS CRT will show an open.

SHORT CHECK - TEST

Press the ↓ key to move the selector to **Short Check - Test**. Use the < or > keys to select YES or NO.

When YES is selected, the **Short Check - Test** 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. The component is scanned for shorts before scanning the component for differences . 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 as defined by the Maximum Short and Minimum Short settings (see below). 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. Using the default min/max short values, the short check finds pins that have ~ 2 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 the same 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.

Short Check is not available when using an RP388.

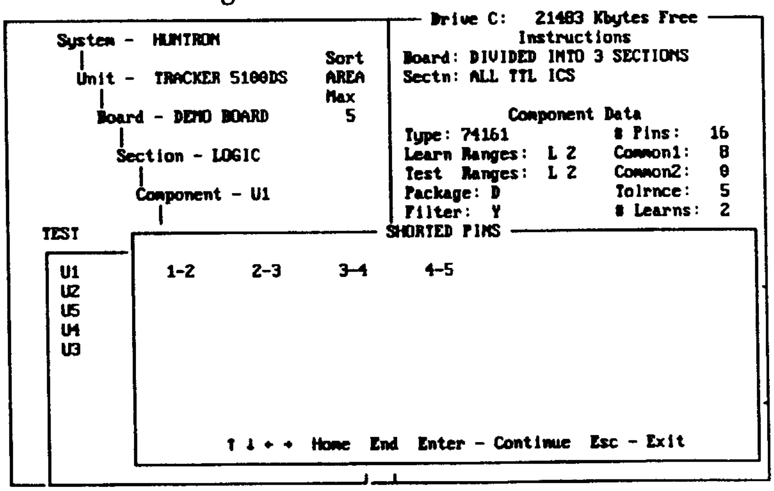


Figure 7-37. SHORT CHECK Screen.

SHORT CHECK - LEARN

Press the ↓ key to move the selector to **Short Check - Learn**. Use the < or > keys to select YES or NO.

This feature works the same way as **Short Check - Test** above except that the scanning for shorted pins occurs right before pin scanning in LEARN mode. This is provided so that while doing board learns you can also find pin combinations that are normally shorted. Then you can go back to EDIT mode and enter the shorted pin information into the Component Instructions text field. When the component is tested, the shorted pin information can be viewed just before the Test Short Check and any pin combinations that were not present before will be suspect.

MAXIMUM SHORT

Press the ↓ key to move the selector to **Maximum Short**. Next press ↵ to edit the value. Type in the desired value from 0 Ω to 100 Ω and press ↵ to save. The value you can enter is actually from the Minimum Short value up to 100 Ω .

MINIMUM SHORT

Press the ↓ key to move the selector to **Minimum Short**. Next press ↵ to edit the value. Type in the desired value from 0 Ω to 100 Ω and press ↵ to save. The value you can enter is actually from 0 Ω up to the Maximum Short value.

The last two settings define the range of the "short" circuit values that the Short Check features look for. The value for Minimum/Maximum short is set in Ohms and is calibrated to work with resistive signatures, however any signature that has the same endpoint (peak value) as a given resistive signature will test the same as that resistor value.

Short Check always looks at the higher impedance of the left and right halves of a signature. For example, with a low range signature formed by the parallel combination of a diode and a resistor that is greater than 10 Ω , the diode has a lower peak value than the resistor so Short Check would only look at the resistance.

If you set Maximum Short = 60 Ω and Minimum Short = 40 Ω , Short Check will only report pin combinations that have 40 Ω through 60 Ω of resistance between them. This would be useful if you have found from past experience that certain ICs tend to fail with 50 Ω "shorts" between adjacent pins.

RP388 IN USE

Press the ↓ key to move the selector to **RP388 In Use**. Use the < or > keys to select YES or NO.

This is the main activation setting for the Prober RP388. Select YES if you have a 5100DS/RP388 system. If you are using a stand alone 5100DS, select NO.

COVER INSTALLED

Press the ↓ key to move the selector to **Cover Installed**. Use the < or > keys to select YES or NO.

This feature works with a 5100DS/RP388 system only. When you install the dust cover accessory onto the RP388, select YES so that the software knows the cover is present. If you do not have a cover, select NO.

SERIAL PORT

Press the ↓ key to move the selector to **Serial Port**. Use the < or > keys to select COM1 or COM2.

Select the serial port of your PC that is connected to the serial connector on the back of the RP388.

MEASUREMENT UNITS

Press the ↓ key to move the selector to **Measurement Units**. Use the < or > keys to select MILS (0.001") or MM (millimeters).

Select your preferred units for using the RP388 in XY Teach and Z Teach modes.

RETEST OPENS

Press the ↓ key to move the selector to **Retest Opens**. Use the < or > keys to select NO, a Z axis travel of 8, 16, 40, or 80 mils (0.203 mm, 0.406 mm, 1.02 mm, or 2.03 mm respectively).

When the RP388 tests a component and finds opens that were not present during LEARN, selecting one of the four travel settings enables an automatic retest to occur. Retest uses a new Z axis distance that is equal to the original position plus the selected travel distance. If the opens were caused by poor physical contact from the probe pin to the device under test, the lower Z axis position should result in a satisfactory contact. If opens are still found, the Z axis is not lowered again. To disable this feature, select NO. Be careful when setting the Retest Opens distance so that it will not interfere with the board or any components.

TRACKBALL

Press the ↓ key to move the selector to **Trackball**. Use the < or > keys to select Logitech if you have a Logitech type trackball or MicroSpeed if you have a MicroSpeed type trackball or a Microsoft compatible mouse.

CAMERA EXPOSURE

Press the ↓ key to move the selector to **Camera Exposure.** Press ↵ and type in the new exposure time. Press ↵ again to save. This allows you to set the digital exposure time from 1 - 999 ms. Increasing the exposure time increases the camera's low light sensitivity but the camera image will take longer to display on your PC monitor. For best results, set the camera exposure between 200 and 500 ms.

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.

7-9. 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 Application Note 2 in the back of this manual 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 7-2, COMPONENT PIN INFORMATION in this chapter.

7-10. 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 discrete components. See example below:

```
                                          Drive C:   21479 Kbytes Free
  System -  HUNTRON                               Instructions
   |                          Sort   Board: DIVIDED INTO 3 SECTIONS
    Unit -  TRACKER 5100DS    AREA   Sectn: ALL TTL ICS
     |                        Max
      Board - DEMO BOARD        5             Component Data
       |                             Type: 74161             # Pins:   16
        Section - LOGIC              Learn Ranges:  L 2    Common1:   8
         |                           Test  Ranges:  L 2    Common2:   0
 ------------------------- WARNING ---------------------------         5
                                                                        2
  68: The component names will be sorted into alpha-numeric order.
  There is no feature to undo the sort.
  Refer to User's Manual (Appendix B).

 ---------------- Enter - Continue  Esc - Abort --------------
 U4                                  A - Add      Insert
 U3                                  E - Edit     Delete    End
                                     P - Pin Info
                                     Esc - Return to Section

                                     Tracker 5100DS and Prober RP388

                                     (c) Huntron, Inc.  1988 - 1992
```

Figure 7-38. 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

7-11. 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 the back of this manual for 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 you have a choice of viewing, printing or storing a troublesheet for the components of the current section. While viewing the troublesheet you can also view the signatures for all the different components. Also, with the RP388 you can view realtime TEST signatures. These same options with the exception of realtime TEST signature viewing, are available at the board level for all the components of the current board.

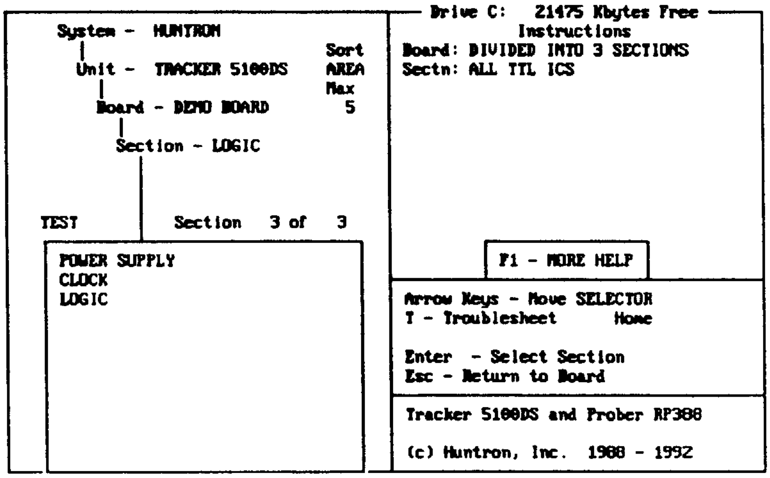


Figure 7-39. Section Troublesheet Selection Window.

The board serial number is entered to identify the troublesheet.

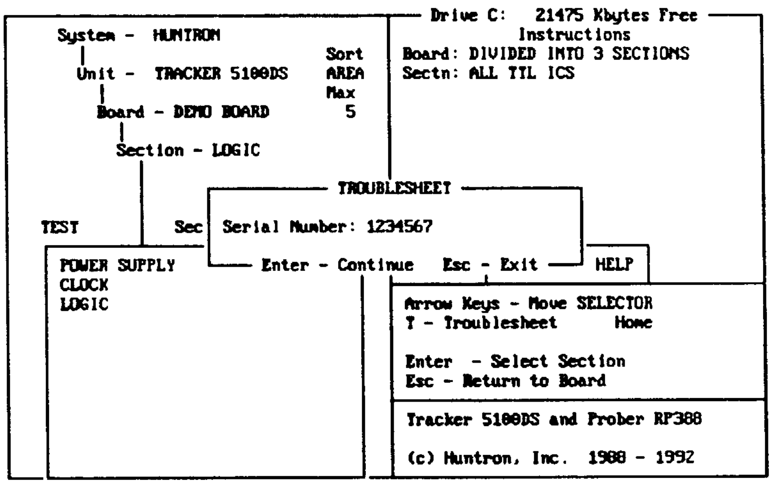


Figure 7-40. Troublesheet Board Serial Number Entry.

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 troubleshleet are allowed.

```
System - HUNTRON                         Drive C:   21467 Kbytes Free
  |                          Sort              Instructions
  Unit - TRACKER 5100DS      AREA      Board: DIVIDED INTO 3 SECTIONS
    |                        Max       Sectn: ALL TTL ICS
    Board - DEMO BOARD        5
      |                                      Component Data
      Section - LOGIC                  Type: 74161          # Pins:    16
        |                              Learn Ranges:  L 2   Common1:   8
        Component - U1                 Test  Ranges:  L 2   Common2:   0
TEST      |                            Package: D           Tolrnce:   5
          | Component    1 of   5      Filter:  Y           # Learns:  2
 U1                                    Merged Learns Space: 13.3 Kbytes
 U2                                           F1 - MORE HELP
 U5
 U4                                    Arrow Keys - Move SELECTOR
 U3                                    T - Test Results
                                       S - Stored Sigs        End
                                       Enter  - Test  [ INSTRUCTIONS  ]
                                       Esc - Return to Section

                                       Tracker 5100DS and Prober RP388

                                       (c) Huntron, Inc.  1988 - 1992
```

Figure 7-41.Select Troubleshoot "T-Test Results" Screen

```
System - HUNTRON                         Drive C:   21463 Kbytes Free
  |                          Sort              Instructions
  Unit - TRACKER 5100DS      AREA      Board: DIVIDED INTO 3 SECTIONS
    |                        Max       Sectn: ALL TTL ICS
    Board - DEMO BOARD        5
      |                                      Component Data
      Section - LOGIC                  Type: 74161          # Pins:    16
        |                              Learn Ranges:  L 2   Common1:   8
        Component - U1                 Test  Ranges:  L 2   Common2:   0
TEST      |                            Package: D           Tolrnce:   5
          | Component    1 of   5      Filter:  Y           # Learns:  2
 U1                                    Merged Learns Space: 13.3 Kbytes
 U2                                           F1 - MORE HELP
 U5                                    ------------- TEST -------------
 U4
 U3                                           8 DIFFERENT PINS

                                        C - Continuous Test
                                        R - Remove From Troublesheet
                                        V - View Signatures
                                        Enter - Next Component  Esc - Exit
```

Figure 7-42. Troubleshoot 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 using the ↓ ↑ keys to move the selector (shown by highlighting the component). 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.

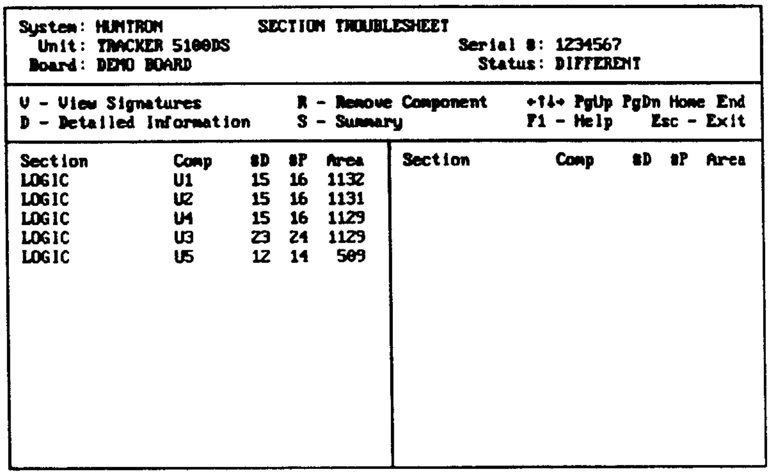


Figure 7-43. Troublesheet View Screen.

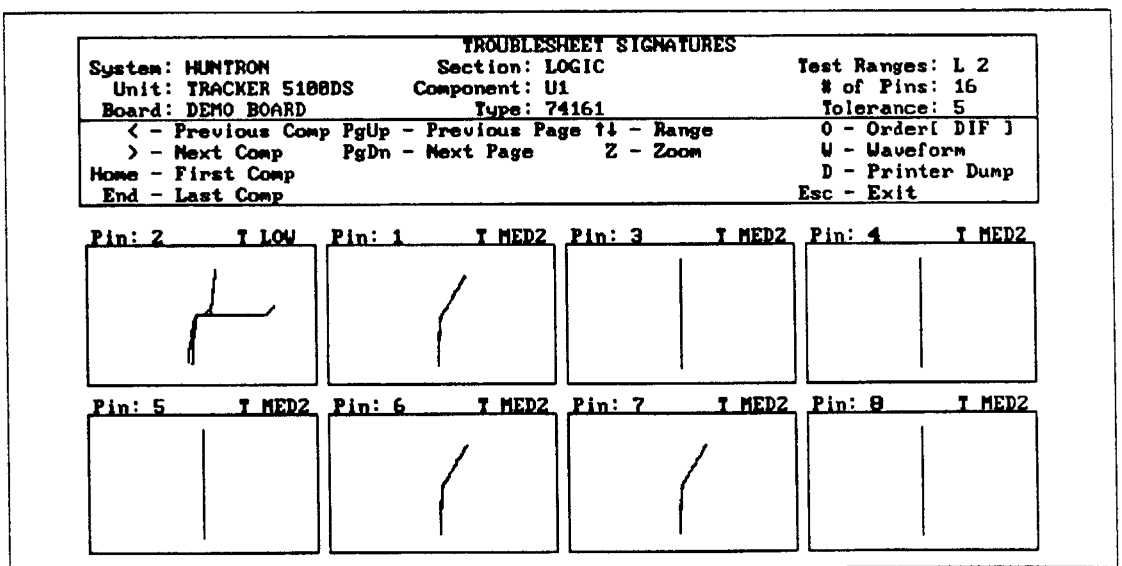


Figure 7-44. Troublesheet View Signatures Screen.

```
System: HUNTRON          SECTION TROUBLESHEET
 Unit: TRACKER 5100DS                              Serial #:
Board: DEMO BOARD                                  Status: DIFFERENT
------------------------ DETAIL PIN INFO ------------------------
V - View Signature|                                           |Up PgDn Home End
D - Detailed Infor| #  Pin  F C1 C2 Range Tol Dev  Area      |lp    Esc - Exit
                  | 1  4    Y 8  0 LOW    5   89   647       |
Section         Co| 2  5    Y 8  0 LOW    5   89   644       |     #D  #P  Area
LOGIC           U3| 3  8    Y 8  0 LOW    5   89   641       |
LOGIC           U5| 4  3    Y 8  0 LOW    5   89   622       |
LOGIC           U4| 5  7    Y 8  0 MED2   5   91   541       |
LOGIC           U2| 6  14   Y 8  0 MED2   5   91   537       |
LOGIC           U1| 7  10   Y 8  0 MED2   5   90   536       |
                  | 8  13   Y 8  0 MED2   5   90   536       |
                  | 9  9    Y 8  0 MED2   5   90   535       |
                  |10  11   Y 8  0 MED2   5   90   535       |
                  |11  15   Y 8  0 MED2   5   90   535       |
                  |12  16   Y 8  0 MED2   5   90   535       |
                  |13  2    Y 8  0 MED2   5   89   520       |
                  |14  6    Y 8  0 MED2   5   87   518       |
                  |15  19   Y 8  0 LOW    5   67   482       |
                  |16  18   Y 8  0 LOW    5   55   394       |
------------------------ PgUp PgDn   Esc - Exit ----------------
```

Figure 7-45. Troublesheet Detailed Window.

```
System: HUNTRON          SECTION TROUBLESHEET
 Unit: TRACKER 5100DS                              Serial #:
Board: DEMO BOARD                                  Status: DIFFERENT
                    ----------- SUMMARY -----------
V - View Signatures |                              |←↑↓→ PgUp PgDn Home End
D - Detailed Informati| Number of Different:     5 |F1 - Help    Esc - Exit
                    |   Number of Removed:       0 |
Section        Comp |Number of Equivalent:       0 |  Comp    #D  #P  Area
LOGIC          U3   |
LOGIC          U5   ------------ Esc - Exit ---------
LOGIC          U4     12  16   472
LOGIC          U2     11  16   433
LOGIC          U1      5  16   381
```

Figure 7-46. 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.

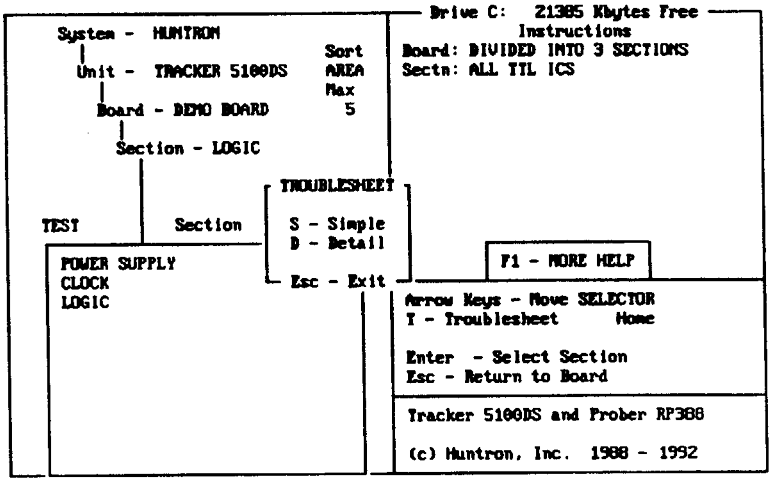


Figure 7-47. Troublesheet Simple/Detail Section Window.

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 and file name for the troublesheet can be specified or you can use the default path and file names (see the Troublesheet path entry window). The default path name is the "Startup Path" selected in SETUP. The default files names are:

Type	File Name
Simple	SIMPLETS.ASC
Detailed	DETAILTS.ASC
ASCII	ASCIITS.ASC

For the simple and detailed troublesheets an ASCII file containing the text of the corresponding printed report is written to the specified path/file name. The ASCII delimited 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]

Problem text (if enabled) [45 alphanumeric character]

Solution text (if enabled) [45 alphanumeric character]

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. Also, if **TS Problem/ Solution** is set to YES in SETUP, you are prompted to enter a description of the problem followed by the solution that was found. 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 carriage return/linefeed.

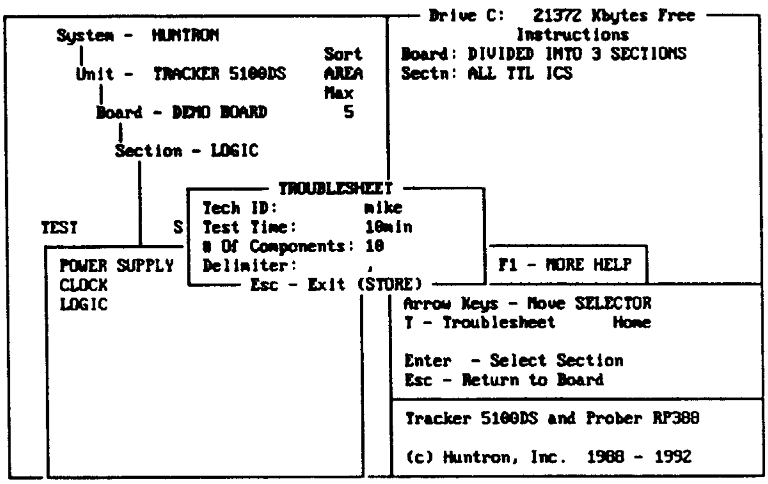


Figure 7-48. Troublesheet ASCII Delimited Entry Window.

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.

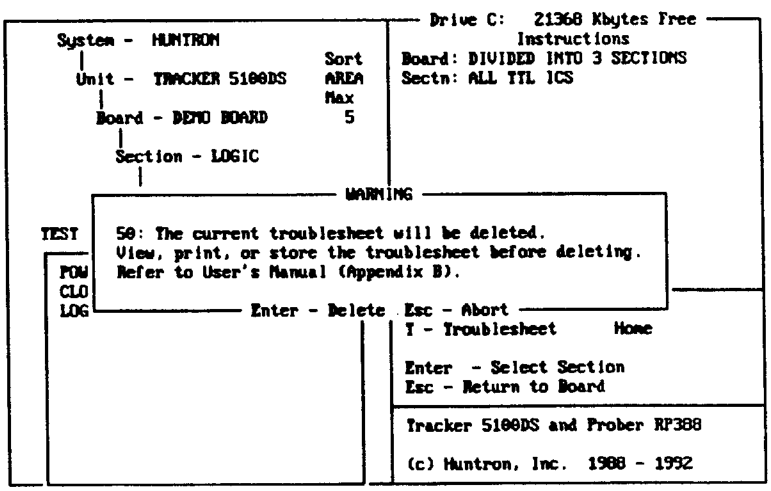


Figure 7-49. Troublesheet Alt+I Warning Window.

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7-12. VIEW MODE

The VIEW mode enables the 5100DS hardware so that signatures can be viewed on the PC's monitor and 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 select the ranges to be enabled 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.

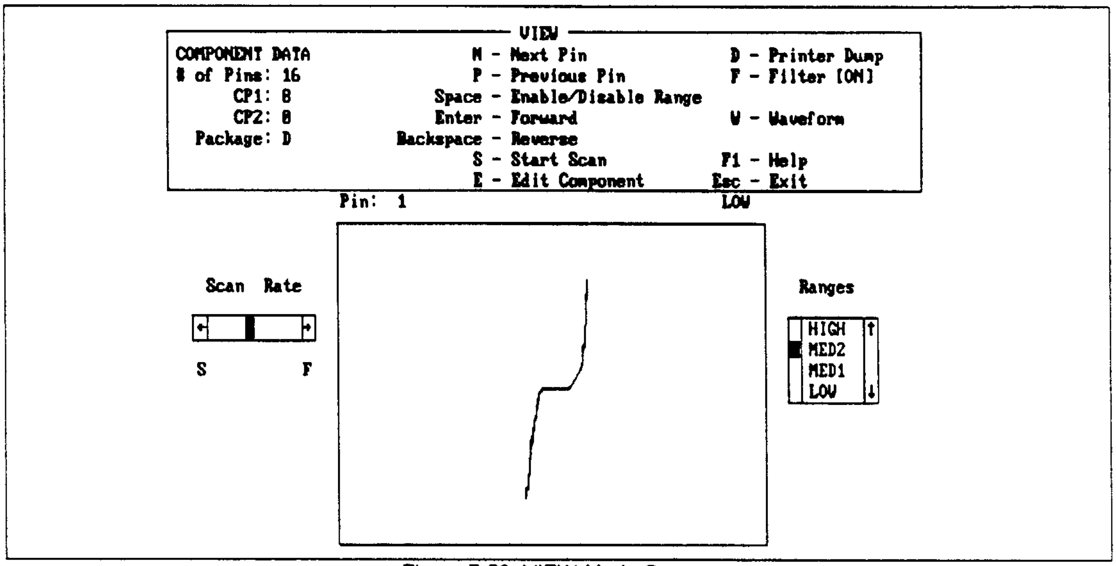

Figure 7-50. VIEW Mode Screen.

ACTIVE KEYS	FUNCTION
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.
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.
↵ Enter	Performs a manual single step forward to the next range or pin in the scan sequence.
Backspace	Performs a manual single step backward to the previous range or pin in the scan sequence.
S	Toggles the action that starts or stops automatic range / pin scanning. If you press **F1** to display the help screen, scanning will pause while the help screen is active.
E	Activates the EDIT mode which is indicated by a reverse video cursor in the "# of Pins" field. The user can then enter the number of pins from 1 to 64, select one or two common pins, and select (D)IP, (S)IP, (F)ront, or (B)oth front and back 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.
D	Activates a printout of the entire VIEW mode graphics screen. Be sure to use SETUP to select the printer you have.

ACTIVE KEYS	FUNCTION
F	Enables or disables the signature filter. This is useful for checking whether the filter should be used on a particular signature. This only affects the digitized signature which is displayed on your monitor. Use the setting of Filter that makes the monitor signature and the 5100DS CRT signature as similar as possible.
W	Switches between signature display and waveform display. Waveform is primarily used for 5100DS familiarization helping new users to understand how analog signatures are created. It has no value during normal ASA troubleshooting.
F1	Displays help information about using the VIEW mode.
Esc	Exits the VIEW mode.
← → Arrows	Controls the SCAN RATE used for automatic scanning.
↑ ↓ Arrows	Controls the range cursor 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.

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**. If the RP388 is in use, the probe tip will move to the pins of the component if XYZ positions have been previously saved. You will first be prompted with the Align option window to align the board if needed. A new screen will appear displaying the real time signature, the keys that are active and the status of the hardware which has been activated.

Press the **E** key to start the EDIT mode. 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 the HIGH and MED 1 ranges. Press the ↑ key and then the space bar to disable MED 1. Press the ↑ key twice to move to the HIGH range. Press the space bar to deactivate the HIGH range. Press the ↑ key 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 your PC's monitor and 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 or on the monitor. Increase and decrease the scanning rate with the ← and → 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 screen will appear by pressing Alt+V. If you are at the component level in either EDIT, LEARN, or TEST, the component data selected there will be used while in VIEW mode. This is especially useful in the EDIT Component Entry mode and Pin Entry pop-up windows where you are deciding what ranges, common pins, etc. to use.

7-13. BOARD ALIGNMENT

This section covers detailed information regarding the alignment of a board used in the RP388.

GENERAL CONCEPT OF ALIGNMENT

The RP388 does not require a net-list or PC-CAD data for accessing the test points on the board. Instead, it uses a unique process to teach the location of the various test points. A close-up image of the board is displayed on the PC monitor. The user simply points the trackball cursor at a test point and clicks the trackball button to digitize the test point location. However, this location is relative to two user-setable alignment points. If a similar board is clamped into the RP388 table, it is possible that it is not exactly in the same position as the first board. So to access a previously digitized test point location, the software needs to know the difference between the original and current board location. This difference is automatically calculated once the user points out the exact location of the two alignment points on the current board. This is easy to do because the software automatically moves to the previously digitized alignment point. The user points to the new location of the alignment point using the trackball. The second alignment point is done in the same way. The software then calculates the difference and applies the offset to the previously digitized test point. The probe tip will then move to the exact location of the test point.

This simple procedure eliminates the need for placing a new board in the exact position as the original "golden" board.

The alignment procedure is required whenever a different board is placed in the RP388 or the board is moved.

The STORE ALIGN procedure guides the user to digitize two points on the "golden" board which will then be used for future reference. These alignment points could be solder joints, nodes or datum points which for best results should be situated diagonally from each other and as far apart in both directions as possible.

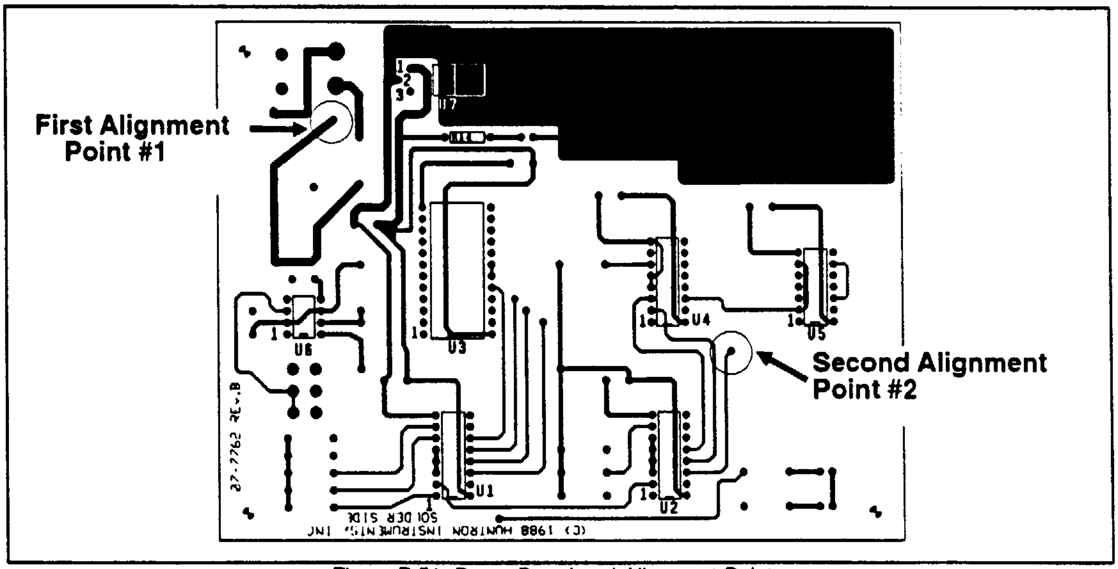

Figure 7-51. Demo Board and Alignment Points.

For best results, choose alignment points that are clearly visible and that have shapes that will enable the user to estimate their centers. The best alignment point is a cross hair pattern on the board because the center will be clearly visible on the PC monitor. As an alternative, pick a small round solder pad with no component lead through it. This will project a clear round image on the PC monitor so that it will be easy to place the trackball cursor on the center of the solder joint image.

For a board mounted in the TOP slot, approximately 1 square inch (645.16 mm^2) of the image around the alignment point is stored on the hard disk. Thus the actual alignment point image can be recalled on the PC monitor for reference purposes.

NOTE

When reference is made to "align the board", this means the user has to digitize the current locations of the two previously setup alignment points. This will always be required, if the user tests or relearns boards. Also if the user goes to the Main menu, alignment of the board will be required.

STORE ALIGN

This screen will appear for "golden" boards that have the component entry information but not XYZ data. Two alignment points diagonally from each other which are at least 100 mils apart have to be selected. For best results, these points should be as far apart from each other as possible, however this is not an absolute requirement. The following is an example of a STORE ALIGN screen. All the key strokes for this screen will be explained here in detail.

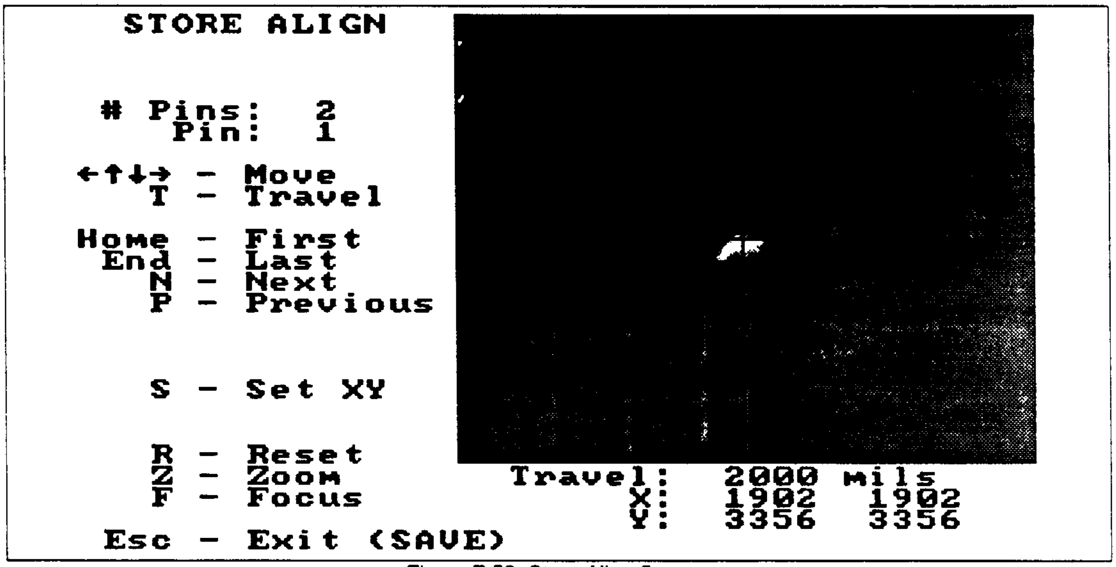

Figure 7-52. Store Align Screen.

Item	Action
# of Pins: 2	This will always be 2 in the STORE ALIGN screen. This refers to the total number of points whose physical locations need to be set.
Pin: 1	This refers to the current pin whose physical location needs to be set.
← ↑ → ↓	Arrow keys allows the user to move the Z Axis mechanism (on which the probe tip and camera head are mounted) in the XY direction. The travel distance is displayed in the "Travel" field. The default Travel distance is set to 2000 mils (i.e. 2 inches since 1 mil = 0.001 inch). Pressing the ←key will move the camera head 2 inches (50.8mm) to the LEFT. Pressing the ↑ key will move the camera head 2 inches (50.8mm) towards the back of the RP388 (i.e. away from you). Pressing the →key will move the camera head 2 inches (50.8mm) to the RIGHT. Pressing the ↓ key will move the camera head 2 inches (50.8mm) towards the front of the RP388.
T - Travel	Pressing T allows the Travel setting to be changed. The keyboard cursor will be at the first digit of the Travel field. Type in the new Travel distance in mils and press ↵.
Home - First	Pressing the **Home** key sets Pin to 1 and moves the camera head to the XY position of pin 1. If the position of Pin 1 was not set previously, the camera head will remain in the current position.

Item	Action
End - Last	Pressing the **End** key sets the Pin to 2 (in this case the last pin) and moves the camera head to the XY position of pin 2. If the position of Pin 2 was not set previously, the camera head will remain in the current position.
N - Next	Pressing the **N** key will increment the Pin number and move to the position of the next pin.
P - Previous	Pressing the **P** key will decrement the Pin number and move to the position of the previous pin.
S - Set XY	Pressing **S** after positioning the camera head with the arrow keys will set the XY position of the camera head. Also, if the trackball cursor was moved, pressing **S** is equivalent to clicking the LEFT trackball button. This will move the camera head to the position of the trackball cursor and set the XY position.
R - Reset	Pressing the **R** key will set all the pin coordinates to zero and allows the user to start over.
Z - Zoom	Pressing **Z** creates a zoomed image at the center of the current image. The zoomed window operates on 20 pixels around the center of the image. Also, the trackball resolution changes to 1 pixel = 2 mils (0.051mm) within the zoomed window. This is the only way to use the trackball for making a 2 mils (0.051mm) movement. However, the arrow keys can still be used to make a 2 mils (0.051mm) movement by changing the Travel setting to 2. If the trackball cursor is outside the zoomed window, a one pixel movement of the cursor will cause a 4 mils (0.102mm) movement. This feature is useful for making fine adjustments for centering the trackball cursor over a particular test point. Also, test point images may appear clearer in the zoomed window.

The following illustration shows a zoomed window.

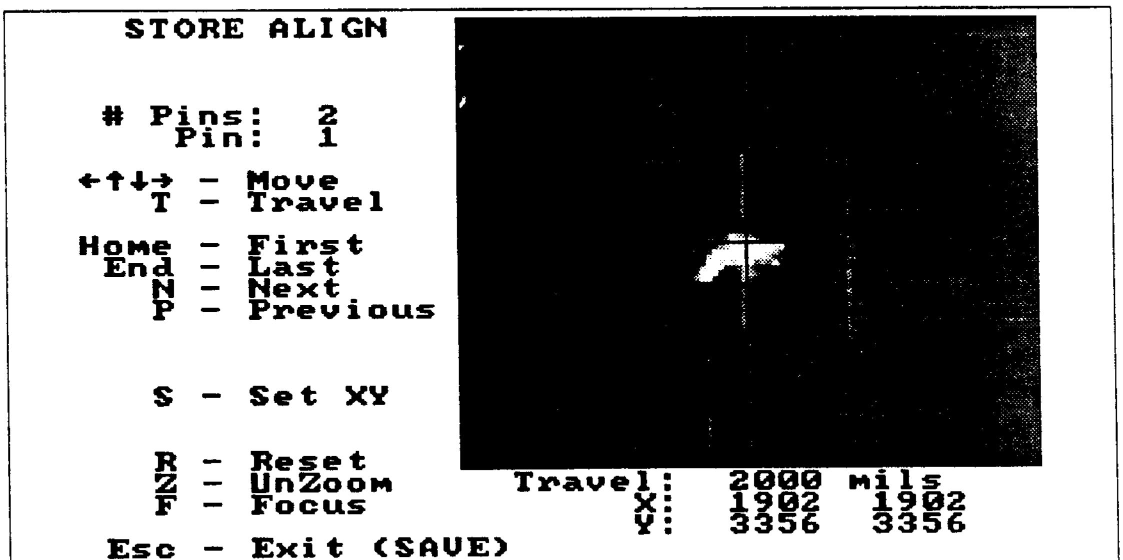

Figure 7-53. Image in Zoom Window.

Item	Action
F - Focus.	If the image displayed on the monitor is not clear, it may be necessary to focus the camera. Focusing will be needed whenever a different PCB clamping slot is used. To focus the image, press **F**. The camera image is now "live". Turn the camera focus knob until the image is focused. Only a slight rotation may be required. Notice the focus numbers changing as you turn the knob. The image will be perfectly focused when the numbers are at a maximum value. Notice that as you turn the focus knob until the image is blurred, the digital focus number decreases. As the image comes into focus the number increases. If the image is focused and you continue to turn the knob, the number will then start to decrease. So just adjust the knob until the focus number is at the maximum value. The actual value of the number depends on the image displayed. Therefore, simply turn the focus knob until the focus number is at the maximum value. When the image is in focus, hit **Esc** to get back into the STORE ALIGN routine.
Esc - Exit (SAVE)	When all the pin locations are set, press **Esc** to exit this routine and press Y to save the information.

Notice that the actual position of the center of the camera head is displayed in the first column below the Travel setting. The second column displays the X and Y position of the trackball cursor.

Saving the information will automatically save the actual image of both the alignment points. These images can be recalled when aligning the board for LEARN or TEST.

ALIGN FOR LEARN AND TEST

This software offers the option of the board alignment before any LEARN or TEST can be done. Also, exiting the component level of the LEARN and TEST and returning back to the component level will offer you the option to align the board. The Align option window allows you to bypass the alignment if the board has not been moved since the last alignment. The ↵ key bypasses the alignment procedure, the **A** key activates the alignment procedure, and **Esc** cancels the current action.

Aligning the board means the user has to digitize the current locations of the two previously setup alignment points. If the two alignment points were correctly setup, the alignment procedure is a simple one.

The following sequence of events will occur depending on the user's action.

1. Clamp the board into the RP388 table. Make sure that the COMMON lead is connected to the COMMON terminal on the 5100DS.
2. Enter the TEST COMPONENT SCREEN of a previously setup board.
3. Press **Alt+U** to test all the components of a section.
4. After the initialization message appears, press ↵. The Z Axis mechanism moves to the back-right corner.
5. Press ↵ to continue.
6. The camera head will automatically move to the XY location of the first alignment point.

7. If the center of the camera image cross hair is not directly positioned over the center of the first alignment point, then the board needs to be aligned. Position the trackball cursor over the center of the alignment point and click the LEFT trackball button.

   Press the **Z** key to obtain a zoomed center image. Make fine adjustments to the trackball until the cursor is directly placed over the center of the alignment point. Click the LEFT trackball button to set the XY position.

   IMPORTANT NOTE

   Notice that the ALIGN TEST or ALIGN LEARN screen has the O key. Pressing O will display the actual stored image of the alignment point which was setup on the "golden" board. You can toggle between the stored "golden" image and the current image by pressing O again. This feature reminds the user of the particular alignment point used for that particular pin. You can also use the zoom feature for a close-up view of the stored image.

8. Press **End** to check the second alignment point. The camera head will move to the location of the previously setup alignment point of pin 2.

9. Repeat step 7 until the second point is aligned.

10. Press **Esc** to exit and press **Y** to save this information.

The program will then begin to TEST the section starting at the first highlighted component.

REALIGN

This feature enables the user to realign the golden board so that the original alignment points can be removed and new alignment points created. This feature should be used with extreme CAUTION because the position of all the component pins are dependent on the correctness of the alignment procedure. Realign is only necessary if the user wants to change the stored alignment points.

Follow the instructions below carefully to realign the board.

To change the stored alignment points you must be at the Component level.

1. Press **Alt+H** to realign the board.

2. Before storing the new alignment points, you must first align the board to the original golden points. The program will move the camera head to the first alignment point.

   Rotate the trackball to center its cursor directly over the center of this point and then click the LEFT trackball button to set it.

3. Press **End** for the second alignment point. The camera head will move to the second stored alignment point.

4. Rotate the trackball to center its cursor directly over the center of this point and then click the LEFT trackball button to set it.

   NOTE

   To display the stored golden image of any alignment point press O. Press O again to display the current image. This feature is useful if you are unable to recall what the original alignment point was.

5. When you have aligned the board to the original points, press **Esc** to exit and **Y** to save.

6. Press **Y** to realign the board. Move the camera head to the new alignment point. Click the LEFT trackball button to set it.

7. Press **End** to do the second alignment point.

8. Move the camera head to the new alignment point and click the LEFT trackball button to set it.

9. Press **Esc** to exit and **Y** to save. The data for all the components in the current section will be automatically updated.

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7-14. XY TEACH MODES

The XY Teach modes refer to the way the pin locations of DIP, SIP, MULTI, FRONT, BOTH (Front and Back) and PROBE packages are stored. The following information covers these packages in detail.

PROBE TEACH - Package type P

When specifying package type P in the EDIT COMPONENT screen, the XY teach procedure will require the user to teach the XY locations of the component pins one at a time.

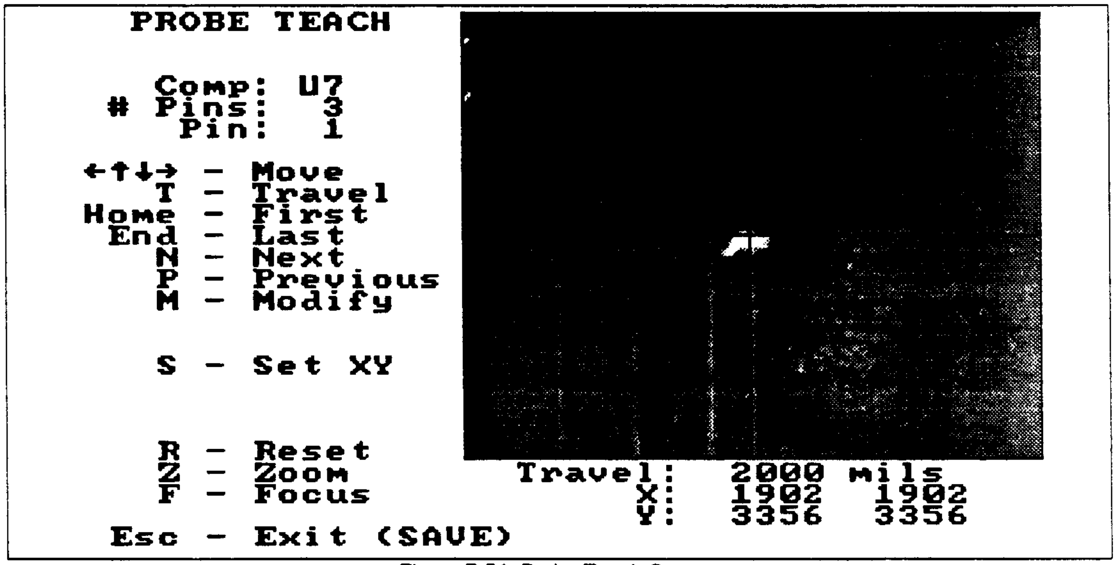


Figure 7-54. Probe Teach Screen.

Item	Action
Comp	Refers to the component name
Pins	Refers to the total number of pins of this component.
Pin	Refers to the current pin whose XYZ location needs to be digitized.
← ↑ → ↓ keys	Allow the camera head to move by the distance set by the Travel field (default is 2000 mils (50.8mm)).
T	Travel allows the changing of the Travel distance.
Home - First	Pressing the **Home** key will set the pin number to 1 and will move the camera head to that pin location if it was already setup.
End - Last	Pressing the **End** key will set the pin number to the last pin of the component and move the camera head to the last pin location if it was already setup.
N - Next	Pressing the **N** key will increment the Pin number and move the camera head to the new pin number if the position exists.
P - Previous	Pressing the **P** key will decrement the Pin number and move the camera head to the position of the new pin number if the position exists.
M - Modify	Pressing the **M** key allows the selecting of any pin number. Type in the new pin number and press ↵.
S - Set XY	Pressing **S** after positioning the camera head with the arrow keys will set the XY position of the camera head. Also, if the trackball cursor was moved, pressing **S** is equivalent to clicking the LEFT trackball button. This will move the camera head to the position of the trackball cursor and set the XY position.

Item	Action
R - Reset	Pressing the **R** key will set all the pin coordinates to zero. This will allow the user to start over with the digitizing process.
Z - Zoom	Pressing **Z** creates a zoomed image at the center of the current image. The zoomed window operates on a 20 by 20 pixels square around the center of the image. Also, the trackball resolution changes to 1 pixel = 2 mils (0.051mm) within the zoomed window. This is the only way to use the trackball for making a 2 mils (0.051mm) movement. However, the arrow keys can still be used to make a 2 mils (0.051mm) movement by changing the Travel setting to 2. If the trackball cursor is outside the zoomed window, a one pixel movement of the cursor will cause a 4 mils (0.102mm) movement. This feature is useful for making fine adjustments for centering the trackball cursor over a particular test point. Also, test point images may appear clearer in the zoomed window.
F - Focus	If the image displayed on the monitor is not clear, it may be necessary to focus the camera. Focusing will also be needed whenever a different PCB clamping slot is used. To focus the image, press **F**. The camera image is now "live". Turn the camera focus knob until the image is focused. Only a slight rotation may be required. Notice the focus numbers changing as you turn the knob. The image will be perfectly focused when the numbers are at a maximum value. Notice that as you turn the focus knob until the image is blurred, the digital focus number decreases. As the image comes into focus the number increases. If the image is focused and you continue to turn the knob, the number will then start to decrease. So just adjust the knob until the focus number is at the maximum value. The actual value of the number depends on the image displayed. Therefore, simply turn the focus knob until the focus number is at the maximum value. When the image is in focus, hit **Esc** to get back into the STORE ALIGN routine.
Left Trackball	Pressing the LEFT trackball button will move the camera head to the position under the trackball cursor and perform the function of the **S** key (set).
Middle Trackball	Pressing the MIDDLE trackball button will change to the previous pin and move to it's XY position if it is already set.
Right Trackball	Pressing the RIGHT trackball button will change to the next pin and move to it's XY position if it is already set.
Esc - Exit (SAVE)	When all the pin locations are set, press **Esc** to exit this routine and press **Y** to save the information.

Notice that the actual position of the center of the camera head is displayed in the first column below the Travel Setting. The second column displays the X and Y position of the Trackball cursor.

SIP TEACH - Package type S

When specifying package type **S** in the EDIT COMPONENT screen, the XY teach procedure will require the user to teach the XY locations of the component pins of a Single-Inline-Package. This package has pins in a single row spaced equally apart. The default pin to pin spacing is 100 mils.

SIPs cover all components like resistor networks, capacitor networks, card edge connectors, ICs that have pins in a single row or even test nodes whose pins are evenly spaced.

The actual spacing distance does not matter. The SIP TEACH procedure will calculate this dimension.

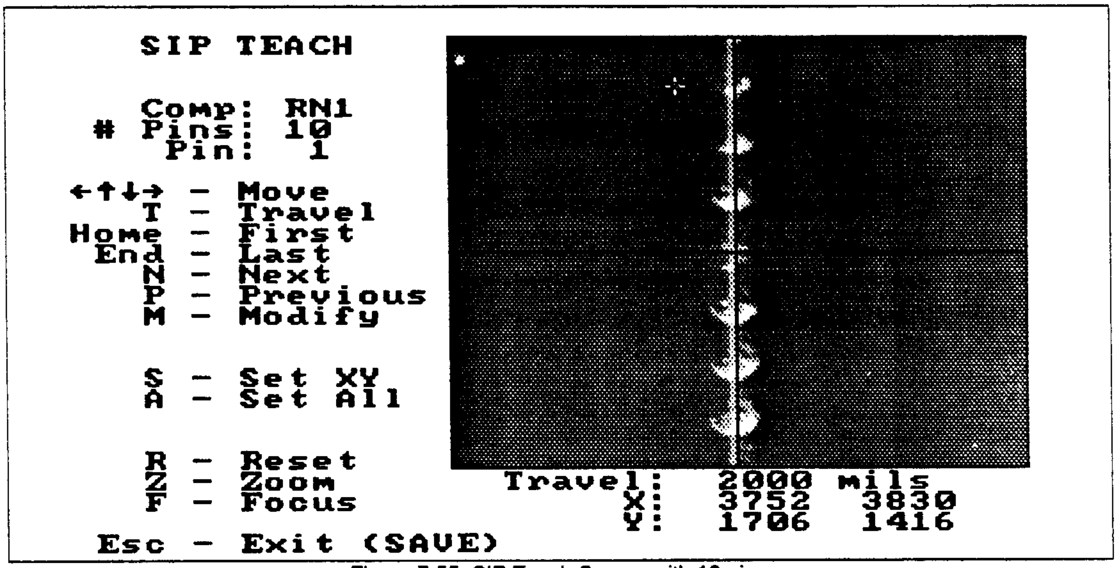


Figure 7-55. SIP Teach Screen with 10 pins.

IN SIP TEACH, the XY location of the first and last pin of the component has to be digitized.

Use the arrow keys or trackball to position the center of the camera image cross hair directly over the center of the FIRST pin.

Press **S** to set the XY location of the first pin.

To digitize the last pin, press the **End** key. The pin number will change to the last pin of the component.

Use the arrow keys or trackball to position the center of the camera image cross hair directly over the center of the LAST pin.

Press **S** to set the XY location of the last pin.

To set the XY locations of the other pins automatically, press **A** (set All). The program will calculate the locations of the other pins.

SIP TEACH - Individual pins

It is also possible to digitize one pin at a time. This may be necessary if a S package was specified for a transistor for example. If the transistor pins are not equally spaced in a single row then do not use the above method to digitize the pin locations.

To do one pin at a time for a SIP package, digitize the first location. Remember to press S or click the LEFT trackball button to set it.

Press **N** to increment the pin number. Use the arrow keys or trackball to position the center of the camera image cross hair directly over the center of this pin. Press **S** to set it.

Repeat the above procedure until all the pins are done.

DIP TEACH - Package type D

When specifying package type D in the EDIT COMPONENT screen, the XY teach procedure will require the user to teach the XY locations of the component pins of a Dual-Inline-Package. This package has pins in two rows. The default pin to pin spacing is 100 mils. The default row to row spacing for 8,14,16,18 and 20 pin components is 300 mils.

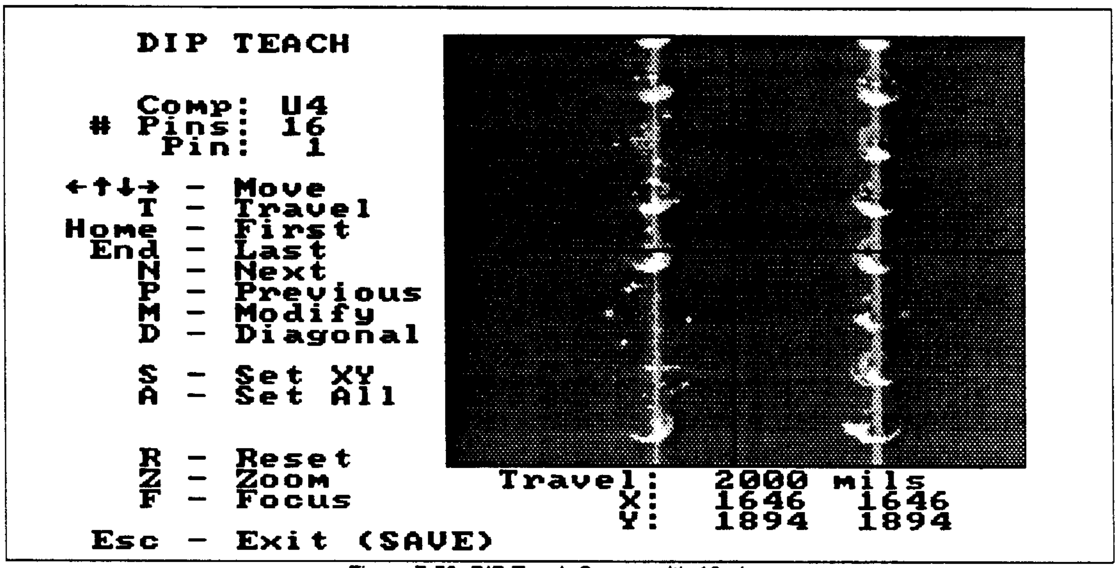


Figure 7-56. DIP Teach Screen with 16 pins.

To enable the program to calculate the individual pin XY locations, the FIRST, LAST and DIAGONAL pin locations need to be set.

Some boards indicate the first pin by a square solder pad instead of the round pads for the other pins.

The last pin location is always opposite the first pin.

The diagonal pin is the pin diagonally across from pin 1. For example, for a 16 pin component, the diagonal pin is 9. For a 24 pin component, the diagonal pin is 13 and so on.

SETTING UP LOCATION DATA FOR A DIP IC

For Dual Inline Package ICs, the following procedure makes it easy to set up the location data of all the pins.

FIRST PIN

Position the camera head center over the first pin of the IC. Adjust the Travel setting and press the appropriate cursor keys so that the image of the IC appears on the screen. If you are probing the solder side of the board, the first pin is often a square solder pad. Use the trackball to "fine tune" into the center of the pad. Pressing the LEFT trackball button once will set the first pin location data. Pressing S will also do this.

Notice that the next suggested key to press is highlighted in white. This serves only as a guide.

LAST PIN

Press the END key if the first pin is done. Notice that the Travel setting is now changed and the pin number changed to the last pin. If the default Travel distance is incorrect press T and set the new Travel distance.

Press the cursor key which points to the last pin of the IC.

Press **S** if you want to set it or rotate the trackball until the trackball cursor is positioned over the center of the last pin and click the LEFT trackball button.

Notice that **D** is now highlighted in white.

DIAGONAL PIN

Press **D** and notice that the Travel distance has changed and the pin number has changed to the diagonal pin (diagonal pin = Total number of pins /2 + 1). Just press the appropriate cursor key which points to the diagonal pin.

Press **S** to set it or use the trackball for fine adjustments.

Notice that **A** is highlighted in white.

To set the XY locations of the other pins automatically, press **A** (set All). The program will calculate the locations of the other pins.

Press **Esc** to exit the DIP TEACH screen and press **Y** to save the data.

Quick summary of DIP TEACH.

1. Locate and move cursor to pin 1.
2. Press **S** to set it
3. Press **END** for the last pin.
4. Press the appropriate cursor key which points to the last pin.
5. Press **S** to set it.
6. Press **D** for the diagonal pin.
7. Press the appropriate cursor key pointing to the diagonal pin.
8. Press **S** to set it.
9. Press **A** to set the remaining pins automatically.
10. Press **Esc** to exit and press **Y** to save the data to hard disk.

MULTI TEACH - Package type M

When specifying package type M in the EDIT COMPONENT screen, the XY teach procedure will require the user to teach the XY locations of the component pins of the following types of IC packages: Pin-Grid-Array (PGA), Plastic-Leaded-Chip-Carrier (PLCC), Leadless-Chip-Carrier (LCC), Quad-Flat-Package (QFP), or Plastic-Quad-Flat-Package (PQFP).

Pin-Grid-Array

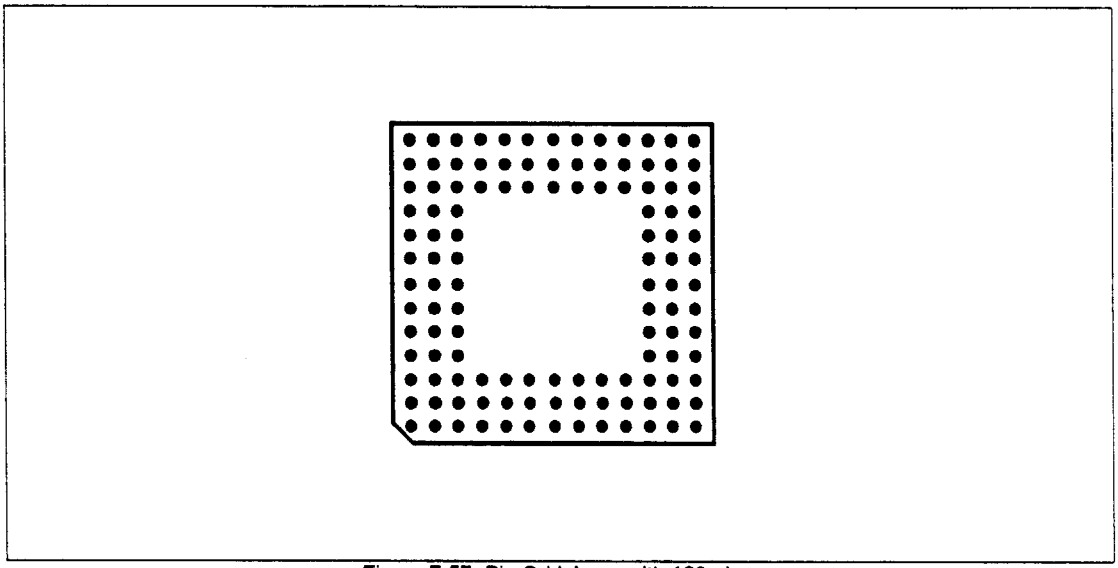


Figure 7-57. Pin Grid Array with 120 pins.

The only physical access to the pins of this type of package is at the solder side of the board. The most common spacing between pins is 100 mils. Although the 5100DS can test components with a maximum of 64 pins, this package can be divided into four sub-components like U1-1, U1-2,U1-3 and U1-4 to bypass the 64 pin limitation. Although this appears to be complicated, it does enable the RP388 to test all of these components without the need for any custom fixturing like a bed-of-nails. Also, test clips simply do not exist for PGAs since there is no top side access to the pins.

MULTI TEACH has a unique way to set the XY locations of the pins of PGAs without doing every pin one at a time.

The following example will show you how to setup the XY locations of a 120 pin PGA.

In the EDIT COMPONENT screen, you will TEACH four components with package type = M.

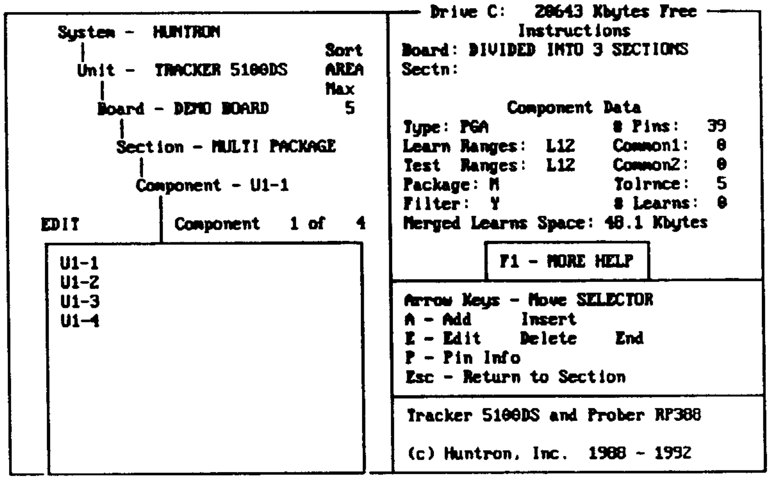


Figure 7-58. EDIT Component with Package Type = M.

Enter U1-1 and U1-2 to consist of 39 pins each and specify package type M. The Common will remain 0.

Enter U1-3 and U1-4 to consist of 21 pins each and specify package type M.

Highlight U1-1 in the EDIT COMPONENT screen and press ↵ to get to MULTI TEACH.

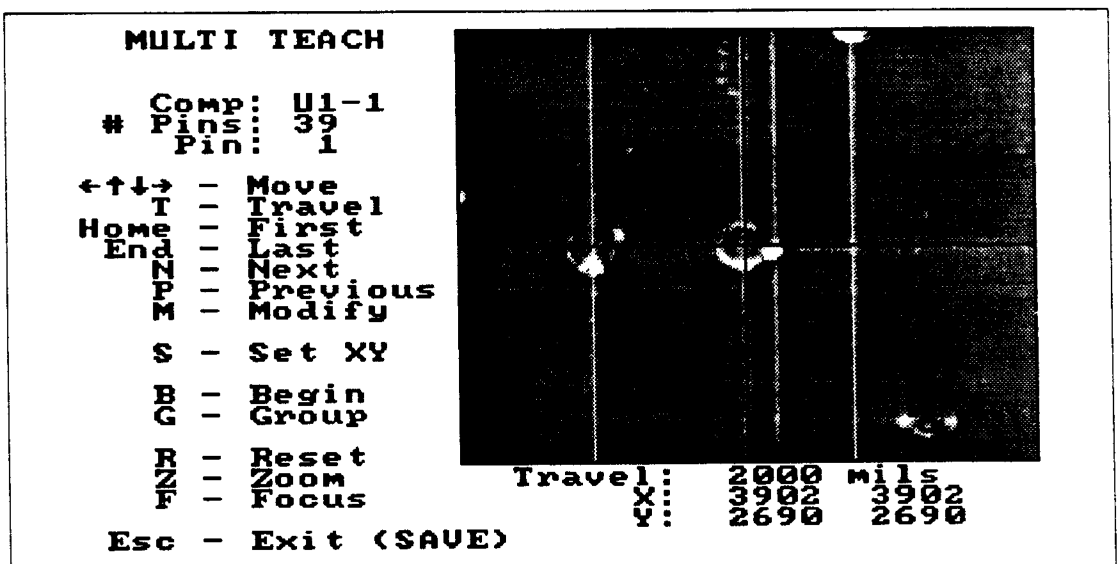


Figure 7-59. TEACH XY Component Screen in MULTI mode.

MULTI TEACH requires you to do one row at a time. Notice that U1-1 has three rows, each consisting of 13 pins. You will have to document your internal pin numbering system which should specify which is the first pin of each row. Use PIN INFO pin names to identify the number of each pin.

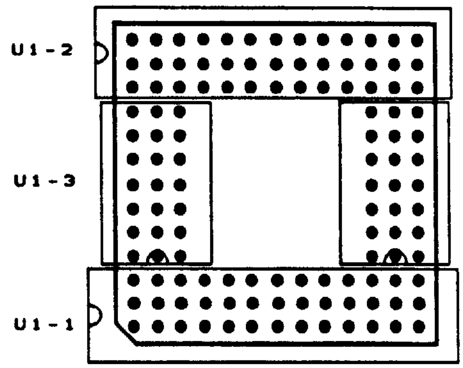


Figure 7-60. PGA Showing Four Components and Pinouts.

The MULTI TEACH options are the same as described in previous chapters for STORE ALIGN, SIP TEACH and DIP TEACH except for the following keys. Do not press these keys yet. A detailed procedure will guide you to setup the all the pins of U1 in the next section.

Item	Action
B - Begin	Pressing the **B** key will inform the program that you are setting up the first pin of a row.
G - Group	Pressing G sets that pin as the last pin of a row of pins. The program will prompt you to type in the number of pins in that row. The other pin XY locations are then automatically calculated.

The following describes the MULTI TEACH procedure for a 120 pin PGA component which was created as four "sub-components" as described above.

SETTING UP U1-1

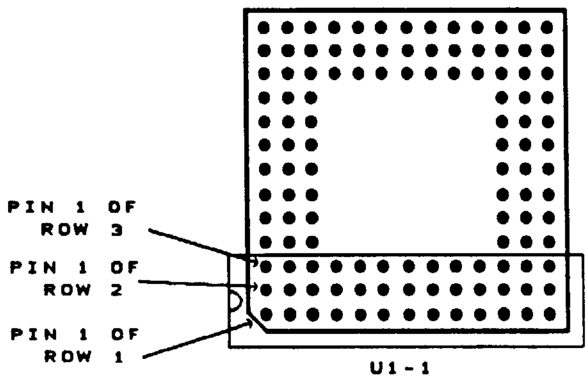


Figure 7-61. PGA - U1-1 Pin 1 of Rows 1, 2 and 3.

1. Move the camera head to the first pin of row 1 as indicated below. Press **B** to set the first pin of row 1. You have now provided the XY data for the first pin of the first row.

2. Move the camera head to the last pin of the first row.

   Press G to set the last pin of the first row. Enter the number of pins in that row (e.g. 13) and press ↵. The first row pin locations are now automatically calculated. Notice that the pin number now changes to 14.

3. Move the camera head to the first pin of row 2 and press **B** to set it.

4. Move the camera head to the last pin of row 2. Press G and type in the number of pins (e.g. 13) and press ↵. Row 2 is now done. Notice that the pin number changes to pin 27.

5. Move the camera head to the first pin of row 3. Press **B** to set it.

6. Move the camera head to the last pin of row 3. Press G and type in the number of pins (e.g. 13) and press ↵. Row 3 is now done. Notice that the pin number changes to pin 39.

Press Esc and press Y to save the information. U1-1 is now done.

SETTING UP U1-2

The procedure is the same as U1-1. Take special notice of where the first pin of each row is.

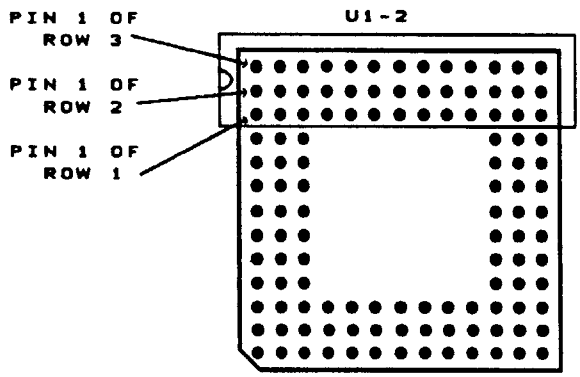


Figure 7-62. PGA - U1-2 Pin 1 of Rows 1, 2 and 3.

SETTING UP U1-3

Take special notice of where the first pin of each row is. Notice that there are only seven pins per row.

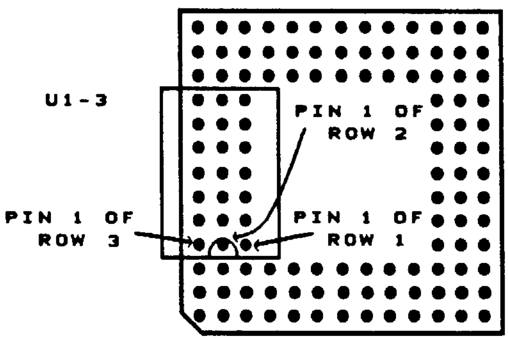


Figure 7-63. PGA - U1-3 Pin 1 of Rows 1, 2 and 3.

SETTING UP U1-4

The procedure is the same as U1-3. Take special notice of where the first pin of each row is.

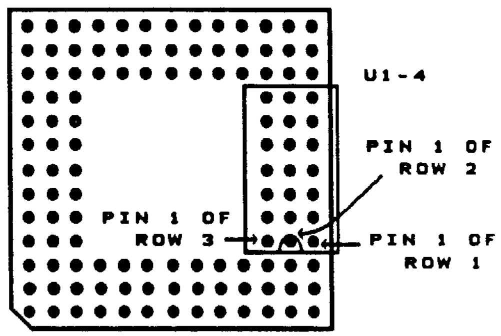


Figure 7-64. PGA - U1-4 Pin 1 of Rows 1, 2 and 3.

U1 is now complete. Although this seems like a tedious process, it is still the most generic way of setting up PGAs because there are so many different pin configurations available.

FRONT TEACH - Package type F

This mode is designed for use with the 5100DS front panel connectors. The pins are scanned from left to right on the front row of pins only (32 pins maximum). The Teach mode works the same as the SIP mode. This package should be used when this type of scanning will be required when testing with the 5100DS.

BOTH TEACH - Package type B

This mode is designed for use with a connector with specific pin number orders. The pins are divided into rows numbered left to right on the front row and left to right on the back row. A **B** package must have an even number of pins. The Teach mode works like the DIP Teach mode but the positions of the end and diagonal pins are reversed.

7-15. Z TEACH

The Z Axis mechanism has the following components which are essential to the RP388:

- Camera Head - this is a camera system mounted on the left side of the Z Axis mechanism.
- Light source - this is the bright red LED source.
- Probe tip - this is the moveable, spring loaded test pin which makes contact with the test point on the board.

The camera head position is only relevant when teaching the XY positions of a test point.

The X direction is the movement from left to right and vice versa.

The Y direction is the movement from front to back and vice versa.

The Z direction is the vertical up/down movement of the probe tip.

The Z Teach window allows the user to setup the vertical up/down distances that the probe tip must move in order to make contact with the test point and to clear any vertical obstacles when moving from pin to pin.

This window always appears on new sections after the first XY Teach of a component is done. The other components of the section will have their Z locations default to the first component's Z data. However, it is still possible to change the Z data for any component by pressing Alt+Z. The Z Teach window will appear for that component.

BOARD SLOTS

These are the three slots on each side wall of the RP388. These slots will grab at least one edge of the board.

The TOP, MIDDLE and BOTTOM slots are shown below:

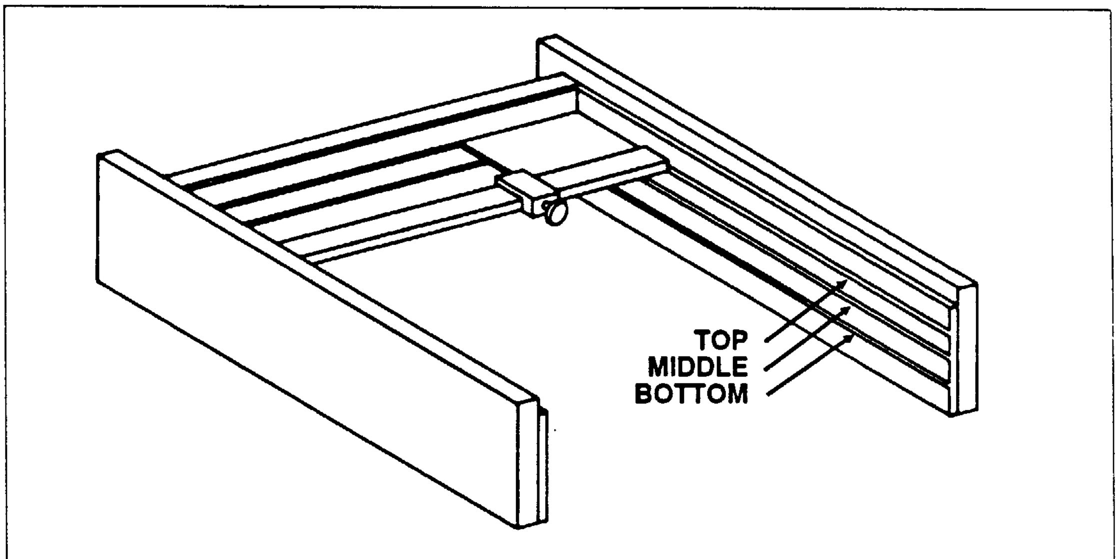


Figure 7-65. Prober Slots - TOP, MIDDLE and BOTTOM.

The maximum travel of the probe tip is the distance between the uppermost probe position and the vertical position of each of these slots. This is setup in the camera offset procedure.

Recall that the slot position is selected in the EDIT SECTION screen.

The following screen will appear after the first component's XY data is setup or when **Alt+Z** is pressed.

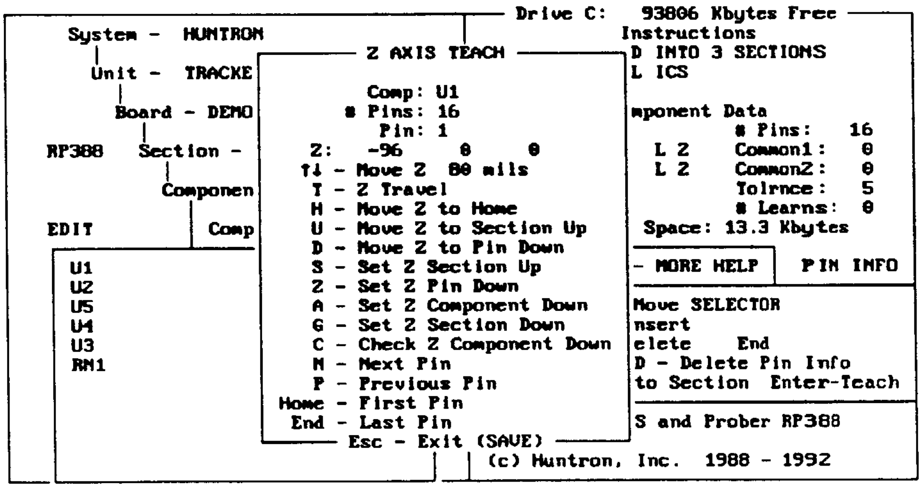


Figure 7-66. Z TEACH Screen.

Item	Description
Comp	Refers to the current component whose Z positions need to be setup.
# Pins	The total number of pins in this component.
Pin	Refers to the current pin whose Z position needs to be setup.
Z: 0 0 0	There are three numbers in the Z field. The first number is the current position of the probe tip in mils. The second number is the stored DOWN position of the probe tip in mils. The last number is the stored UP position of the probe tip in mils.
↑ ↓ Keys	Move the probe tip 80 mils (2.03mm). Pressing the ↑ or ↓ key will move the probe tip 80 mils (2.03mm) in that direction. This only moves the probe tip. It does not set the Z position of the probe tip.
T	Modify the Z travel in increments of 8, 40, 80 or 160 mils (0.203, 1.02, 2.03 or 4.06 mm respectively).
H	Move Z Home - the Z Home position is the uppermost position of the probe tip. This position is automatically set by the RP388. Pressing **H** moves the probe tip all the way UP.
U	Move Z to Section Up - the Section Up position is a position defined by the user which is between the DOWN position of the slot and the Z Home position. In the Tutorial of Chapter 6 this position is often referred as the Up position. The probe tip will move to this position when a pin TEST/LEARN is done. Therefore, the probe tip does not move to the Z Home position after the 5100DS records the signature. This reduces the overall test time. Pressing **U** will move to an already setup UP position. If this is not set, the UP position will default to the Z Home position.

Item	Description
D	Move Z to Pin Down - the Down position is that position which enables the probe tip to make good contact with the test point. The default Down position is the slot position. Pressing **D** will move the probe tip to an already setup DOWN position.
S	Set Z Section Up - pressing **S** will set the UP position for all the components of that section. However, you will first have to move the probe tip to that desired position and then set it with the **S** key. This position would be the vertical position on the board which clears all vertical components so that when the probe tip is moving from one pin's location to another, no component will interfere with it.
Z	Set Z Pin Down - pressing **Z** will set the Down position for that pin only. The Down position is that probe tip position where it makes a good contact with the test point. In most cases the Down position for all the pins of that component will be the same, especially when the solder side of the board is being tested.
A	Set Z Component Down - pressing the **A** key will set the Down position of all the pins of that component. This is the quickest way to set the Down positions. Also, this key will override all other previously setup Z Down positions for this component. If you want to set the Z down position of pin 10 for example, which is higher than the other pins of that component, first set the Z Down position with **A**. Then modify pin 10 and press **Z** to set the new position of pin 10 only. The only way to get to pin 10 is to press **N** for next pin until pin 10 is displayed.
G	Set Z Section Down - there may be instances when after setting up all the section component's Z positions, you may want to change the Z positions globally so that the new positions apply to every component. Pressing **G** allows you to do this. First use the **S** and **A** keys to set the Down and Up positions respectively. Then press **G** to modify all the other component's Z positions. A warning will appear before the changes occur. This feature avoids the tedious task of changing the Z positions one component at a time.
C	Check Z Component Down - pressing **C** will move the probe tip to the Down position. It will stay down for a brief period and will then go to the Up position. The pin number will be incremented and the probe tip will move to the next Z Down position. No signatures are actually recorded. This feature allows you to check the XY and Z positions of all the pins of that component.
N	Next Pin - pressing **N** will increment the pin number and move the probe tip to the XY position of that pin.
P	Previous Pin - pressing **P** will decrement the pin number and move the probe tip to the XY position of that pin.
Home	First Pin - pressing the **Home** key will set the pin number to 1 and will move the probe tip to the XY position of that pin.
End	Last Pin - pressing the **End** key will set the pin to the last pin of that component and will move the probe tip to the XY position of that pin.
Esc	Exit (SAVE) - pressing the **Esc** key will exit the Z AXIS TEACH window and will prompt you to save the data. Pressing **Y** will save the data. Pressing N will leave the Z data unchanged.

All the other component pin Z locations will default to that of the first component. Press **Alt+Z** if the current component requires different down setting than the previous component.

NOTE

If the probe tip is changed, select MAINT at the Main menu and then select O - Camera Offsets. Set the offsets for at the slots.to be used. This will adjust for any changes in the position and length of the probe tip.

GLOBAL Z MODIFICATIONS

The simplest way to change the Z data for all the components is to press **Alt+Z** when the first component of the section is highlighted at the EDIT COMPONENT screen.

1. The Z Teach pop-up window will be displayed.
2. Use the ↑ and ↓ keys to position the probe tip.
3. Use the **S** key to set the Up position for all the components of the section.
4. Use the ↑ and ↓ keys to position the probe tip.
5. Use the **G** key to set the Down position for all the components of the section.

7-16. GLOBAL CHANGE

The GLOBAL CHANGE, **Alt+C** allows you to change component data settings for an entire section. This is useful for cases where a lot of data was entered incorrectly. Let's say you wanted a Test Tolerance of 15 for all components in a section but you forgot to change the tolerance for the first component (left it set to the default, 5) and then used **Alt+B** (Build) to duplicate that first component's data multiple times. **Alt+C** can change every 5 to a 15 with a few keystrokes. Another example of the usefulness of this feature is the conversion of 5100DS based data to Prober RP388 data, especially when the 5100DS data has common pins that are not set to zero and you want to use the RP388 which needs (in it's simplest configuration) all common pins set to zero so that a discrete lead can be clipped to a common point on the board to be tested.

The changes caused by **Alt+C** are permanent unlike the **Alt+Q** quick change which does a temporary change of component test parameters for the current test. The following figure shows the GLOBAL CHANGE pop-up window that is activated by **Alt+C** at the section level of EDIT.

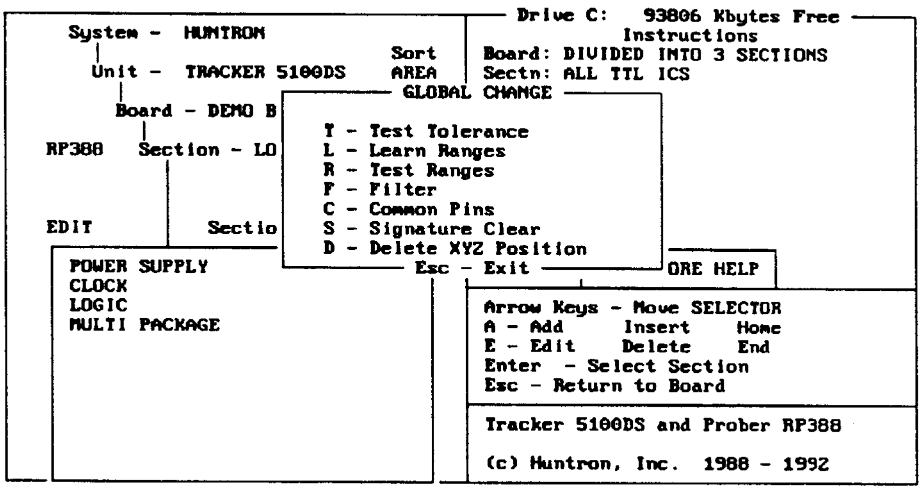


Figure 7-67. Global Change Pop-up Window.

An important factor when making these changes is that your signature data will usually have to be deleted. This is because the component data affects the way signatures are gathered so that when a change is made the existing learned signature data is no longer valid. When you select one of the GLOBAL CHANGE options of that causes signature deletion, you will be prompted with several warnings of what is about to happen before the changes and deletions actually occur.

The following paragraphs summarize what you can do with **Alt+C**:

PIN INFO AND "*"

If components have an "*" (or PIN for range) in one or more of their data fields so that the PIN INFO file normally controls the setting per pin, the "*" is changed to the global value you enter. The PIN INFO file is not deleted however; it can still be used again by editing any setting back to an "*". If **Alt+C** is used to change a setting back to an "*", then any components in the section that do not have PIN INFO files will have them automatically generated.

TEST TOLERANCE

This allows you to change the test tolerance for all components in a section to a value between 0 and 99. Signature data is not affected.

LEARN RANGES

The learn ranges for all components in a section can be changed to L12, L12H or PIN. Any changes to the learn ranges on a component that has been learned will cause signature data to be deleted (after warning messages). If necessary, any test range settings of (H)igh will be changed to Med (2) in the Component Data or PIN INFO files.

TEST RANGES

The test ranges for all components in a section can be changed to any combination of ranges provided that each range has been learned for all the components. For example, if a section has three components which have learn ranges of L12H, L12 and 12H, you can globally change the test ranges to "1" or "2" or "12". Including "L" or "H" will result in an error since all three components were not learned in those ranges. You then have a choice of aborting the change or making the change on only those components that have valid learn ranges for the change. Signature data is not affected.

FILTER

You can change the filter setting for all components in a section to (Y)es or (N)o. If a component has a different setting (including "*") than what the section is being changed to, the signatures of that component will be deleted (after warning messages).

COMMON PINS

All common pin settings in a section can be set to zero by using this selection. If no common pins is a change from what a component was learned with, the signature data will be deleted (after warning messages).

SIGNATURE CLEAR

This allows you to keep all the Component Data and PIN INFO entered in the EDIT mode while deleting all learned signature data (after warning messages). The number of learns will be set to zero for all components in the section.

DELETE XYZ POSITION

When a Prober RP388 is in use, you can delete all the stored XYZ locations for the board including alignment points and component pin locations.

7-17. IMPORT

The IMPORT feature is designed to eliminate the data entry required to build board tests for the 5100DS and to automate XY test point programming for the RP388. This is done by importing a Huntron ASCII CAD (*.HNT) file (e.g. BOARD.HNT) into the 5100DS/RP388 database. Huntron ASCII CAD files must be created using a third party utility, or a utility developed by the user. See the sections entitled "COMPONENT FORMAT - HUNTRON ASCII CAD SAMPLE FILE" and "NET FORMAT - HUNTRON ASCII CAD SAMPLE FILE" later in this chapter for the format specifications of Huntron ASCII CAD files. The section entitled "THIRD PARTY UTILITY DEVELOPMENT VENDORS" gives names of ASCII translator vendors.

Huntron ASCII CAD files are imported to create 5100DS/RP388 databases in two formats: COMPONENT and NET. With the COMPONENT format, a component is created for each of the components in the CAD file (zero-pin components and one-pin components such as mounting holes are omitted). This database structure is similar to the normal way the 5100DS/RP388 system is used (i.e., each pin of each component is tested). If the NET format is used, the database that is created will test only one pin per net (node). The number of separate nets is divided by 64 (e.g., a board with 150 nets will have two components with 64 pins and one component with 22 after a NET import). NET format also appends a cross-referenced net list to the BOARD.DOC file which is accessible by pressing the F3 key. See the section entitled "HUNTRON ASCII CAD FILE DESCRIPTION" later in this chapter for creating COMPONENT and NET CAD files. The align screens and the component level allow the user to view all the test point locations on the board. Alignment points are highlighted to help locate them quickly.

In the 5100DS/RP388 database, the connection hardware is selected at the section level. This accessory creates a section of the imported components, so the user must select 5100DS or RP388 connection hardware before importing. This selection affects the component package types. When RP388 is selected, all components are created with an 'M' (multi-sided) package type for maximum flexibility. When 5100DS is selected, the component package types are controlled by the COMPONENT / NET format setting. With COMPONENT format, components are created with 'D' (DIP), 'S' (SIP) and 'P' (Probe) packages, based on the number of pins. Components with an even number of pins greater than 4 will be DIPs. Components with an odd number of pins greater than 4 will be SIPs. All other components with be Multi. All components are created with 'P' packages for the NET format.

Each time an Huntron ASCII CAD file is imported, a section of a board is created. This allows for both net and component tests to be generated for the same board. This also allows the adding of an imported section to an existing board. Since only XY locations are imported into an RP388 section, the Z Up and Down positions must be set for the section. Some pin locations may need to be adjusted due to the mounting of components on the board.

After the conversion of the board is complete, a board that is known to be good is mounted in the RP388. The board is then aligned and realigned to establish the location of the test points with respect to the RP388. Then the Z Up and Down positions are established for that section of the board.

IMPORTING A HUNTRON ASCII CAD FILE

1. Start the 5100DS/RP388 software by typing "**51DS**" ↵.

2. Log on with user name and password.

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

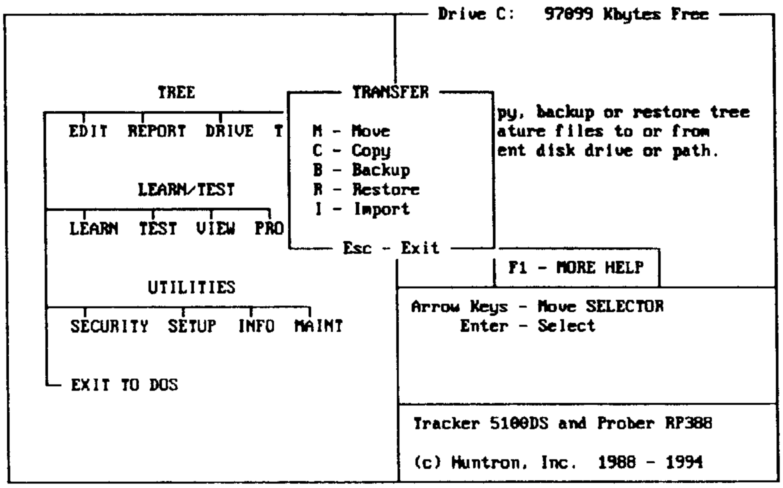


Figure 7-68. TRANSFER Screen.

4. Press **I** to access IMPORT. At the IMPORT board selection screen, choose a board for section import and press ↵. If the board does not exist yet, go to the Edit mode and ADD the board first.

5. The IMPORT path / file entry pop-up window will appear. Enter the full path of the *.HNT file to be imported, including drive, path, file name and extension (e.g., C:\CAD\PCB.HNT) and press ↵. Huntron ASCII CAD files must be created using a third party or user-developed utility. See the sections entitled "COMPONENT FORMAT - HUNTRON ASCII CAD SAMPLE FILE" and "NET FORMAT - HUNTRON ASCII CAD SAMPLE FILE" later in this chapter for the format specifications of Huntron ASCII CAD files. The section entitled "THIRD PARTY UTILITY DEVELOPMENT VENDORS" gives names of ASCII translator vendors.

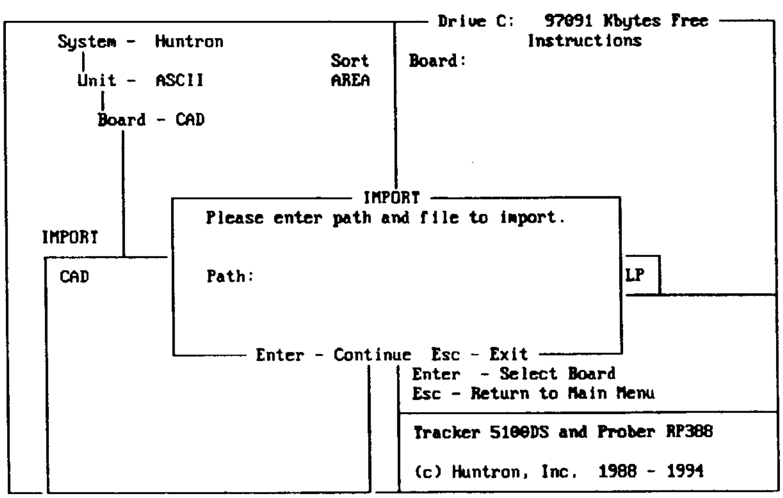


Figure 7-69. IMPORT Enter Path Pop-up Window.

6. The IMPORT SELECTION pop-up window will appear as shown in the next figure.

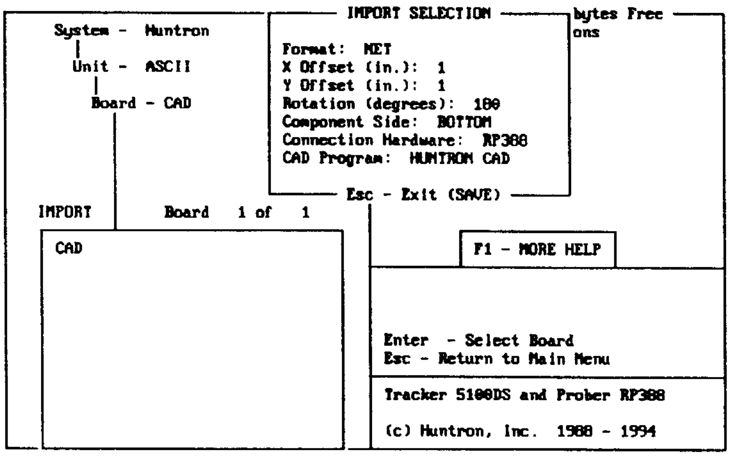


Figure 7-70. IMPORT Selection Pop-up Window.

7. Select the Connection Hardware (5100DS or RP388) using the ← or → keys (i.e.,these instructions assume you have selected RP388).

8. Select the HUNTRON CAD program using the ← or → keys.

NOTE

The other information in the IMPORT SELECTION pop-up window is displayed from the *.HNT file.

9. Press **Esc**, then **Y** to save and start the import process.

10. During the import you will see a "Please wait..." message. The time to import a board varies with the size and complexity of the board and the speed of the computer you are using. A simple board like the Huntron Demo Board can take one minute on a 486 computer. Large boards could easily take 5 minutes or more.

11. The "Import has been completed" pop-up window will appear. Press **Esc** to return to the Import Board Selection screen and then **Esc** to return to the Main menu.

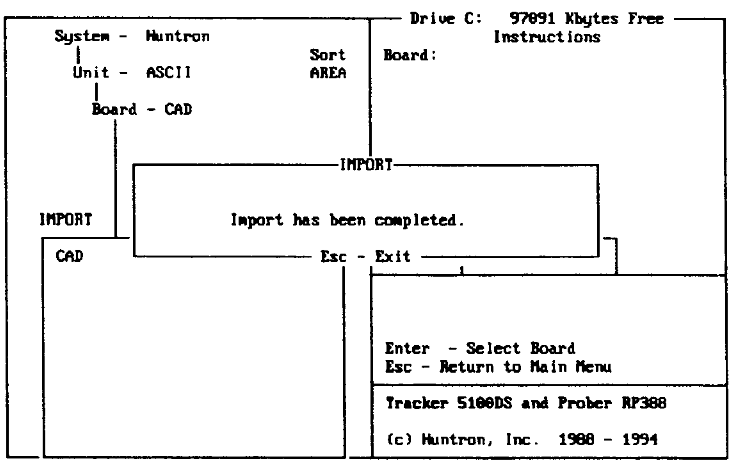


Figure 7-71. IMPORT Completed Pop-up Window.

12. Press **E** to select EDIT mode, and then select the board with the imported section.

13. If the *.HNT file was created in NET format, press **F3** to see the net list. Press **Esc** to exit. Press ↵ to get to the section level.

```
BOARD TEXT

NET LIST FOR SECTION:  NET 1

COMP.  PIN  NET        NODES
--------------------------------------------------------------------

CMP001 1    UN1        R2-2
CMP001 2    UN2        C6-2
CMP001 3    UN3        U7-1        SW4-8
CMP001 4    UN4        R17-1       SW4-15
CMP001 5    UN5        D5-2        SW4-14
CMP001 6    UN6        R16-1       SW4-13
CMP001 7    UN7        R18-1       SW4-11
CMP001 8    UN8        R19-1       SW4-9
CMP001 9    UN9        D6-1        SW4-10
CMP001 10   UN10       D6-2        C10-1
CMP001 11   UN11       U7-2        R11-2       R10-2       C8-2
CMP001 12   UN13       U7-3        R12-2
CMP001 13   UN14       R10-1       U7-6
CMP001 14   UN15       R13-1       U8-6
CMP001 15   UN16       U8-2        R14-2       R13-2       C9-2
CMP001 16   UN17       U8-3        R15-2       SW4-7

↑, ↓, PgUp, PgDn, Home, End, Esc-Exit
```

Figure 7-72. Sample Netlist Screen.

14. Select the section that was created from the imported CAD data (e.g., COMP1 for component format or NET1 for Net format). Press **E** to edit the section if the slot needs to be changed. Imported sections default to the top slot.

15. Press ↵ to get to the component level. The component level will have all the components that were imported.

16. Press **Alt+H** to align the board. Follow the instructions to mount the board in the RP388, and then press ↵ to continue.

17. The ALIGN screen appears and the RP388 will move to the vicinity of Alignment Point #1 (AP #1). Press **V** to see the layout of the test points with the alignment points highlighted.

18. At this point you must determine where the alignment points are on the physical board. When you have done that, press **Esc** to exit from View PCB.

19. Use the arrow keys or the trackball to move the camera image until it is centered over AP #1.

20. Press **S** to set the point if you are using the arrow keys. The trackball sets the point when the left button is pressed.

21. Press **End** to move to AP #2.

22. Use the arrow keys or the trackball to move the camera image until it is centered over AP #2.

23. Press **S** to set the point if you are using the arrow keys.

24. Press **Esc**, then **Y** to save these points.

25. The REALIGN THE BOARD pop-up window will appear. Press **Y** to realign. This will change all of the pin locations to reflect the placement of the board so that only minimal adjustments are needed for alignment.

26. The STORE ALIGN screen will appear and the RP388 will move to the AP #1 that was set above. Without moving the cursor, press **S** to set the point.

27. Press **End**. The RP388 will move to the AP #2 that was set above.

28. Press **S** to set the point for this mode.

29. Press **Esc**, then **Y** to save these points.

30. Press **Alt+Z** to activate Z Axis Teach.

31. Move the probe tip down to a point higher than the tallest component on the board. Test times will be faster if the probe is closer to the board, but it must be able to pass over all of the components.

32. Press **S** to set Z Section Up, and ↵ to continue.

33. Move the probe down until it makes good contact with the component pin on the board.

34. Press **G** to set Global Section Down, and ↵ to continue.

35. Press **Esc**, then **Y** to save the Z information.

NOTE:
Use Alt+Z to adjust the Z Down settings of other components if necessary.

This completes the instructions for importing a CAD file into the 5100DS/RP388 database.

The program sets the Learn ranges to "L12H" and the Test ranges to "???" (auto range). These settings may not be appropriate for your board. If the ranges need to be changed, make global changes by pressing **Alt+C** at the section level. Components can be edited individually if range requirements vary. After making necessary changes, follow the directions in sections 5-8 and 5-9 (for the 5100DS), or sections 6-10 and 6-11 (for the RP388) for learning and testing the board.

HUNTRON ASCII CAD FILE DESCRIPTION

IMPORT can read two types of Huntron ASCII CAD files. These files are Carriage-Return Line-Feed <CR/LF> delimited files. The indented lines use the TAB character. The sample file information in parenthesis should not be included in an actual Huntron ASCII CAD file.. The lines marked "Value not used" are for possible future use, but must be included in the file. Use full names in lines marked with a limited number of characters, because future versions may support longer names. The file should be broken into two sections if some components on each side can only be accessed from one side of the board. The TEST LAYER lines separate these sections.

The X and Y pin locations will be rounded down to an even number because the RP388 moves in two mil (0.002 inch or 0.051 mm) increments. Locations beyond the probing area of the RP388 will not be reached (this includes negative locations). The RP388 will move as far as it can and then lower the probe. The maximum travel limits of the RP388 are 12,350 mils (313.69mm) in the X direction and 13,410 mils (340.61 mm) in the Y direction. These limits do not account for the camera offsets or the offsets created by alignment when the board is placed in the RP388. If the board is rotated or offset prior to importing, make sure the locations are within the limits. When setting up a board for testing the bottom side of the board, make sure the pin locations are set up looking at the board from the bottom side. Most CAD packages use bottom side pin locations looking through the top side of the board. If this is the case, the pin locations must be mirrored to allow correct probing of the bottom side of the board. If the file is divided into two TEST LAYERs, mirror only the BOTTOM SIDE section. In most cases, thru-hole components should be placed in the opposite test layer from where they are mounted. Surface mount components should be placed in the test layer where they are mounted.

IMPORT COMPONENT FORMAT

The COMPONENT format contains a block of information about each component, with a group of lines describing each pin. In order to use the CAD data with an RP388, the user must know where the Alignment Points (AP) are located. The COMPONENT format uses the first pin of the first component as AP #1 and the last pin of the last component as AP #2. The pins should be listed in numeric order. The components will be tested in the order they are listed in the file. Some type of sorting may be required to minimize test times.

COMPONENT FORMAT - HUNTRON ASCII CAD SAMPLE FILE

```
BOARD NAME : full path of source file  i.e. C:\CAD\BOARD.DAT (Value not used)
BOARD ROTATION : 0, 90, 180 or 270 degrees (used for display purposes)
BOARD OFFSET : x offset : y offset (used for display purposes)
TIMESTAMP : time                        (Value not used)
DATESTAMP : date                        (Value not used)

TEST LAYER : TOP_LAYER                  (Side of board for testing section)
COMPONENT NUMBER : 1                    (Start of component block, value not used)
REFERENCE DESIGNATOR : R1               (Right most six characters used)
PACKAGE : R5                            (Value not used)
TYPE : 100K                             (Left most fourteen characters used)
NUMBER OF PINS : 2                      (More than 64 pins creates multiple components)
COMPONENT ROTATION : 180                (Value not used)
COMPONENT SIDE : TOP                    (Value not used)
        PIN NAME : 1                    (Left most three characters used)
        NET NAME : NET1                 (Value not used)
        PIN POSITION : 1279 : 1038      (X and Y in mils)
        PIN ACCESS : ALL                (Value not used)
        PIN DRILL : 37                  (Value not used)
        PIN NAME : 2                    (Left most three characters used)
        NET NAME : NET2                 (Value not used)
        PIN POSITION : 1279 : 1638      (X and Y in mils)
        PIN ACCESS : ALL                (Value not used)
        PIN DRILL : 37                  (Value not used)
ENDCOMP                                 (End of component block)
COMPONENT NUMBER : 2                    (Start of component block, value not used)
REFERENCE DESIGNATOR : C1               (Right most six characters used)
PACKAGE : C2                            (Value not used)
TYPE : 100MFD                           (Left most fourteen characters used)
NUMBER OF PINS : 2                      (More than 64 pins creates multiple components)
COMPONENT ROTATION : 180                (Value not used)
COMPONENT SIDE : TOP                    (Value not used)
        PIN NAME       : 1              (Left most three characters used)
        NET NAME       : NET1           (Value not used)
        PIN POSITION : 1279 : 1038      (X and Y in mils)
        PIN ACCESS : ALL                (Value not used)
        PIN DRILL : 37                  (Value not used)
        PIN NAME       : 2              (Left most three characters used)
        NET NAME       : NET2           (Value not used)
        PIN POSITION : 1279 : 1138      (X and Y in mils)
        PIN ACCESS : ALL                (Value not used)
        PIN DRILL : 37                  (Value not used)
ENDCOMP                                 (End of component block)
```

TEST LAYER : BOTTOM_LAYER	(Side of board for testing section)
COMPONENT NUMBER : 3	(Start of component block, value not used)
REFERENCE DESIGNATOR : R2	(Right most six characters used)
PACKAGE : R5	(Value not used)
TYPE : 10K	(Left most fourteen characters used)
NUMBER OF PINS : 2	(More than 64 pins creates multiple components)
COMPONENT ROTATION : 180	(Value not used)
COMPONENT SIDE : BOTTOM	(Value not used)
PIN NAME : 1	(Left most three characters used)
NET NAME : NET1	(Value not used)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN ACCESS : BOTTOM	(Value not used)
PIN DRILL : 37	(Value not used)
PIN NAME : 2	(Left most three characters used)
NET NAME : NET2	(Value not used)
PIN POSITION : 1279 : 1138	(X and Y in mils)
PIN ACCESS : BOTTOM	(Value not used)
PIN DRILL : 37	(Value not used)
ENDCOMP	(End of component block)
COMPONENT NUMBER : 2	(Start of component block, value not used)
REFERENCE DESIGNATOR : C2	(Right most six characters used)
PACKAGE : C2	(Value not used)
TYPE : 1MFD	(Left most fourteen characters used)
NUMBER OF PINS : 2	(More than 64 pins creates multiple components)
COMPONENT ROTATION : 180	(Value not used)
COMPONENT SIDE : BOTTOM	(Value not used)
PIN NAME : 1	(Left most three characters used)
NET NAME : NET1	(Value not used)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN ACCESS : BOTTOM	(Value not used)
PIN DRILL : 37	(Value not used)
PIN NAME : 2	(Left most three characters used)
NET NAME : NET2	(Value not used)
PIN POSITION : 1279 : 1138	(X and Y in mils)
PIN ACCESS : BOTTOM	(Value not used)
PIN DRILL : 37	(Value not used)
ENDCOMP	(End of component block)
END	(End of File)

IMPORT NET FORMAT

The NET format contains a block of information about each net, with a group of lines describing each pin on the net. The first pin of each net will be used for testing. When using the RP388 with surface mount components it may be more effective to list a via as the first pin of a net to avoid probing component leads. If this is implemented, only list one via on the net, because they will be added to the cross-reference list. Make sure to list all pins on the net to allow component pin cross-reference generation. This list can be displayed using the F3 Board Text Key. This information may also be used in future software versions. The pins of each net will be put in the cross-reference in the order they are listed. The net format uses the first pin of the first net as AP #1 and the first pin of the last net as AP #2. The nets will be tested in the order they are listed in the file. Some type of sorting may be required to minimize test times (see Sorting Algorithm).

NET FORMAT - HUNTRON ASCII CAD SAMPLE FILE

BOARD NAME : full path of source file i.e. C:\CAD\BOARD.DAT (Value not used)
BOARD ROTATION : 0, 90, 180 or 270 degrees (used for display purposes)

BOARD OFFSET : x offset : y offset	(used for display purposes)
TIMESTAMP : time	(Value not used)
DATESTAMP : date	(Value not used)

TEST LAYER : TOP_LAYER	(Side of board for testing section)
NET NAME : NET1	(Right most six characters used)
PIN NAME : 1	(Used in cross-reference netlist)
COMPONENT : R1	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : TOP	(Value not used)
PIN NAME : 1	(Used in cross-reference netlist)
COMPONENT : C1	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : TOP	(Value not used)
NET NAME : NET2	(Right most six characters used)
PIN NAME : 1	(Used in cross-reference netlist)
COMPONENT : R2	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : TOP	(Value not used)
PIN NAME : 1	(Used in cross-reference netlist)
COMPONENT : C2	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : TOP	(Value not used)

TEST LAYER : BOTTOM_LAYER	(Side of board for testing section)
NET NAME : NET3	(Right most six characters used)
PIN NAME : 2	(Used in cross-reference netlist)
COMPONENT : R1	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 3	(Value not used)
PIN ACCESS : BOTTOM	(Value not used)
PIN NAME : 2	(Used in cross-reference netlist)
COMPONENT : C1	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : BOTTOM	(Value not used)
NET NAME : NET4	(Right most six characters used)
PIN NAME : 2	(Used in cross-reference netlist)
COMPONENT : R2	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : BOTTOM	(Value not used)
PIN NAME : 2	(Used in cross-reference netlist)
COMPONENT : C2	(Used in cross-reference netlist)
PIN POSITION : 1279 : 1038	(X and Y in mils)
PIN DRILL : 39	(Value not used)
PIN ACCESS : BOTTOM	(Value not used)

END

SORTING ALGORITHM

Some type of sorting may be required to minimize XY travel and reduce test times. The sort algorithm should use the location of each first pin for sorting data. The nets/components should be sorted starting with the upper right corner (0, 0) of the board. On boards that are broken into test sections, each section should be sorted individually.

One sorting technique is a band sort with a configurable band width. With this technique, the board would be partitioned into 1-inch bands, oriented lengthwise on the board. Select the first pin along the length (X) of the band, followed by the other pins with the same X position within the band. Then select the next pin along the length of the band, followed by the other pins with the same X position, and repeat the process until the end of the band is reached. Minimize travel distances by alternating the direction in which the components or nets are sorted within each band (i.e., sort the first band right to left, sort the second band left to right, etc.). The last band of the board should be a minimum of half the band width and a maximum of 1 1/2 times the band width. The band width in mils should be user configurable to allow optimization of the algorithm. Other algorithms may give better optimization on certain types of boards.

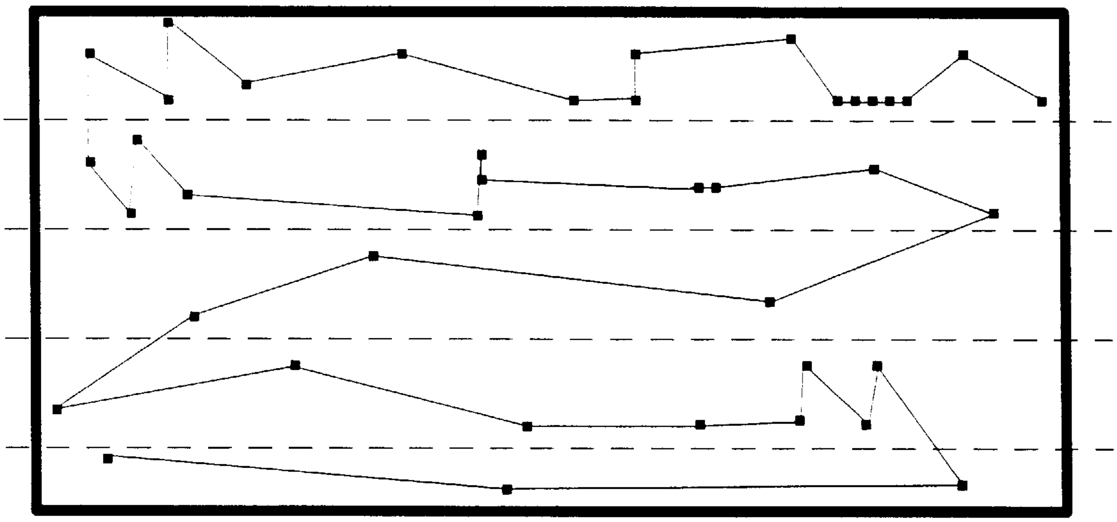


Figure 7-73. IMPORT Net Format Band Sorting Example.

THIRD PARTY UTILITY DEVELOPMENT VENDORS

Router Solutions, Inc. has developed these utilities for PCB layout CAD programs. They can be contacted at:

Router Solutions, Inc.
180 Newport Center Drive, Suite 180
Newport Beach, CA 92660
Telephone: (714) 721-1017
Fax: (714) 721-1019

or

Router Solutions GmbH
Sandbergstrasse 65
64285 Darmstadt
Germany
Telephone: (49) 061-51-63051
Fax: (49) 061-51-63053

or

Router Solutions Ltd.
Ambrose House
30/33 Milton RD.
Swindon, Wiltshire
SN1 5JA United Kingdom
Telephone: (44) 793-488-049
Fax: (44) 793-531-643

APPENDIX A
RELATED DOS COMMANDS

To use the 5100DS software, you will find it necessary to use a few DOS commands. For more information, refer to your DOS 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 root directory and the file allocation tables on a disk. You must use this command to format all new disks before 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 Chapters 2 or 3).

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.

Check static control system / wrist strap. Reset 5100DS.

Communication between the PC and the 5100DS was interrupted. Reset the 5100DS hardware by pressing **F10** or by turning the 5100DS/RP388 off, then on.

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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215K. 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 conventional memory is greater than 215 K. 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 (Maximum # of Samples).

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 /or troublesheet information will be lost.

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 lost.

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: This error is not used.

82: This error is not used.

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.

84: Board documentation file failure

The board documentation file BOARD.DOC is not present in the directory or the file has been corrupted. Check to make sure the file is present for the current board.

85: Board layout file failure

The board layout file LAYOUT.PCX or auxiliary graphics files GRAPH01.PCX, GRAPH02.PCX, GRAPH03.PCX or GRAPH04.PCX is not present in the directory or the file has been corrupted. Check to make sure the file is present for the current board.

86: Video failure

The computer is not capable of displaying the graphics file because of the video mode it was created under.

87: Expanded memory failure

Check expanded memory manager.

There is not enough expanded memory to perform the requested action.

88: Serial port buffer clear failure

Invalid serial port, port not open, or wrong protocol

Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Check for device drivers and TSRs that may affect the serial port.

89: Serial port close failure

Invalid serial port, port not open, or PS/2 interrupt conflict

Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Check for device drivers and TSRs that may affect the serial port.

90: Serial communication link with the RP388 failure

Check serial cable connections and RP388 power, reset RP388

Check the power switch on the RP388. It should be set to ON. Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Make sure the serial cable is connected to the correct port. Check for device drivers and TSRs that may affect the serial port.

91: Serial port open failure

Serial port not found, port already open, or wrong protocol

Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Check for device drivers and TSRs that may affect the serial port.

92: Serial port read failure

Invalid serial port, port not open, wrong protocol, or no data

Check the power switch on the RP388. It should be set to ON. Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Make sure the serial cable is connected to the correct port. Check for device drivers and TSRs that may affect the serial port.

93: Serial port setup failure

Invalid serial port, port not open, or wrong parameter

Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Check for device drivers and TSRs that may affect the serial port.

94: Serial port time out

Check serial cable connections and RP388 power, reset RP388

Check the power switch on the RP388. It should be set to ON. Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Make sure the serial cable is connected to the correct port. Check for device drivers and TSRs that may affect the serial port.

95: Serial port write failure

Invalid serial port, port not open, or queue full

Check the power switch on the RP388. It should be set to ON. Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Make sure the serial cable is connected to the correct port. Check for device drivers and TSRs that may affect the serial port.

96: Invalid serial port

Serial port number out of range

Check SETUP to verify the setting for the serial port. Make sure the serial port exists in your computer. Check for device drivers and TSRs that may affect the serial port.

97: Camera image failure

Check camera cable, camera board installation, and VGA compatibility

98: This error is not used.

99: Set all failure

The necessary pin coordinates are not specified

Check the help file for the pins that must be set before "Set all" can be used.

100: Cannot Z Teach if the XY coordinates are not all set.

Use XY Teach to set all of the XY coordinates.

101: Invalid alignment points

Alignment points must be more than 500 mils or 12.7 mm apart.

102: Cannot learn if the XY and Z coordinates are not all set.

Use XY Teach and Z Teach to set all of the coordinates.

103: Z coordinates must be below Z Section Up.

Make sure all pins have a Z down setting that is below the Z Section Up setting.

104: Alignment points must be ~ 0.6 "(15 mm) from the walls.

Choose alignment points that are at least 0.6" (15 mm) away from the back and right slot walls of the RP388.

105: The board side has been changed.

All section XYZ data will be lost.

106: The board slot has been changed.

All section Z data will be modified accordingly.

107: The XY data is invalid.

Check XY Camera Offsets.

108: The Z data is invalid.

In Z Teach, the Down setting is not valid for the current slot.

109: Alignment point image file failure

Make sure that there is sufficient disk space. The alignment point images for each section require 60K of space.

110: Z Down position for the entire section will be set.

All previous Z Down settings for the entire section will be lost.

111: Z up position for the entire section will be set.

The previous Z Up setting for the entire section will be lost.

112: A 'F' package was entered with more than 32 pins.

A 'F' package must have from 1 to 32 pins.

113: A 'B' package was entered with an odd number of pins.

A 'B' package must have an even number of pins.

114: Move or copy destination file failure

The destination diskette is full or unformatted.

115: Common pins per pin settings will be disabled.

Common pins per pin values are not lost.

116: Learn signatures for the entire section will be deleted.

Number of Learns for all components of the section will be set to zero.

117: Common pins for the entire section will be set to zero.

Common pins per pin values are not lost.

118: Filter per pin settings will be disabled.

Filter per pin values are not lost.

119: Filter for the entire section will be modified.

Filter per pin values are not lost.

120: Test ranges and pin ranges of 'H'igh will be changed to Med '2'.

Learn ranges of 'H' are being disabled, so Test range of 'H' will be invalid.

121: Test ranges will be set to 'PIN'.

Test ranges must be 'PIN' if Learn ranges are 'PIN'.

122: Learn ranges for the entire section will be modified.

Range per pin values are not lost.

123: Test ranges for the entire section will be modified.

Range per pin values are not lost.

124: Tolerance per pin settings will be disabled.

Tolerance per pin values are not lost.

125: Tolerance for the entire section will be modified.

Tolerance per pin values are not lost.

126: Test ranges of (auto range) will be disabled.

Learn components before changing to auto range.

127: Test ranges of 'PIN' (per pin) will be disabled.

Test ranges per pin values are not lost.

128: Some components have invalid learn ranges.

Press Enter to update components with valid learn ranges.

129: Cover key switch ENABLED.

Close the cover or turn the cover key switch to DISABLED.

With the cover installed and the cover key switch set to ENABLED, the cover must be closed for the RP388 to operate. If there is no cover installed, the RP388 will not operate with the cover key switch in the ENABLED position.

130: Cover key switch DISABLED.

The RP388 will operate with the cover open.

Setting the cover key switch to the DISABLED position and setting "COVER INSTALLED" to NO in the SETUP screen allows the RP388 to function with the cover open. Care should be taken when operating the RP388 in this configuration.

131: RP388 has been stopped or turned off and back on.

The current board will be aligned before the next operation.

The previous alignment has become invalid.

132: Delete the XY and Z Coordinates.

All section XYZ data will be lost.

This will also remove the alignment points of the section.

133: This section has no learned components.

Use Alt + U in learn mode to learn the section.

134: Import file failure.

Check available space on current drive.

135: The component XYZ data will be deleted.

The XYZ data must be deleted because it is affected by the package type and number of pins.

136: Invalid XYZ locations

Move board away from back/right walls.

The current component has pin locations that are outside the allowed probing area. All pins must be more than 0.6"(15mm) from the back/ right walls. Use board spacers to move the board away from the back/right walls.

137: Component signatures may not be valid with 'per pin' settings.

Relearn the component if signatures have changed.

In order to support components with pin info that were created with Versions 6.00/6.20, you can edit a component setting to an "*" without deleting signatures. This warning appears to let you know that signatures learned before the change may be invalid after the change.

138: Move/Copy OUT has been disabled.

Use Backup and Restore.

This feature is no longer supported.

139: Component changes will cause signatures to be deleted.

This warning appears in conjunction with some of the Alt +C Global Change options. Signatures will only be deleted for components that have new component information as a result of the global change.

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 one mode or function to another. It also lists what the function keys do.

NOTE
LEVEL refers to the BOARD, SECTION, or COMPONENT screen of the program.

Table 1. Short Cut Keys.

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	SECTION	Makes global changes to all components in the section. The LEARN ranges, TEST ranges, filter setting and tolerance can be changed. All common pins can be set to zero. If necessary, signature data will be deleted. Also, you can delete signature data without making any changes (refer to Chapter 7 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+H	EDIT	COMP	Hardware align and realign.
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+K	LEARN	COMP	Toggles the appropriate Short Check on and off.
	TEST	COMP	
Alt+L	EDIT	ALL	Changes to the LEARN mode.
	TEST	ALL	

Table 1. Short Cut Keys (con't).

KEY	MODE	LEVEL	ACTION
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	
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.
	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 7 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+U	LEARN	COMP	Activates AutoLearn and AutoTest.
	TEST	COMP	

Table 1. Short Cut Keys (con't).

KEY	MODE	LEVEL	ACTION
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+Z	EDIT	COMP	Activates the Z Teach mode.
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	
SHIFT+F1	ALL	ALL	Function key help (F1-F9)
F1	ALL	ALL	Help
F2	EDIT	COMP	Displays the Component Instructions pop-up window.
	LEARN	COMP	
	TEST	COMP	
F3	EDIT	ALL	Displays the text file BOARD.DOC
	LEARN	ALL	
	TEST	ALL	
F4	EDIT	ALL	Displays the graphics file LAYOUT.PCX
	LEARN	ALL	
	TEST	ALL	
F5	EDIT	ALL	Displays the graphics file GRAPH01.PCX
	LEARN	ALL	
	TEST	ALL	
F6	EDIT	ALL	Displays the graphics file GRAPH02.PCX
	LEARN	ALL	
	TEST	ALL	
F7	EDIT	ALL	Displays the graphics file GRAPH03.PCX
	LEARN	ALL	
	TEST	ALL	

Table 1. Short Cut Keys (con't).

KEY	MODE	LEVEL	ACTION
F8	EDIT	ALL	Displays the graphics file GRAPH04.PCX
	LEARN	ALL	
	TEST	ALL	
F9	EDIT	ALL	Moves the Z Axis mechanism of the RP388 to the Home position.
	LEARN	ALL	
	TEST	ALL	
F10	ALL	ALL	Resets the 5100DS hardware.

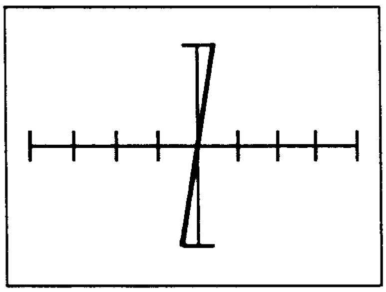
APPENDIX D
EXAMPLES OF COMPONENT SIGNATURES

TESTING RESISTORS

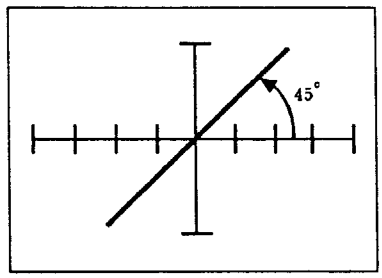
If a resistance that is decreasing in magnitude, is applied across the Tracker 5100DS test probes, then the trace on the 5100DS CRT will rotate in a counterclockwise direction around its center axis from an open circuit position. The degree of rotation is a function of the resistance value and the test range selected.

THE LOW RANGE

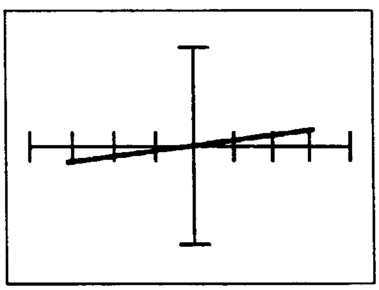
The LOW range is designed to test resistance between 1Ω and 400Ω. Figure D-1a shows the effect of resistance on the angle of rotation in the LOW range. A 1Ω resistor causes almost 90 degrees of rotation, and a 50Ω resistor produces a 45 degree rotation. A 400Ω resistor causes a small rotation. Resistors lower than 1Ω appear as a short circuit (i.e. vertical trace) and resistance values above 400Ω look like open circuits (i.e. horizontal trace).



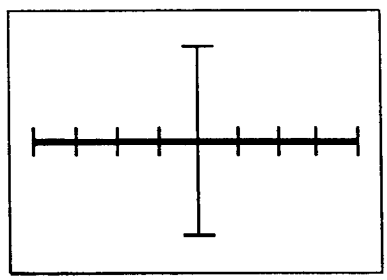
1Ω



50Ω



400Ω

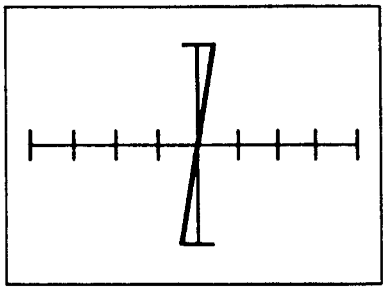


>400Ω

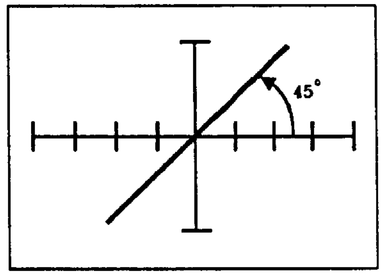
Figure D-1a. Effects of Resistance on the Rotation Angle in the LOW Range.

THE MEDIUM 1 RANGE

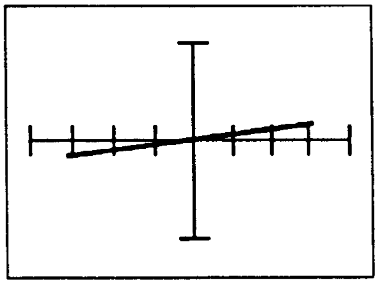
The MED 1 range is designed to test resistance between 50Ω and 10kΩ. Figure D-1b shows the signatures for a 50Ω resistor, a 1kΩ resistor, a 10kΩ resistor, and a >10kΩ resistor using the MED 1 range. Resistors that are smaller than 50Ω appear almost as a vertical line. A 1kΩ resistor causes an angle of 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.



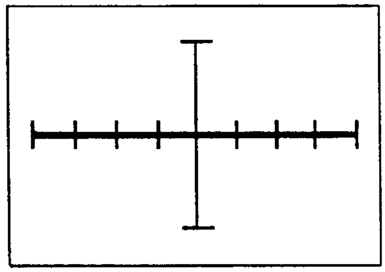
50Ω



1kΩ



10kΩ

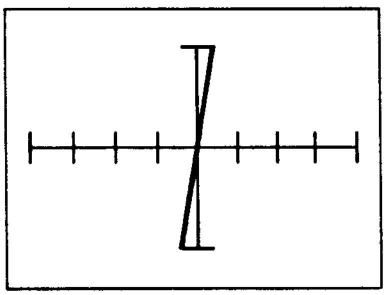


> 10kΩ

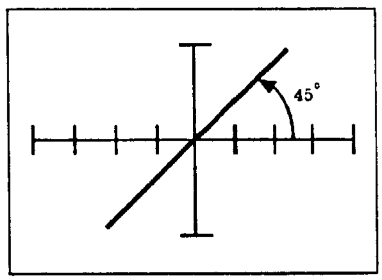
Figure D1 -b. Effects of Resistance on the Rotation Angle in the MED 1 Range.

THE MEDIUM 2 RANGE

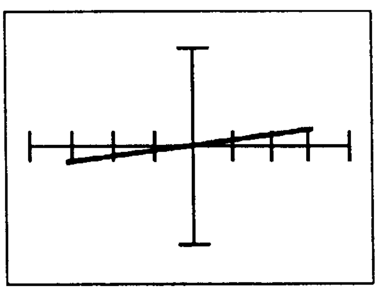
The MED 2 range is designed to test resistance between 1kΩ and 200kΩ, as shown in Figure D-1c.



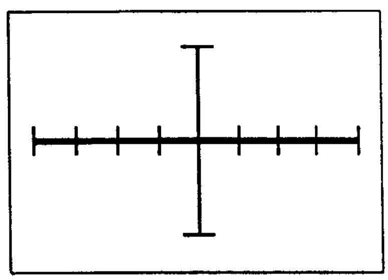
1kΩ



15kΩ



200kΩ

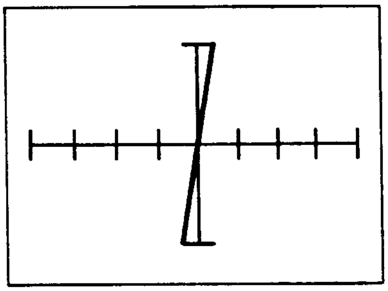


> 200kΩ

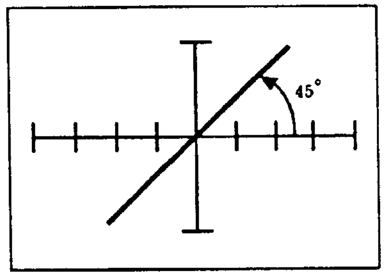
Figure D-1c. Effects of Resistance on the Rotation Angle in the MED 2 Range.

THE HIGH RANGE

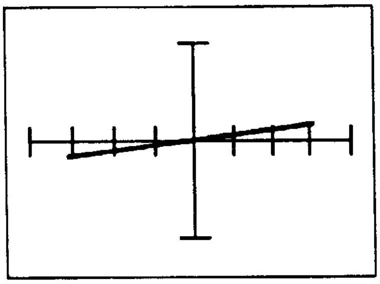
The HIGH range is designed to test resistance between 3kΩ and 1MΩ, as shown in Figure D-1d.



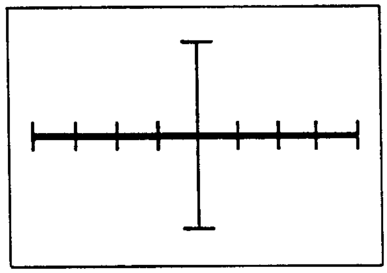
3kΩ



50kΩ



1MΩ

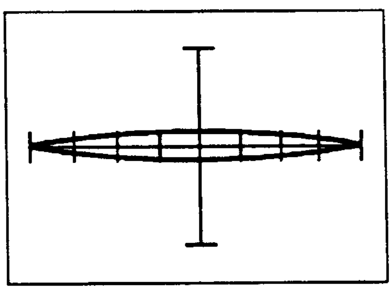


> 1MΩ

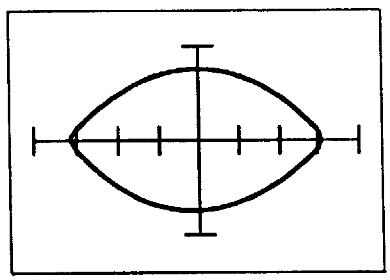
Figure D-1d. Effects of Resistance on the Rotation Angle in the High Range.

TESTING CAPACITORS

A capacitor produces an elliptical signature on the 5100DS. In the lower ranges, this ellipse approaches an open circuit. In the higher ranges it approaches a short circuit. If this signature becomes irregular or broken, the component may be defective.

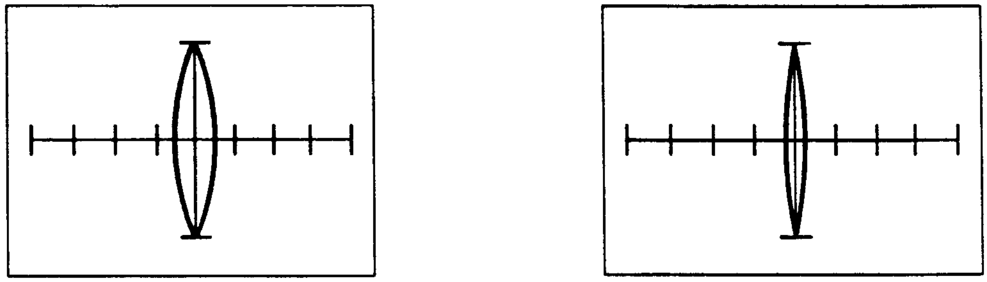


LOW Range



MED 1 Range

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.

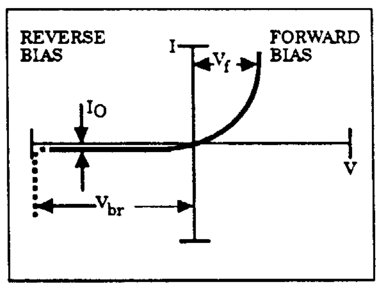
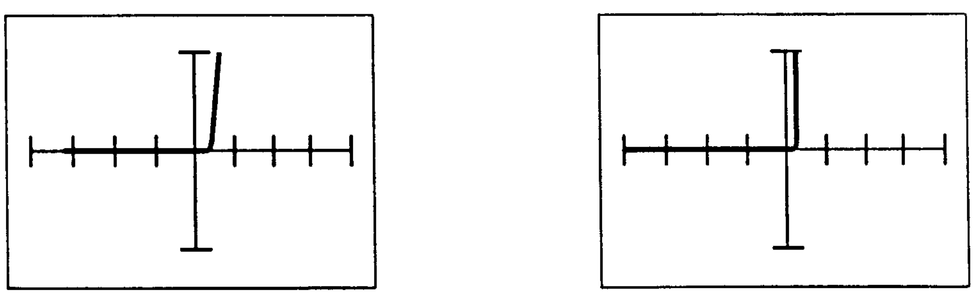


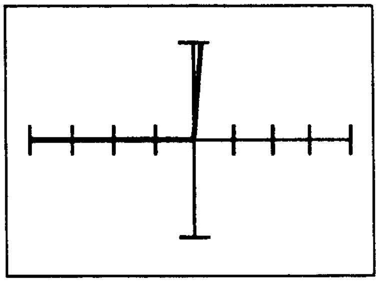
Figure D-3. Volt-Ampere Characteristics of a Diode.

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.

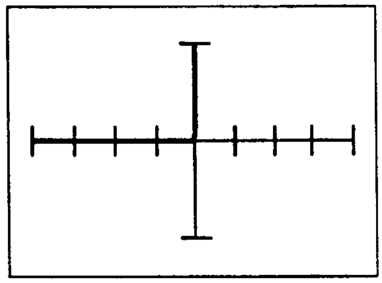


LOW Range *MED 1 Range*

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.

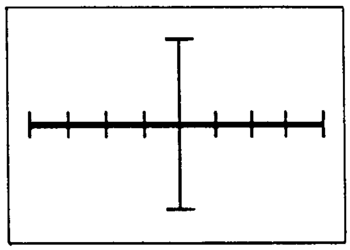


Figure D-5. Signature of an Open Diode.

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.

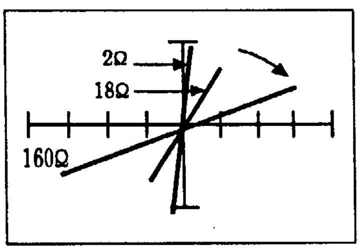
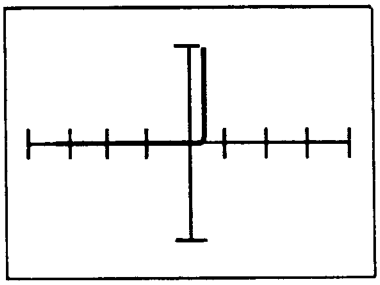


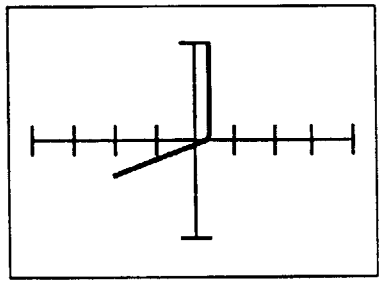
Figure D-6. Effect of Resistance on a Signature in the LOW Range at 200 Hz.

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.

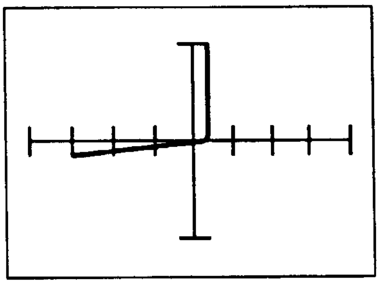
Another diode failure is leakage resistance, which can be modeled as resistance in parallel with a perfect diode. This resistance affects the ability of the diode to provide maximum output for a given input.



No leakage

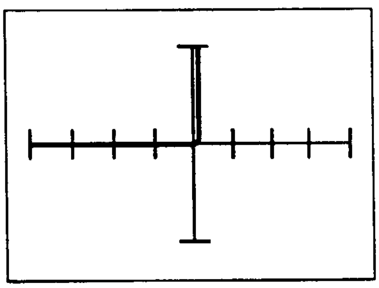


100Ω

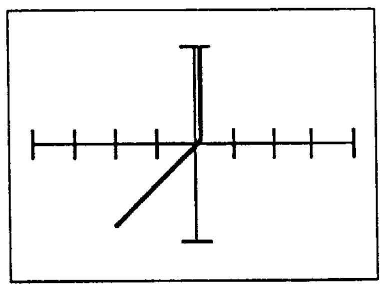


1kΩ

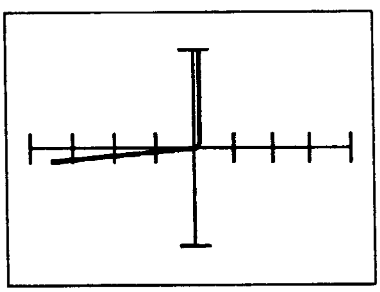
Figure D-7a. Influence of Leakage Resistance in the LOW Range at 200Hz.



No leakage

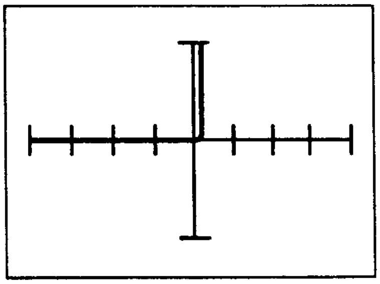


1kΩ

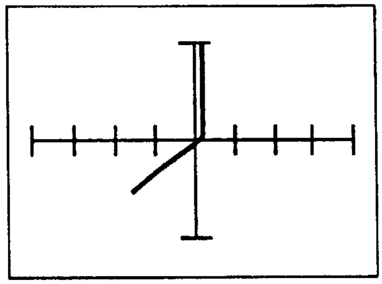


10kΩ

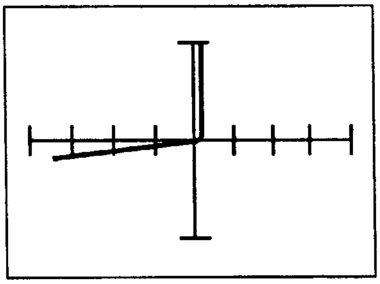
Figure D-7b. Influence of Leakage Resistance in the MED 1 Range at 200Hz.



No leakage

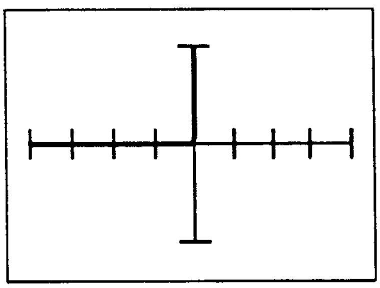


10kΩ

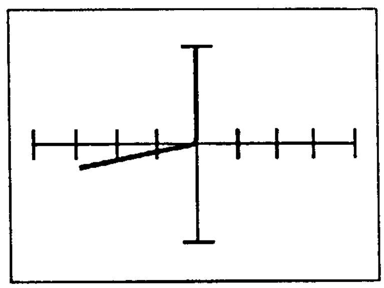


100kΩ

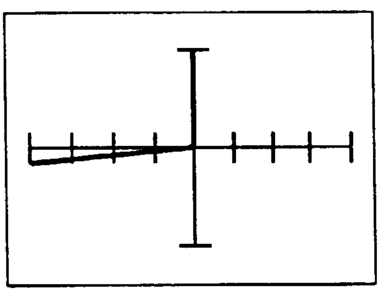
Figure D-7c. Influence of Leakage Resistance in the MED 2 Range at 200Hz.



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.

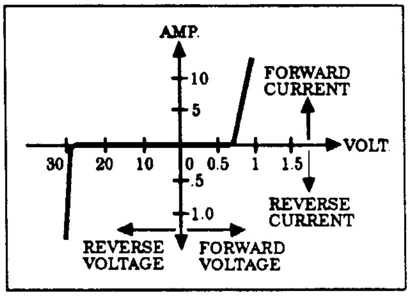
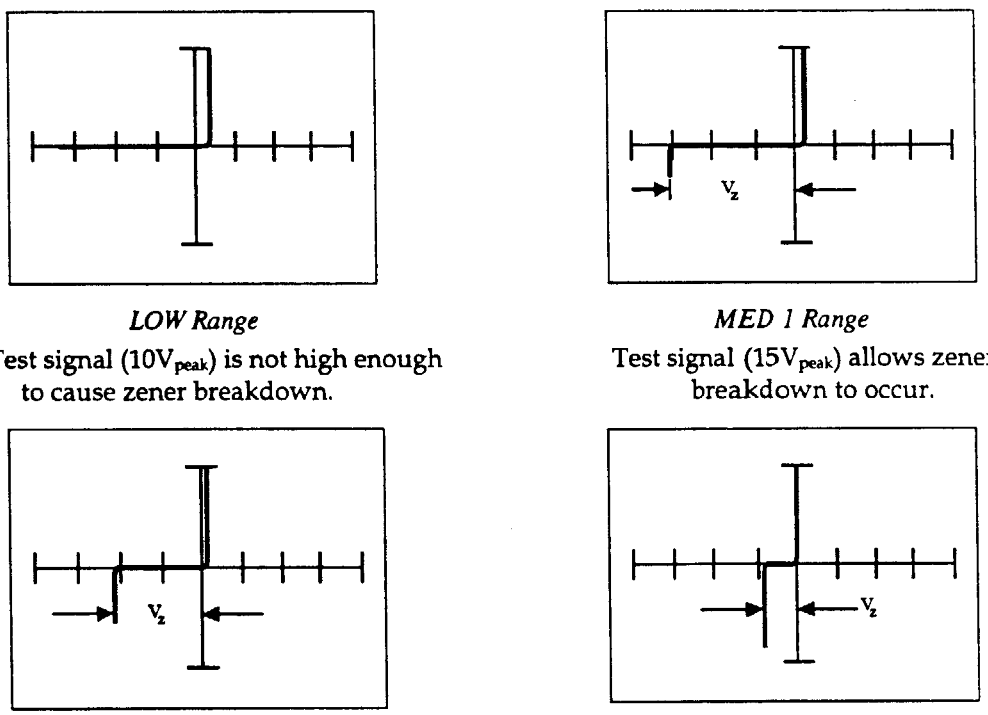


Figure D-8. Characteristics of a Typical 30V Zener Diode.

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.

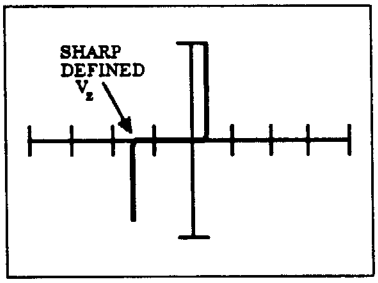


Figure D-10a. Signature of a good Zener Diode in the MED 1 Range at 200Hz.

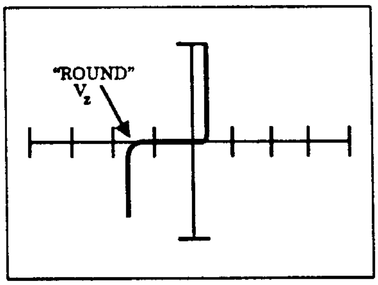


Figure D-10b. Signature of a marginal Zener Diode in the MED 1 Range at 200Hz.

TESTING TRANSISTORS

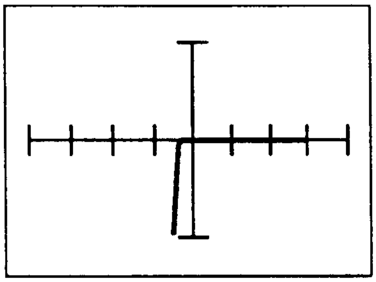
Use of the 5100DS may alter the current gain of a bipolar transistor whenever the emitter is tested. Either the base-emitter or collector-emitter test circuits satisfy this criterion. While heating of the device due to the current produced by the 5100DS may produce a temporary change in the current gain (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.

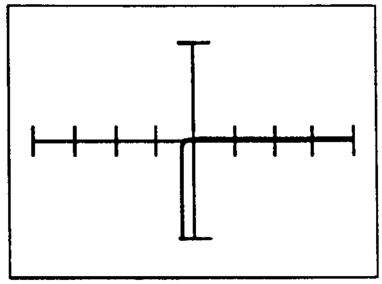
However, some circuits may depend on the current gain of the particular part in use (such as instrumentation that is calibrated to a certain current gain value, or precision differential amplifiers with matched transistors). In such instances, the 5100DS should not be used, since its use may cause the 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:

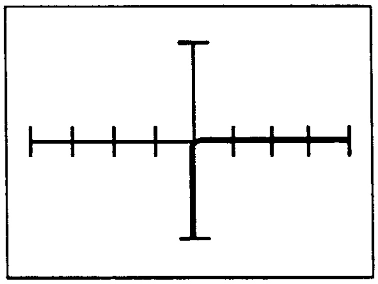
- Keep the duration of the test as short as possible, less than 3 seconds in the LOW range.
- Use the MED 2 or HIGH ranges as much as possible.



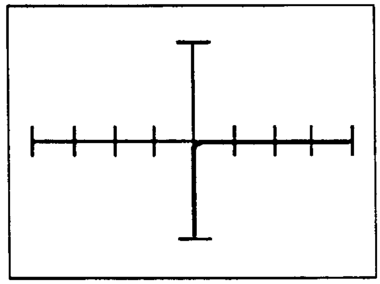
LOW Range



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.

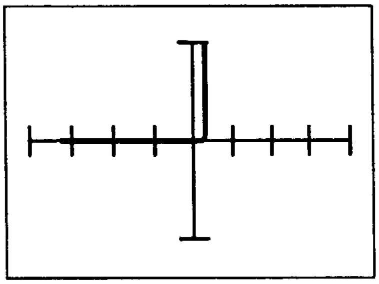
Table D-1. Component Signatures Diagnostic Table.

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

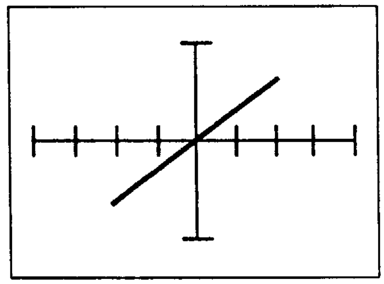
Good signatures for multiple components on the 5100DS depend on a number of variables, such as whether the components are in series or in parallel, the value of the components, and the selected test and learn ranges.

DIODE AND RESISTOR IN PARALLEL

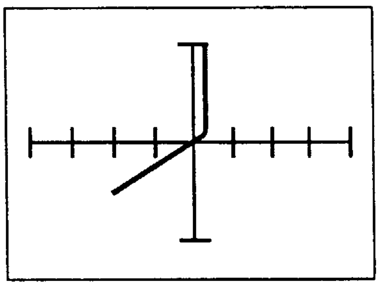
Figure D-12 shows the effect of a resistor on a diode signature. The resulting multiple signature is a composite of the two, with the diode dominating the vertical section of the signature, and the resistor dominating the horizontal section.



Diode Only



50Ω Resistor Only

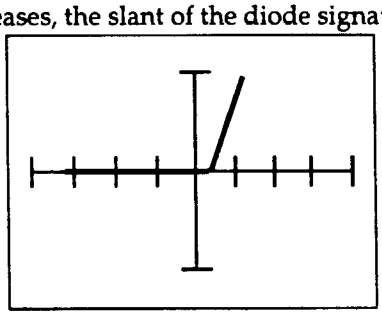


Combined

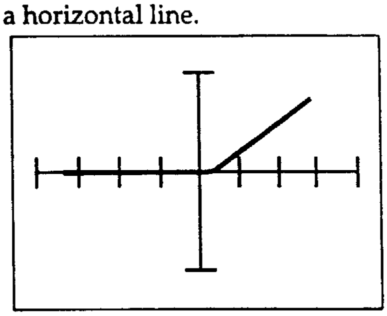
Figure D-12. Parallel Diode/Resistor Signature in the LOW Range.

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.

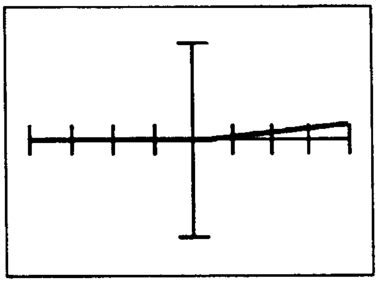


10Ω



50Ω

Figure D-13. Series Diode/Resistor Signature in the LOW Range.



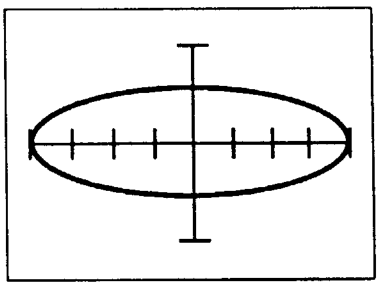
500Ω

Figure D-13 (cont.). Series Diode/Resistor Signature in the LOW Range.

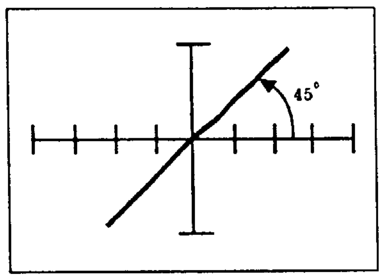
CAPACITOR AND RESISTOR IN PARALLEL

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.

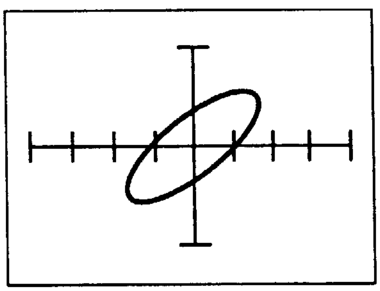
Figure D-14 shows the effect of a 50kΩ resistor on a 0.1μF capacitor (rotation and shrinking of the ellipse) in the HIGH range.



0.1μF Capacitor Only



50kΩ Resistor Only

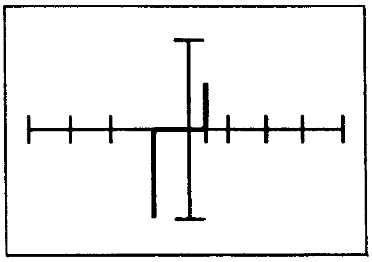


Combined

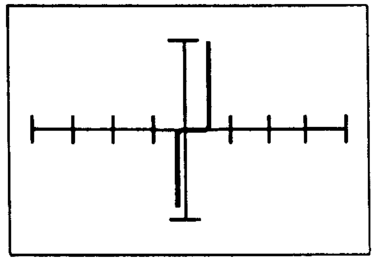
Figure D-14. Parallel Capacitor/Resistor Signature in the HIGH Range.

TESTING INTEGRATED CIRCUITS

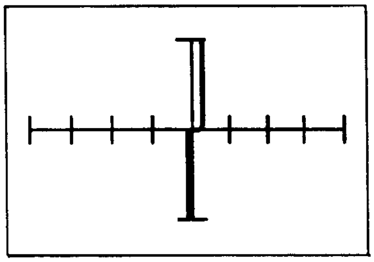
This manual has discussed the techniques of testing resistors, capacitors, diodes and transistors. All of these techniques can be applied to test integrated circuits. The signature produced across any two pins of an integrated circuit is the resultant effect of resistors, diodes, transistors and capacitors. 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.



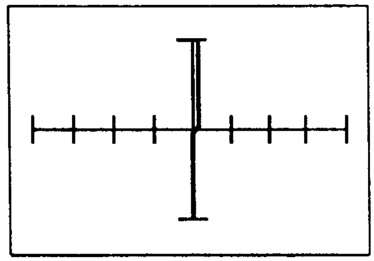
LOW Range



MED 1 Range

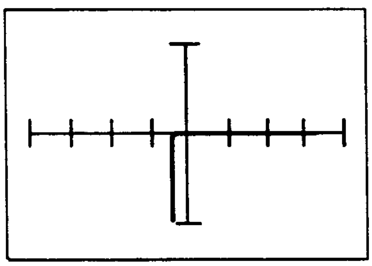


MED 2 Range

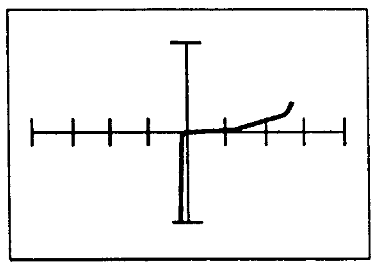


HIGH Range

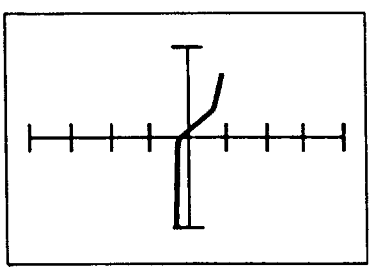
Figure D-15. Signatures between the Input and Output pins of a Good 7805 IC.



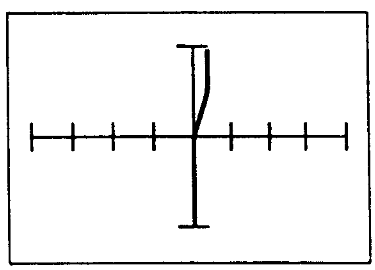
LOW Range



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** 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.

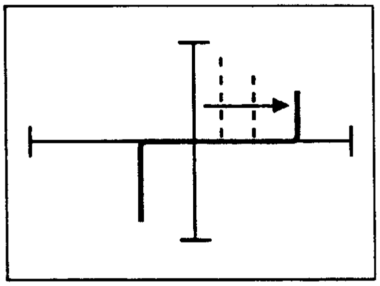


Figure E-1. Slow Settling CMOS Signatures

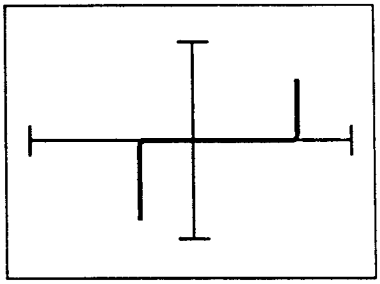


Figure E-2. Normal CMOS "chair" Signature

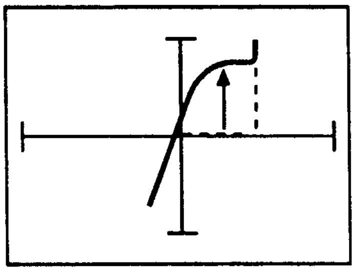


Figure E-3. CMOS Charging Effect Signature

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
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 marked Huntron 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 and VH2, VH3...VH25.

(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 LOW 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 G
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).

Alignment of the board/ Align the board — This refers to positioning the trackball cursor over the center of the image of the first and second alignment points which were previously recorded on the golden board. This is used to inform the software of the current physical position of the current board in relation to the golden board.

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 characteristic is called an analog signature.

Arrow keys — These keys are the ↑, ↓, ← and → keys.

ASA — An abbreviation 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.

Camera Head — This is mounted on the right side of the Z Axis mechanism. It consists of a image sensor, a miniature lens and a optical filter. It is used to sense and transfer the optical image of the board to the Personal Computer.

Camera Offset Board — This board is used to for adjusting the RP388 camera position relative to the probe tip and for setting the probe tip position relative to the 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.

Cross Hair Two lines that intersect at 90 degress and are used as for sighting, specifically in the RP388, the red crossed lines on the camera image screen.

Demo Board The electronic circuit board supplied with the Tracker 5100DS to be used with the tutorial sections of this manual. Demonstrates the capabilities of the software and hardware and also used as a training tool.

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).

Down position This is the position of the probe tip when it is making contact with the test point on the board.

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.

Focus The camera lens occasionally has to be moved towards or away from the scene (i.e. the board-under-test in this case) so that the image appears clearly on the PC screen. Focusing is accomplishes by rotating the "focus" knob which is mounted on the camera head.

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 $3k\Omega$ to $1M\Omega$ and a capacitance range of 500pF to $.2\mu F$.

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.
mils	1 mil = 1 thousandth of an inch. 1 inch = 1000 mils. 5 inches = 5000 mils.
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), P (Probe), M (Multi), B (Both) or F (Front).
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.
Probe Tip	Refers to the spring loaded test pin which actually makes contact with a test point on the board.
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.
Resolution	This is the minimum linear distance that the Prober is capable of making in any direction.
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.
Section Up position	This is the position of the probe tip when it is above the test point on the board. The probe tip will retract to this intermediate position when moving from pin to pin of an IC.
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.

Slot — There are three slots in the RP388 walls. These slots are 100 mils wide and are machined out of non-conductive plastic material (Delrin). These slots are used to hold the board.

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.

Target — Two lines that intersect at 90 degress and are used as reference positions, specifically in the RP388, the calibration targets located on the top of the RP388 or the camera offset targets found on the Camera Offset board.

Teach — This refers to translating the physical position of the Z Axis mechanism to actual distances from the home position which is then stored on the hard disk of the PC.

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.

Trackball — This is a pointing device similar to a mouse except that a ball is rotated using a simple thumb operation to point to a particular object in a user's software application. Although the end result is exactly the same as a mouse, the advantage is smaller desk space and ease of use.

Trackball cursor — Similar to a mouse cursor, this is a cursor which looks like a "+" sign which moves as the user rotates the ball of the trackball. By rotating the ball of the trackball, the cursor is placed directly over the center of the image of a test point. Clicking a trackball button then sets the test point XY location.

Travel — The Travel setting in the XY Teach screen indicates what distance the Z axis mechanism will move in the X or Y direction.

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.

X axis — This refers to the hardware responsible for moving the Z Axis mechanism along the width of the RP388. This includes the X motor, bracket (mounted on the left side) and the X slide.

XY data — The XY data consist of numerical data referring to the actual position of the Z Axis mechanism in relation to the home.

Y axis — Refers to all the hardware responsible for moving the X and Z mechanisms along the length of the RP388. It consists of the Y motor, bracket (mounted on the rear of the RP388), and the two rails (mounted on the left and right side walls).

Z Axis Mechanism — This refers to all the hardware mounted on the Z axis which slides along the X axis rail. It consists of the Z motor, Z Slide, Probe Holder, Probe tip and the Camera head.

Z Home position — This is the position of the probe tip when it is all the way up. This is the uppermost position that the probe tip is capable of moving to. After a component test is done, the probe tip will move to this position before moving to the location of the next component.

NOTES:

APPENDIX H
PCB TEXT/ GRAPHICS

INTRODUCTION

This feature supports six additional screen displays of text/graphics for a board. One screen displays a text file and the other screens display a graphical layout of the components on the board. You can view these screens by pressing the **F3** key for the text screen or **F4 - F8** for the board layout and other graphics screens.

The following guide is divided into two parts. The first part will explain how you can make a text file and board layout. The second part of this guide will show you how to use these new features.

DETERMINING THE BOARD LOCATION AND NUMBER

The board text/graphics files must be stored in the same subdirectory as the board under test you have selected. If you have already created a board using the 5100DS software then the first step is to determine where the board is located on your computer's hard disk. For this tutorial, we will use C:\51DS as the path\directory location. The 5100DS software assigns each board stored in a particular path\directory on your computer a unique board number. This board number is not the same as the board name you used in EDIT, so we will need to determine what the board number is. The following figure is a simplified diagram of how the 5100DS program organizes board data files on your computer's hard disk.

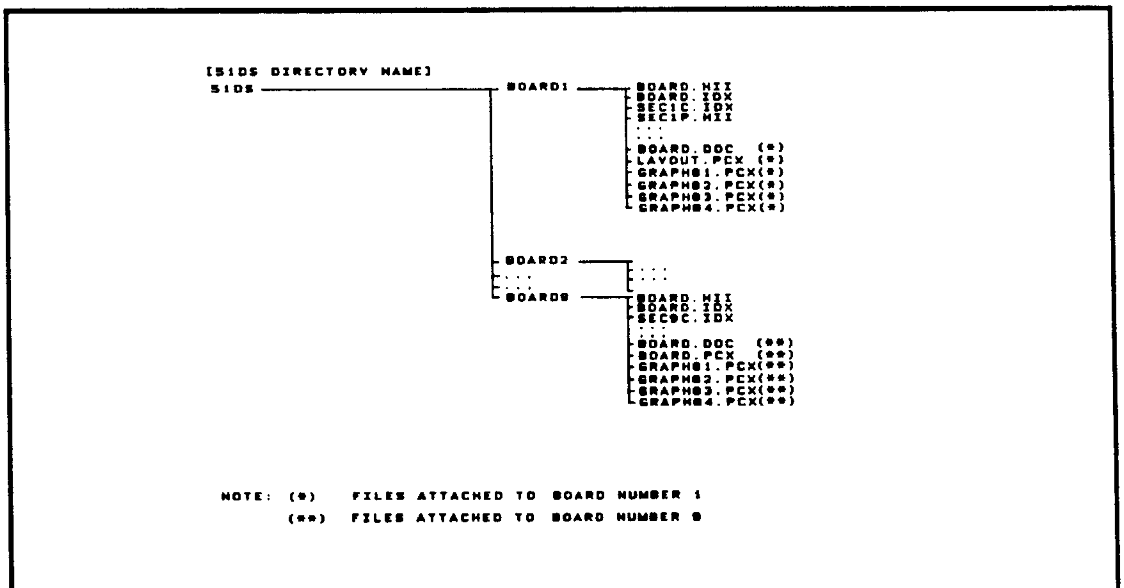


Figure H-1. Board Organization.

At your computer's DOS prompt (typically "C:"), start the 51DS software by typing "**CD \51DS**"↵, then "**51DS**"↵. If the board you have chosen is in a different drive or path from the drive\path selected when the software is started, use the DRIVE feature to change to the correct drive\path. At the Main menu, press "D" and type in the drive\directory path where the board you have picked is located. For this example, you will use the "C:\51DS" path\directory so make any changes that are needed using DRIVE. The figure below shows the Main menu with the DRIVE function activated.

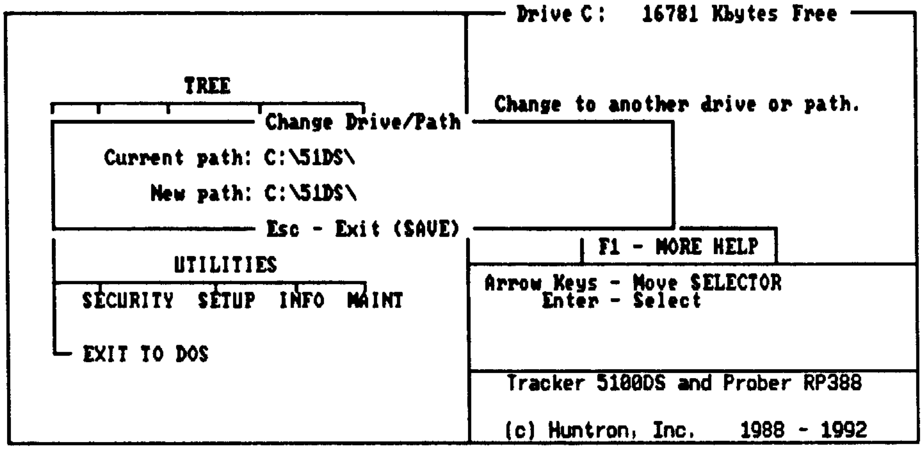


Figure H-2. DRIVE Function Selected.

Activate the EDIT mode by pressing "E" at the Main menu and select the board you have chosen. The board number of the selected board is listed above the board selection box near the center of the EDIT board selection screen. For this example, choose the demo board from the EDIT board selection screen. The figure below shows the EDIT board selection screen with the demo board as board number 1. Make note of this number for later use. Return to the Main menu and exit the 5100DS software.

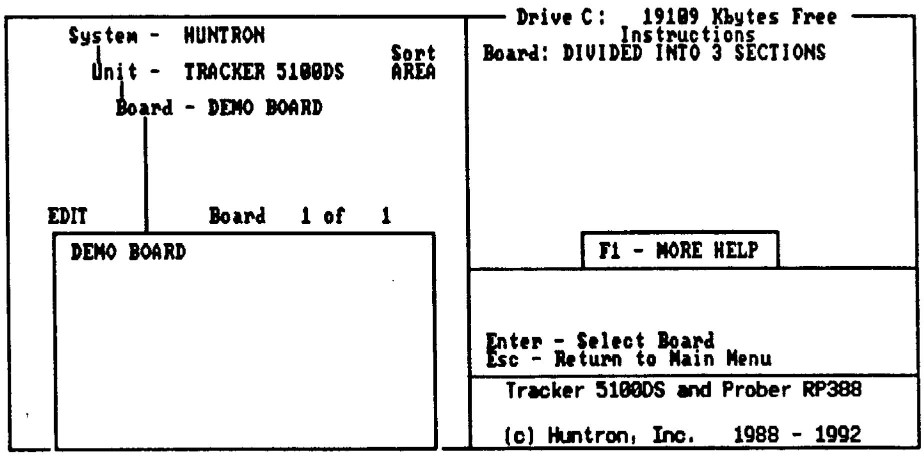


Figure H-3. EDIT Board Selection Screen.

CREATING A BOARD TEXT SCREEN

NOTE

Board text screens must be stored in an output file that is ASCII format. Make sure the word processor you use can support ASCII formated output.

This section will show you how to make a detailed parts list that can be displayed by the 5100DS/RP388 software.

NOTE

The maximum text file size is 11,000 lines (500 screens of 22 lines each). Also the maximum number of characters per line is 75.

At the DOS prompt, go to the directory where your word processor has been installed on your computer. For example if you have Microsoft DOS 5.0, you would type "CD \DOS" ↵ and then type "EDIT"↵ to start the program.

The parts list for the Huntron Demo Board will be used for this example. First, type in the parts list provided below:

HUNTRON DEMO BOARD PARTS LIST

ITEM	DESCRIPTION
C1- C5	Capacitor, 0.1 uF, mono ceramic, 50V
C6	Capacitor, 0.01 uF, mono ceramic,50V
C 7	Capacitor, 0.47uF, mylar, 50V
C8	Capacitor, 47uF,tantalum, 16V
C9	Capacitor, 1000uF, alum electro, 16V
D1	Diode, 1N4005
DS1-DS3	LED, Red, T1¾
R1,R2,R14	Resistor, 180 ohm, 1/4 W, 5%
R3,R5-R13	Resistor, 10K ohm, 1/4 W, 5%
R4	Resistor, 47K ohm, 1/4 W, 5%
SW1	Switch, toggle, DPDT
U1	IC, 74161, 4 bit binary counter
U2	IC, 74LS162, decade counter
U3	IC, 74154, 4 to 16 line decoder
U4	IC, 74LS138, 3 to 8 line decoder
U5	IC, 74LS02, quad 2 input NOR
U6	IC, 555, timer
U7	IC, LM340, voltage regulator

After the last component has been typed in, move down a few lines and type in the following:

"COMMENTS:
BOARD - DIVIDED INTO 3 SECTIONS; POWER SUPPLY, LOGIC, CLOCK
USE C9 (-) LEAD AS COMMON FOR ALL SECTIONS
USE F4-F8 KEYS FOR CIRCUIT BOARD DRAWINGS TO IDENTIFY PARTS"

You have now completed the parts list. Compare the parts list you just typed on your computer with the one above and make sure these are the same.

Before you are ready to save your parts list, make sure your word processor is configured to output in ASCII format. If you are using the DOS 5.0 editor, then the file format is ASCII. Consult your DOS manual or word processor's manual for more details. Save your parts list by naming this file "BOARD.DOC" and store it in the same path where the board you are creating this file for is located.

For example, the demo board is located in the C:\51DS\BOARD1 path\directory, so type "**C:\51DS\BOARD.DOC**" to save the text file there. Also, its always a good idea to make a backup copy of this file. Use a different name in order to distinguish between text files for other boards. Type "**DEMOBD.DOC**" for the backup file name and save it in your word processor directory. If you need to make changes, load "**DEMOBD.DOC**" into your word processor and perform your edits. Then, use the same procedure as before to save this file to the correct board location in your computer.

IMPORTANT NOTE

Make sure your word processor is configured to output in ASCII format. Consult your word processor's manual for more details on how to do this.

CREATING A PCB GRAPHICS SCREEN

This part of the tutorial will show you how to create a graphical layout of a board that then can be displayed by the 5100DS software. Your graphics drawing program must be "PCX" format compatible and will be used to draw the board layout. For this exercise, use the demo board or refer to Figure 5-1 as a guide.

The first step is to start-up the paint program. For example when using Publisher's Paintbrush, at the DOS prompt, type "CD **\PBRUSH**" to go to the paintbrush subdirectory. Start the program by typing "**PAINT**"↵.

Select the background color for the board. For example if you want to use green as the board color, then move the mouse so that the cursor is over the color selection boxes. Choose green and activate the background by clicking the mouse button.

The next step involves specifying the size of board if your paint program allows you to adjust the size of the drawing area. For example when using Paintbrush, move the cursor to the top of the screen and activate the **PAGE** menu. Place the cursor on **Clear** and click the left mouse button to activate. Before entering the board layout dimensions, make sure PELS is selected on the screen. Refer to the following table for the correct pixel (PEL) setting for a variety of board sizes.

Table H-1. Paintbrush Setting for Different Board Sizes.

BOARD LAYOUT SIZE (WxH inches)	PAINTBRUSH SETTING (WxH PELS)
6.4 x 4.8	640 x 480
12.8 x 14.4	1280 x 1440
19.2 x 9.6	1920 x 960

Enter the "width" to the appropriate dimension (640 PELS = one screen width, which represents 6.4 inches of board width). Set the "height" to the appropriate dimension (480 PELs = one screen height, which represents 4.8 inches of board height). The maximum board layout size is limited by the amount of expanded memory in your computer. For 1 Mbyte of expanded memory, the maximum board size is about 19.2 by 9.6 inches (1920 by 960 PELS) which is about 3 screens wide by 2 screens high (six screens total).

NOTE

Up to 512K of LIM expanded memory or 512K of XMS extended memory is used by the 5100DS software. To allow the graphics display program to use this 512K of LIM memory add the following line to your AUTOEXEC.BAT file:

SET RTVMEXP = 0,0

If your paint program does not allow adjusting the drawing area, then the maximum board size will be limited to the size and resolution of your PC's display.

The next step will be to tell the software that the standard component outline library is located in "\51DS\PCXLIB".

If you are using Paintbrush, then move the cursor to the **EDIT** menu at the top of the screen and select **Name Is** option. Move the cursor to the ">>C:\PBRUSH" line and press the left mouse button. At the ">" prompt, enter the drive/path for the component library. Type "**C:\51DS\PCXLIB**" ↵. The component names will be listed in alphanumeric order. Select a component from the list and click the left mouse button. To read other component names on the list, place the cursor on the scroll bars on the right side of the pop-up window and move the bar using the cursor and left mouse button. Refer to the following figure to see the complete standard library.

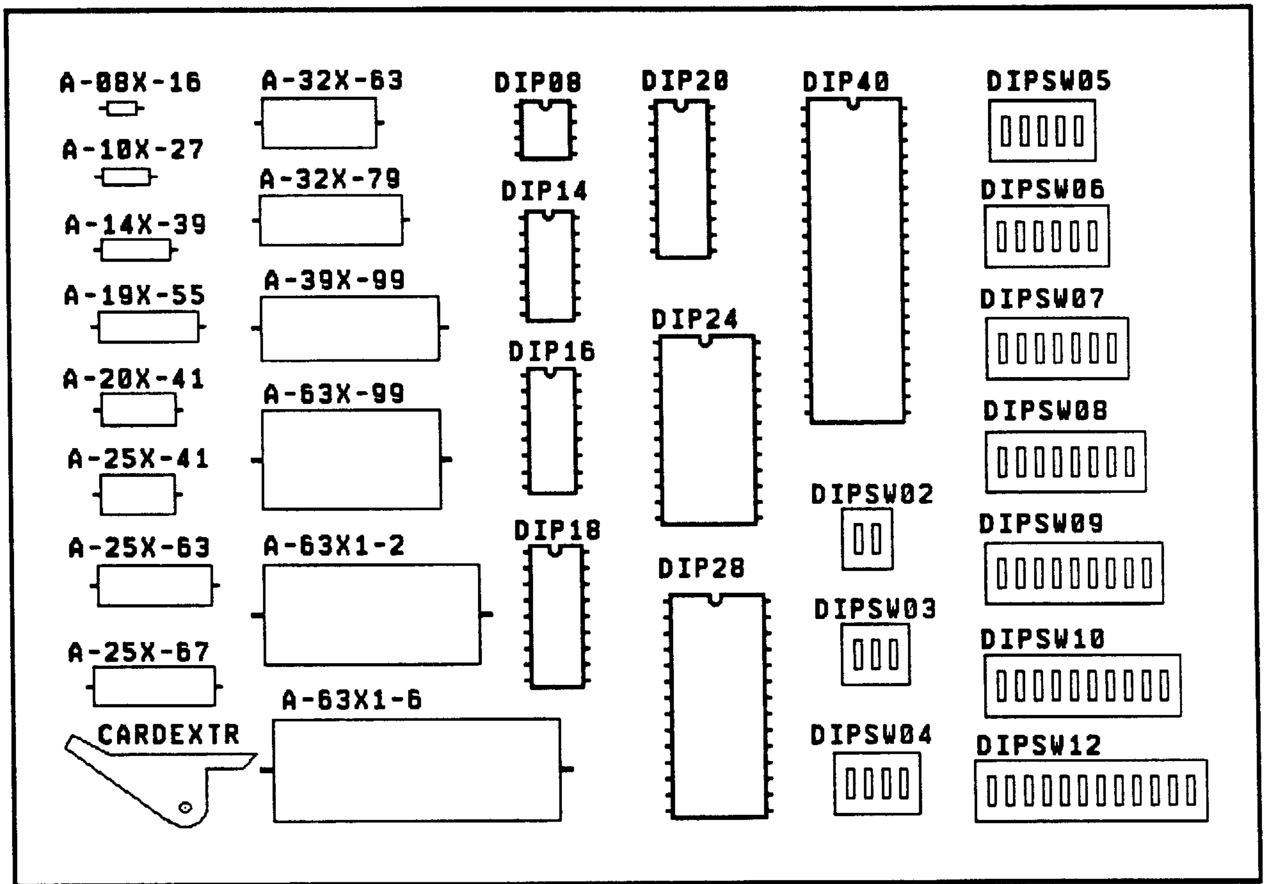


Figure H-4a. Standard Component Outline Library

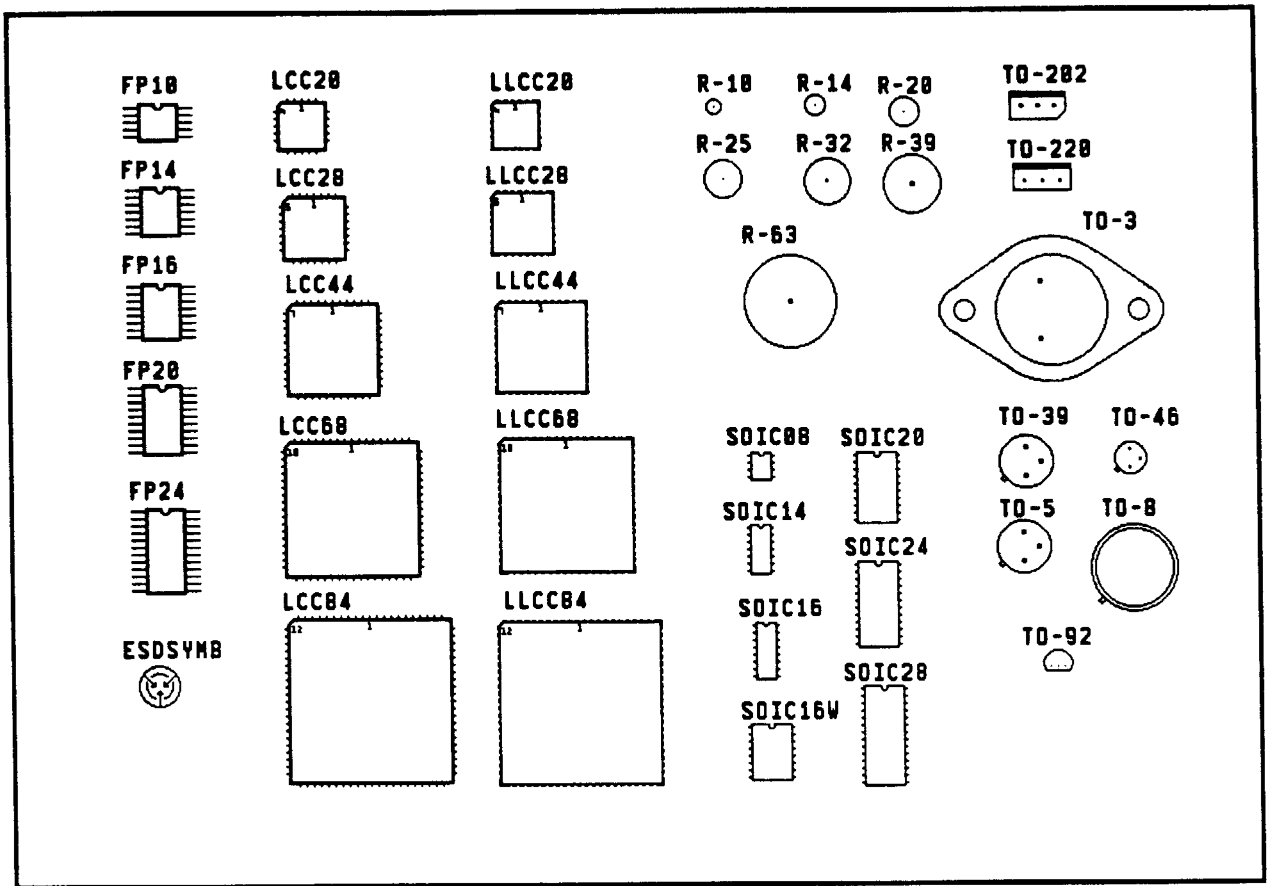


Figure H-4b. Standard Component Outline Library (cont.)

Locate the component you wish to place on your board layout from the standard library and type in its name to select it.

For example in Paintbrush, you would move the cursor to the top of the screen and select the EDIT menu, then the **Paste** option. Type "**A-10X-27**" to retrieve the resistor outline from the library. Use the demo board or refer to Figure 5-1 for correct component placement. Drag the component around the screen using the mouse and place it at the desired location. Release the left mouse button and click the right mouse button to freeze the component's position on the layout. Repeat this sequence for the rest of the components on the demo board.

The next step is to label each component on the layout. Position the cursor adjacent to a component and make sure there is enough clearance to type its label. For example in Paintbrush, click the left mouse button to activate text entry mode. Type in the correct label for the component you have selected. Use the demo board or refer to Figure 5-1 for the correct label names. After the label name has been typed in, hit ↵ on the keyboard, and move the cursor to another component. Repeat the previous steps to add label names for the remainder of the components on the demo board layout.

NOTE

The demo board used for this tutorial contains a few components that are not in the standard component library. These components will have to be created. Use your paint program to draw them and refer to your paint program's manual if needed.

Your screen should look like the following figure when you are done.

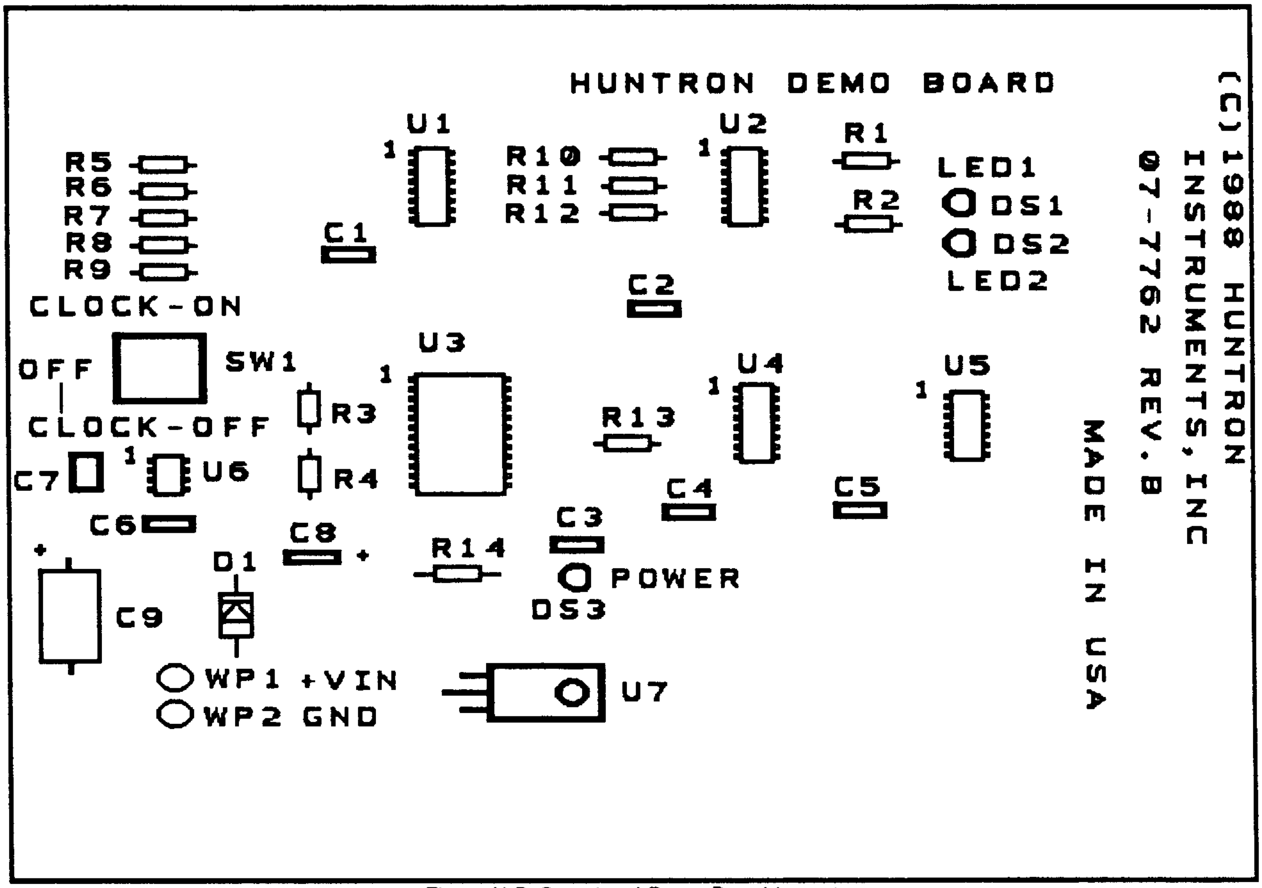


Figure H-5. Completed Demo Board Layout.

Now save this graphics file by naming it "LAYOUT.PCX" and make sure you save it in the same path where the board you are creating this file for is located. The demo board is located in the drive/path, C:\51DS\BOARD1\. For example, when using Paintbrush, move the cursor to the top of the screen and select the PAGE, Save As option. At the ">>" prompt, type "**C:\51DS\BOARD1**" ↵. Next, move the cursor to the line below the one you just typed in and press the left mouse button to select it. Type "**LAYOUT.PCX**" on this line to save this file. You can also make four more graphics screens that can be displayed by creating them in a similar manner as "LAYOUT.PCX" and saving each one with a specific name. Each of the graphics file can be accessed by pressing the appropriate function key as follows:

KEY	GRAPHICS FILE
F4	LAYOUT.PCX
F5	GRAPH01.PCX
F6	GRAPH02.PCX
F7	GRAPH03.PCX
F8	GRAPH04.PCX

USING THE PCB TEXT/GRAPHICS SCREENS

The second part of this guide will show you how to access the screens you have just created.

At your computer's DOS prompt (typically "C:"), start the 5100DS software by typing "**CD \51DS**"↵. Next, type "**51DS**" ↵ to start the program. Enter the User name and password and the program will display the Main menu screen.

The text and layout screen can be accessed in the EDIT, LEARN, or TEST functions. In each of these three functions, the screens are accessable at the board, section, or component selection levels.

You can also access the text and layout screens at the component level while the component instructions pop-up window (F2 key) is displayed in LEARN or TEST modes. However, these screens are not available at the component level while the results pop-up window is displayed in LEARN or TEST. Press the **Esc** key to clear the results display and enable the board info screens.

To display the text screen, select the EDIT, LEARN, or TEST functions, choose the board that you have created a text screen file for and press the **F3** key. The text screen will appear and the following keys are active:

Home	Go to the beginning of the board text screen
End	Go to the end of the board text screen.
Pg Up	Move to the previous page (22 lines) of the board text screen.
Pg Dn	Move to the next page (22 lines) of the board text screen.
↑	Move to the previous line of the board text screen.
↓	Move to the next line of the board text screen.
Esc	Exit and return to the previous 5100DS function screen.

To display the custom layout graphics screen, select the EDIT, LEARN, or TEST functions, choose the board that you have created a custom board layout screen for and press the **F4 - F8** keys. The graphics screen will appear and the following keys are active:

Home	Go to the far left side of the board layout screen.
End	Go to the far right of the board layout screen.
Pg Up	Move to the top of the board layout screen.
Pg Dn	Move to the bottom of the board layout screen.
↑	Move to the next upper half page of the board layout screen.
↓	Move to the next lower half page of the board layout screen.
←	Move to the next left half page of the board layout screen.
→	Move to the next right half page of the board layout screen.
Esc	Exit and return to the previous 5100DS function screen.

This is the end of this short guide on how to create and use the PCB text/graphics screens for the 5100DS/RP388 software. If you have any specific questions about your word processing program or the graphics drawing software, refer to their respective manuals.

NOTES:

APPLICATIONS AND TECHNICAL NOTES

This section 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.
AN6	Using the PC-Pedal™ with a Tracker 5100DS.
AN7	RP388 Spring Contact Probes
AN8	RP388 Test Board Support Accessories.
AN9	Using the Shortrack to find a defective bus IC.

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.

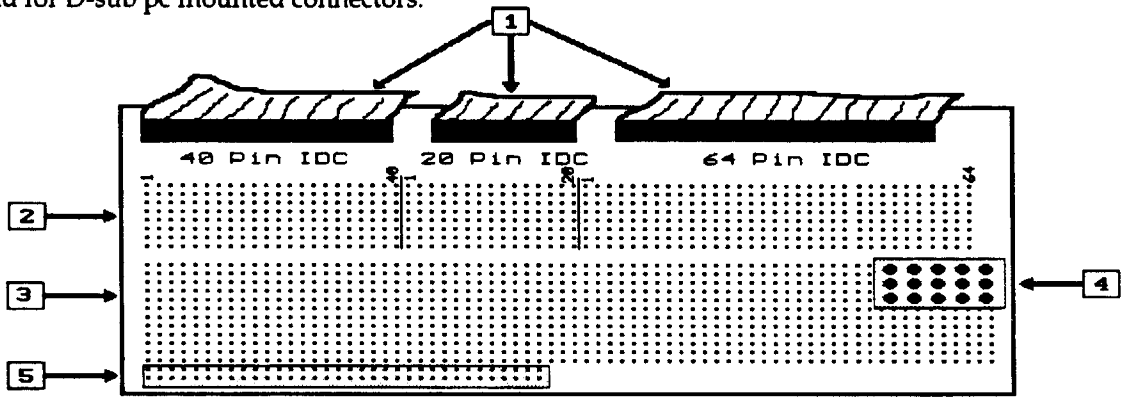


Figure 1. Sections of the FEA Board.

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 three 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 1 and 2.

Table 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	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
FRONT ONLY	1	2	3	4	5	6	7	8	9	10										
BOTH FRONT AND BACK	1	2	3	4	5	6	7	8	9	10	20	19	18	17	16	15	14	13	12	11

Table 2. Pinout Configuration 16 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
FRONT ONLY	1	2	3	4	5	6	7	8												
BOTH FRONT AND BACK	1	2	3	4	5	6	7	8					16	15	14	13	12	11	10	9

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.

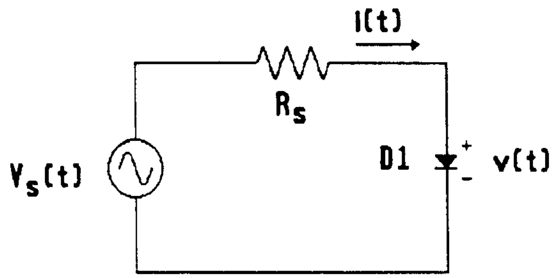


Figure 1a.

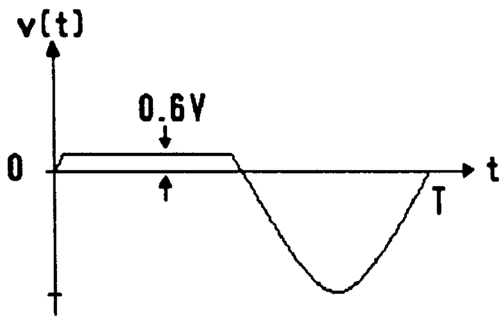


Figure 1b.

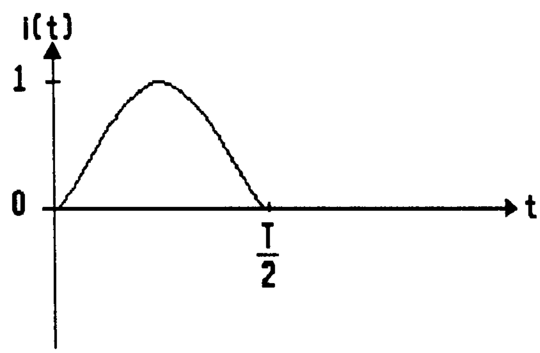


Figure 1c.

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.

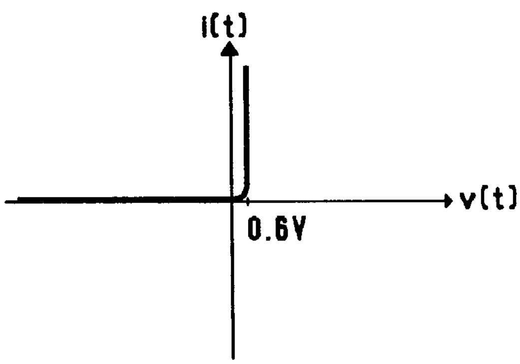


Figure 1d.

The signature of a known good device can be compared to that of a suspect device. 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.

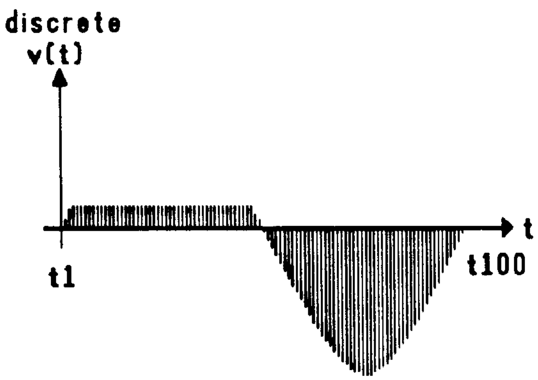


Figure 2a.

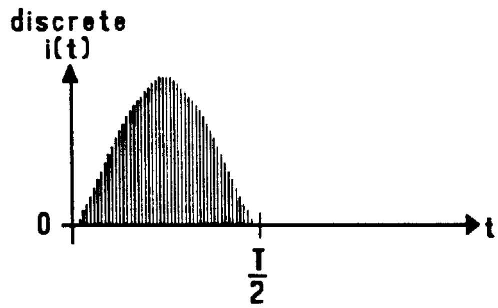


Figure 2b.

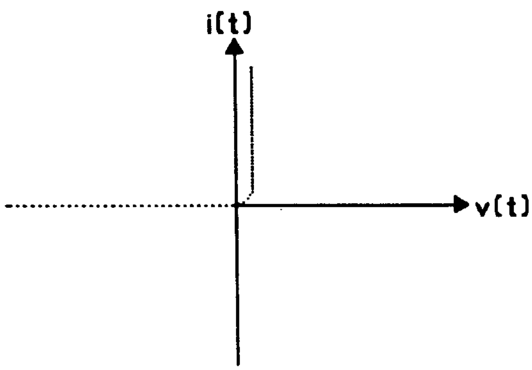


Figure 2c.

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 $t_1, t_2, t_3 \ldots t_{100}$ 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.

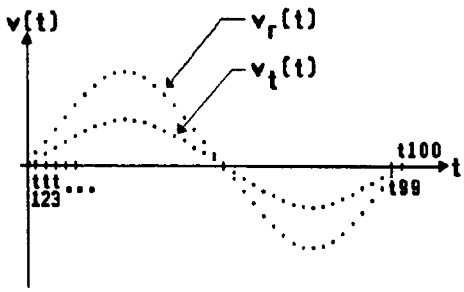


Figure 3a. Signature Comparison.

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.

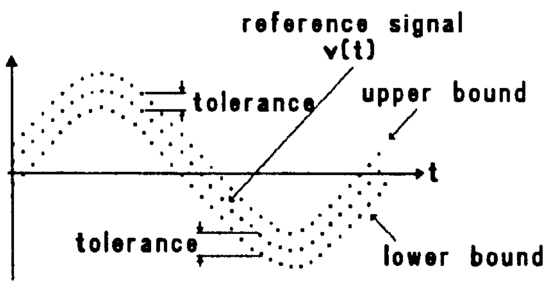


Figure 3b. Tolerance Bounds.

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 $t_1, t_2 \ldots t_N$. 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 suspect device 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.

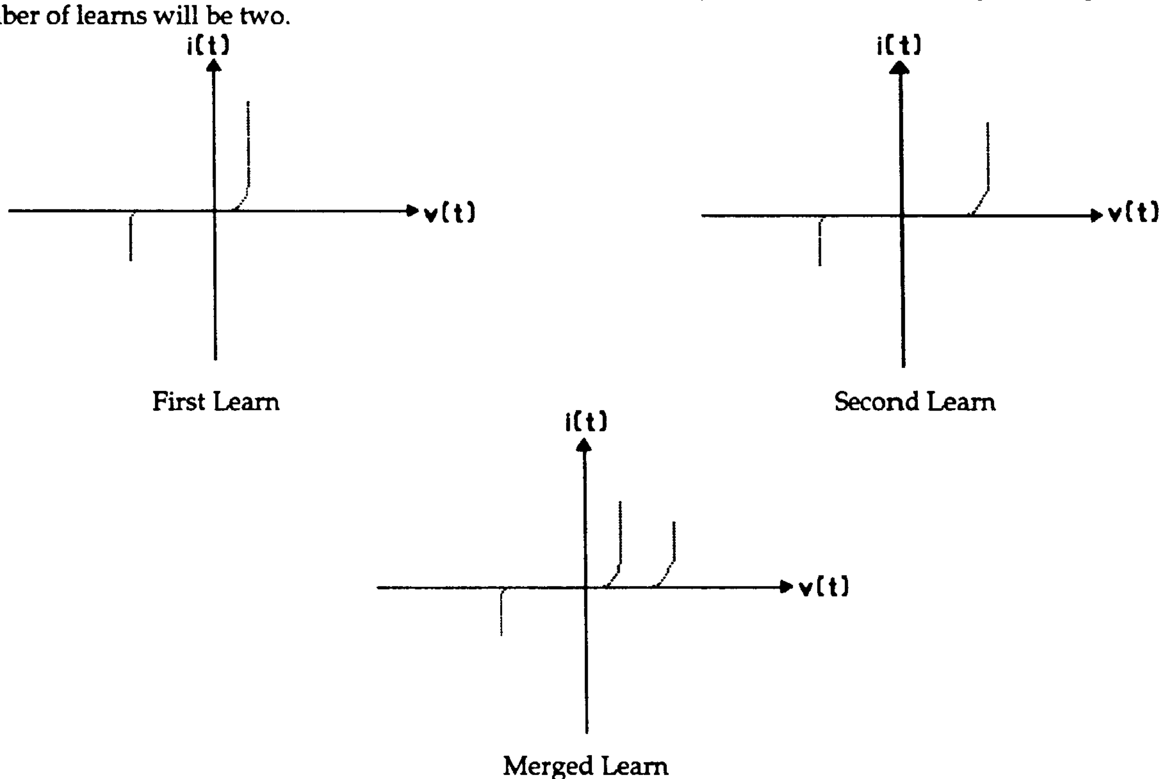


Figure 4a. Merged Signatures.

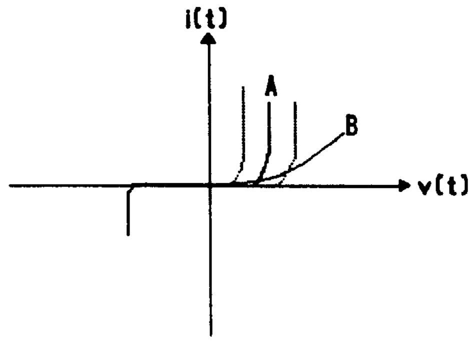


Figure 4b. Equivalent (A) and Different (B) Signatures.

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.

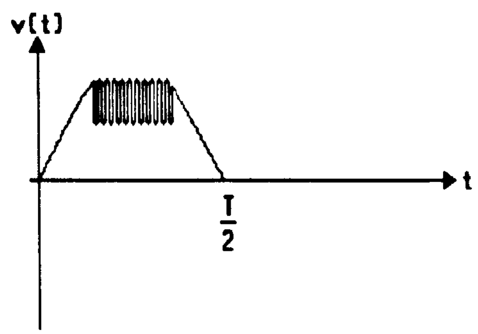


Figure 5a. Oscillation superimposed on v(t).

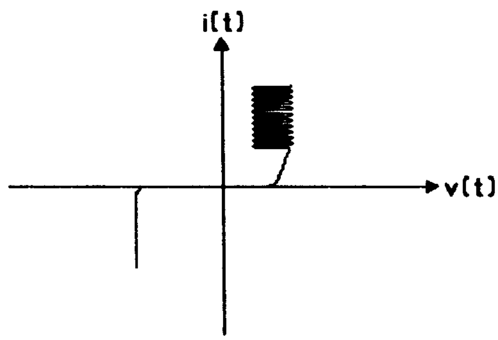


Figure 5b. Oscillating Signature observed on the 5100DS CRT.

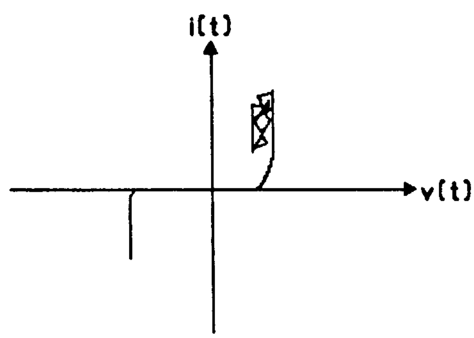


Figure 5c. "Spider Web" Signature observed on the PC monitor.

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.

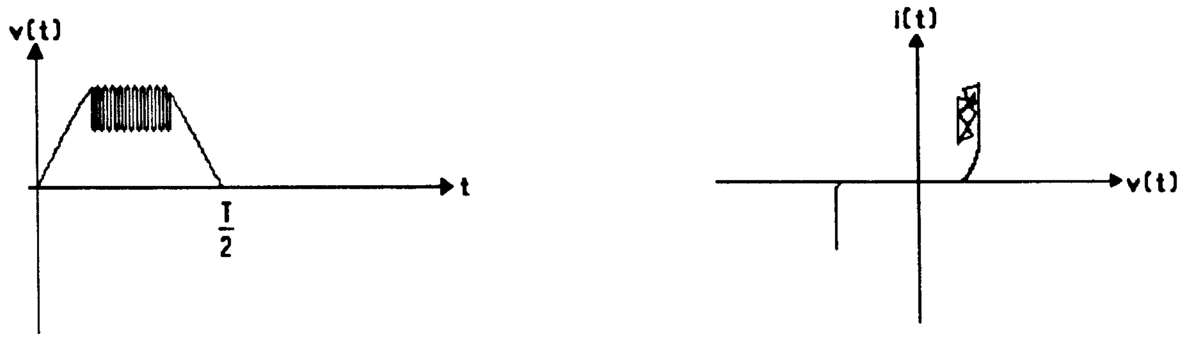


Figure 6a. The Parasitic Oscillation and its Discrete Signature.

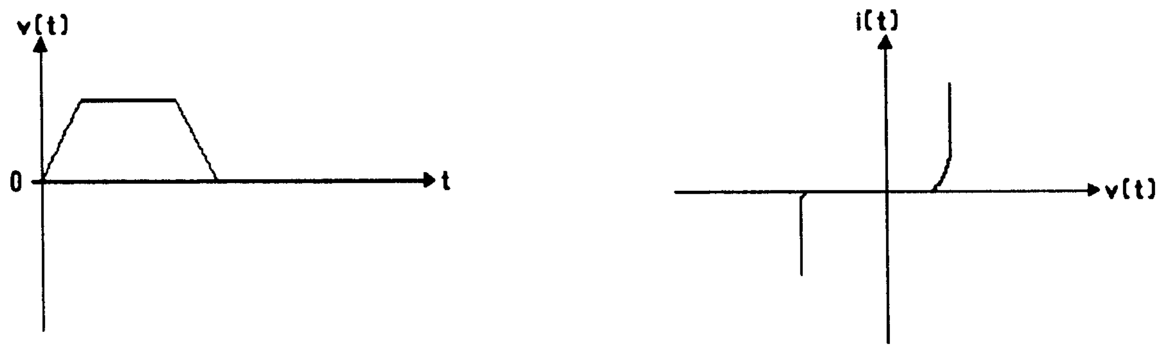


Figure 6b. The Parasitic Oscillation Removed by the FILTER Routine, and its Discrete Signature.

4. Number of Samples and Unstable Signatures

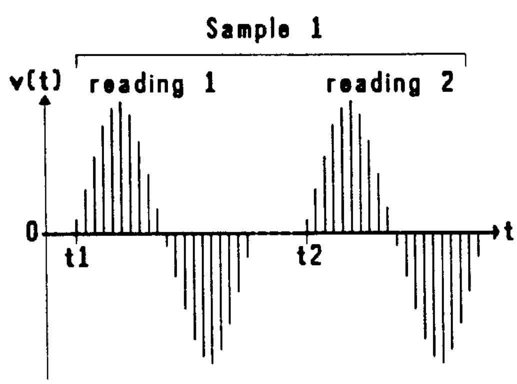


Figure 7. V(t) read at t1 and at t2.

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.

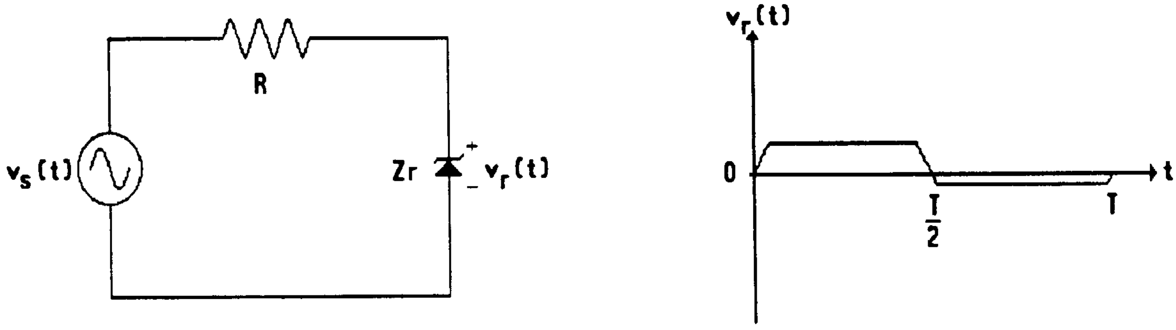


Figure 8a. Tracker signal on a Reference Zener Diode Z_r.

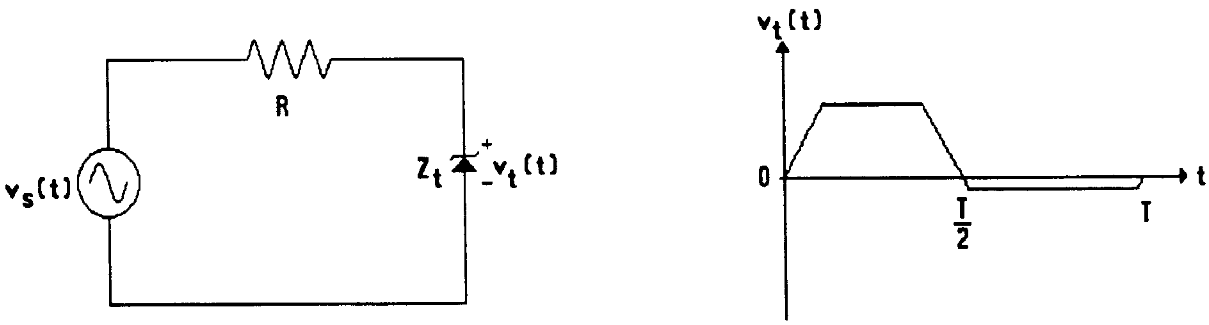


Figure 8b. Tracker signal on a Zener Diode Under Test Z_t.

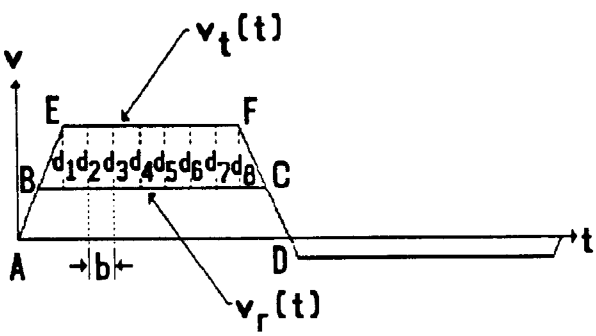


Figure 8c. Signals $V_r(t)$ and $V_t(t)$ superimposed on a 2 times scale.

The difference between $V_r(t)$ and $V_t(t)$ is the area enclosed by BEFC and is given as:

Area BEFC $= bd_1/2 + bd_2 + bd_3 ... + d_8 b/2$

$= b[d_1/2 + d_2 + d_3 ... + d_8/2]$

$=$ 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.

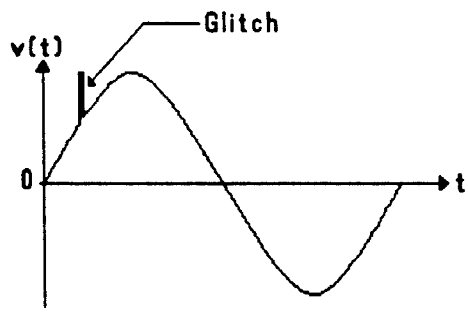
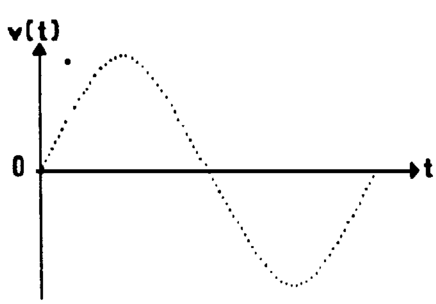
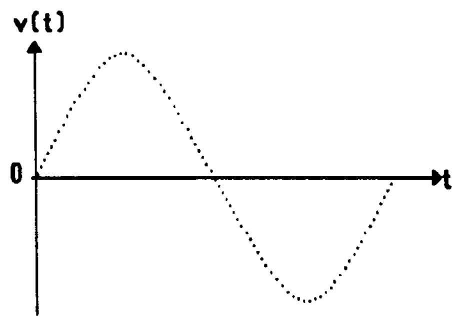


Figure 9a. An electrical spike (glitch) appearing in the continuous time signal.

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.

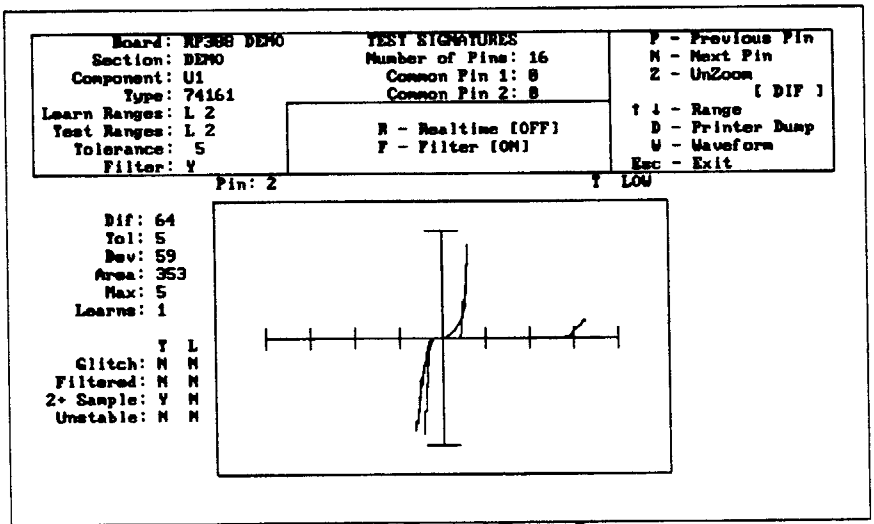


Figure 10. A Typical Zoom Screen.

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.

Dif: 64 — This number indicates the largest difference between the LEARN and TEST signature data points. If the pin/range was equivalent this number shows how close it was to being marked DIFFERENT.

Dev: 59 — The peak deviation between test and learn signatures is 59. On the LEARN SIGNATURES screen, this indicator is blanked out for the first learn since there is nothing to compare the learn to.

Area: 353 — The sum of the deviations between the test and learn signatures is 353. 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 similar 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.

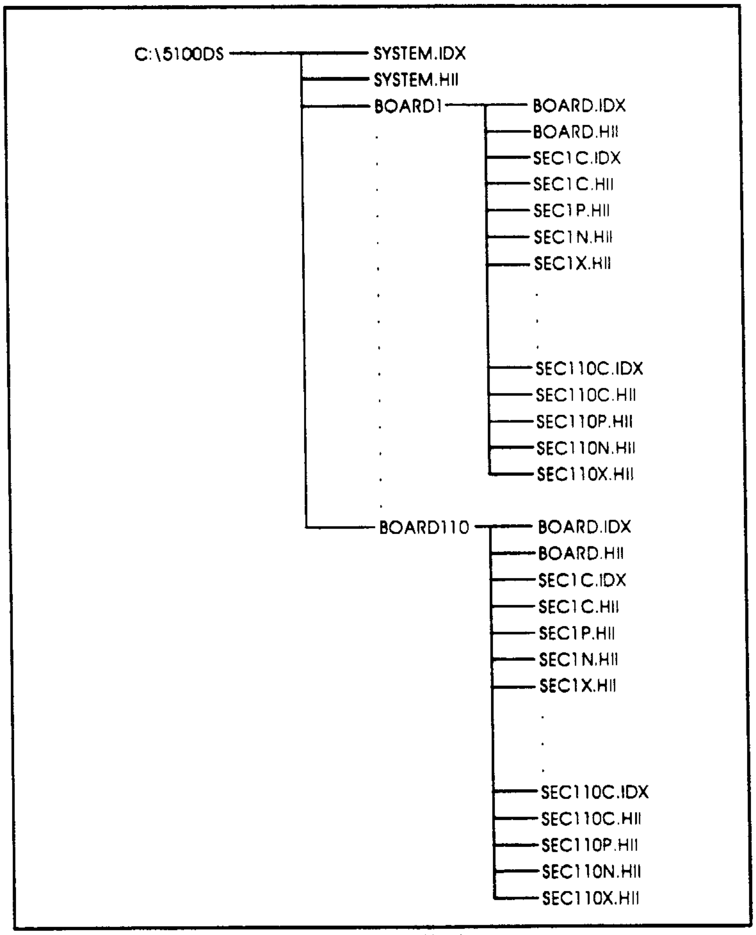


Figure 1. 5100DS File Structure.

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)
SEC#XA#.HII	32340 * 2 alignment points * NUMBER OF SECTIONS (if RP388 is in use)

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 the 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 and RP388: = [1.05 * (22 + 61 + 22 + 64 + 96 + 666 + 1300 + (201 * 304))] + (2 * 32340) = 131182

This example of a board with three components (U1, U2, U3) can be used as a guide to calculate 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.

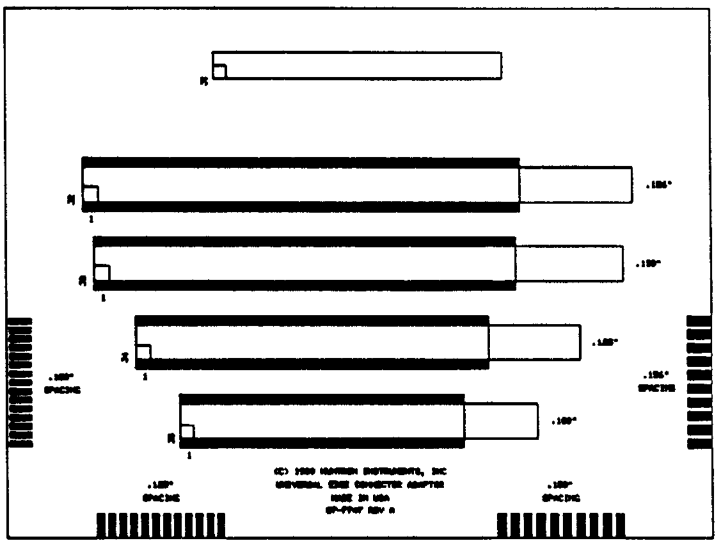


Figure 1. Universal Edge Connector Adaptor.

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 PCB using the template on the UECA, if needed.
3. Plug the PCB into the correct edge connector socket on the UECA. Make sure to check that the PCB 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 PCB.

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 PCB card edge so that the second group of pins are aligned to pin 1 on the UECA edge connector socket.

6. There are four component package configurations in the COMPONENT ENTRY screen (EDIT mode) that define the testing sequence of the PCB'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 a DIP IC).

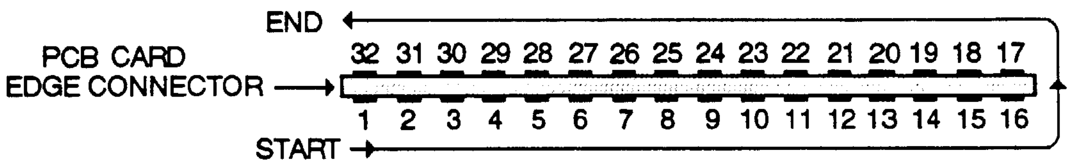


Figure 2. PCB 32 Pin Card Edge-DIP Mode Pin Testing Order.

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.

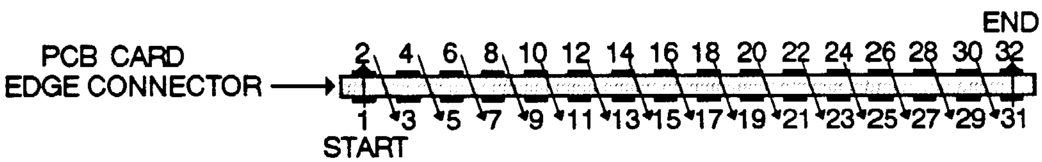


Figure 3. PCB 32 Pin Card Edge-SIP Mode Pin Testing Order.

Package type "F" selects FRONT mode which tests only one side of the edge connector. Testing sequence starts at pin 1 (lower left corner), down the same side to the end pin 16.

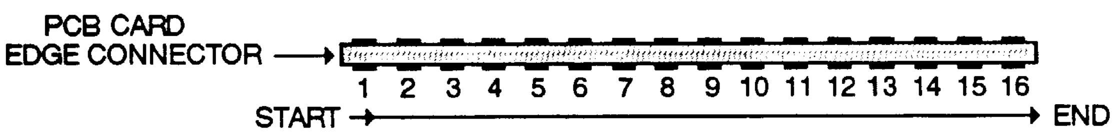


Figure 4. PCB 32 Pin Card Edge-FRONT Mode Pin Testing Order

Package type "B" selects BOTH front and back mode which tests pins on one side down the row of pins to the end and then over to the other side of the card edge pins. Test sequence starts from pin 1 (lower left corner) to pin 16 (lower right corner), then starts back at pin 17 (upper left corner) to pin 32 (upper right corner).

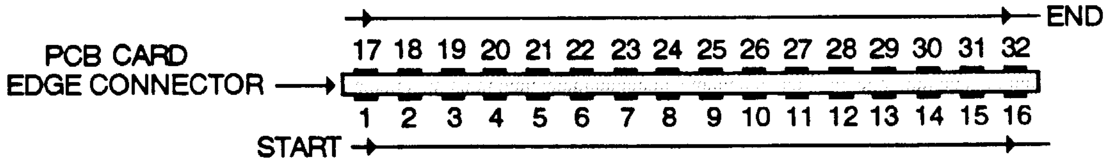


Figure 5. PCB 32 Pin Card Edge-BOTH Mode Pin Testing Order.

Use the package type that best matches your PCB'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 7, section 7-2 of this manual.

7. You can select a COMMON pin on the PCB edge connector. Or you can set CP1 and CP2 to 0 in the EDIT COMPONENT screen and establish a COMMON on your PCB 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 PCB.

8. After completing the component information in the EDIT mode, go to the LEARN mode and learn the board.

NOTE

If you want to quickly verify the PCB 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 PCB edge connector with it. The 5100DS CRT displays a "short" (vertical) signature when there is a match.

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 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 Start-up 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:

- Leave 512K of LIM expanded memory available for the 5100DS software use.
- If 512K of LIM memory is not available, leave 512K of XMS extended memory for the 5100DS software to use.
- Remaining extended or expanded PC memory and memory utility software can be used to create a RAM disk. This RAM disk may 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.
- Remaining extended or expanded PC memory and utility software can be used to create a hard disk cache. This will speed up access to the hard disk.

NOTES:

APPLICATION NOTE 6
USING THE PC-PEDAL™ WITH THE HUNTRON TRACKER 5100DS

INTRODUCTION

The PC-Pedal™ is an optional foot switch accessory for the Tracker 5100DS that can enhance testing speed and reduce test time. The PC-Pedal allows the user to replace the hand movement needed every time the ↵ key is required to be pressed with a foot pedal action. The user can now have both hands free at all times to move or hold test clips or test probes on the board under test and not need to press the ↵ key on the keyboard.

INSTALLATION

The following steps describe the simple installation of this foot switch.

1. Locate your computer's parallel printer port.

2. Disconnect the printer cable from the computer if attached.

3. Attach the foot switch connector to the computer' s parallel printer port.

4. Reconnect the printer cable to the foot switch connector. The foot switch connector is a pass through type that shares the printer port transparently.

5. Make a backup copy of the original PC-Pedal program disk and put the original disk in a safe place.

NOTE
Do not write protect the backup copy of the disk.

6. Insert the backup copy of the program disk into a floppy drive and log on to this drive.

7. Type "**SETUP**" ↵ to start the PC-Pedal SETUP program.

8. Follow the steps of the SETUP program.

9. Type "**ADJUST**" ↵ to run the PC-Pedal ADJUST program.

10. At the *MINIMUM DELAY* prompt, press **Y** to set the correct time delay.

11. Enter "**10**" for the time delay (this is a suggested setting that can be changed later).

12. At the *CHANGE THE LETTER* prompt, press **Y** to set the key.

13. Press the ↵ key to configure the foot switch to emulate this key.

14. After the ADJUST program is finished and returns the PC to the DOS prompt, copy the ANYKEY.COM and ADJUST.COM files from the program disk to the 51DS directory on the PC's hard disk. For example, type "**COPY A:\ANYKEY.COM C:\51DS**" ↵ and "**COPY A:\ADJUST.COM C:\51DS**" ↵. If the 51DS directory resides on a different path, then substitute the correct drive letter for "C:" and/or the correct directory for \51DS.

15. If you are using the default directory for your 51DS (i.e. C:\51DS), add the following line to your AUTOEXEC.BAT file:

    "C:\51DS\ANYKEY"

    If the 51DS directory resides on a different path then substitute the correct path for "C:\51DS".

16. Reboot the PC.

17. Start the 5100DS software. The foot switch will now act as the ↵ key function.

NOTE

If you experience any problems with the installation or operation of the foot switch contact Huntron Technical Support for assistance.

APPLICATION NOTE 7
RP388 SPRING CONTACT PROBES

INTRODUCTION

The RP388 uses a spring loaded probe for making contact with a test point. Various probe styles are available depending on the type of components tested. These probes are commonly used in bed-of-nails fixtures and are readily available from a large number of manufactures. Since the probe fits into a specific receptacle, only specific probe sizes can be used. The receptacle is press-fitted into the probe holder. It is a widely used industry standard size, so finding probes that fit into this receptacle should not be a problem. Manufacturers of these probes and the receptacle specifications are listed at the end of this application note.

This application note describes the different probes supplied with the RP388 and their uses.

LIFE EXPECTANCY OF SPRING CONTACT PROBES

Generally, quality probes like those from Interconnect Devices Inc. (IDI) are rated at 1,000,000 cycles minimum. The life expectancy depends on proper use and maintenance of the probe.

REPLACING THE PROBE TIP

Use the needle nose pliers supplied with the RP388 tool kit to pull the probe out of the receptacle. It is not necessary to remove the probe holder to do this. Simply grip the probe tip with the pliers and pull straight downward. The probe tip should come out easily.

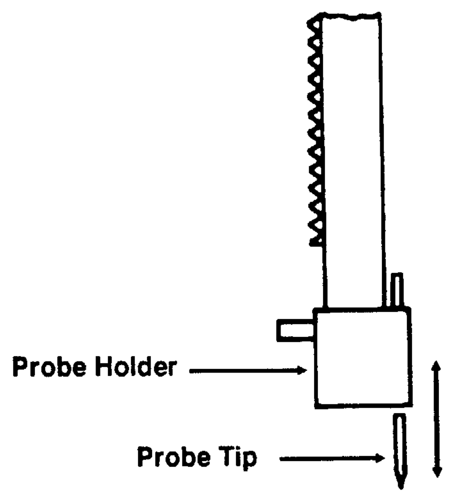


Figure AN7-1. Removing and Replacing the Spring Probe.

Use Maintenance - CAMERA OFFSETS to compensate for the different length probes. This should be run whenever the probe tip is changed.

The following probes are supplied with the RP388:

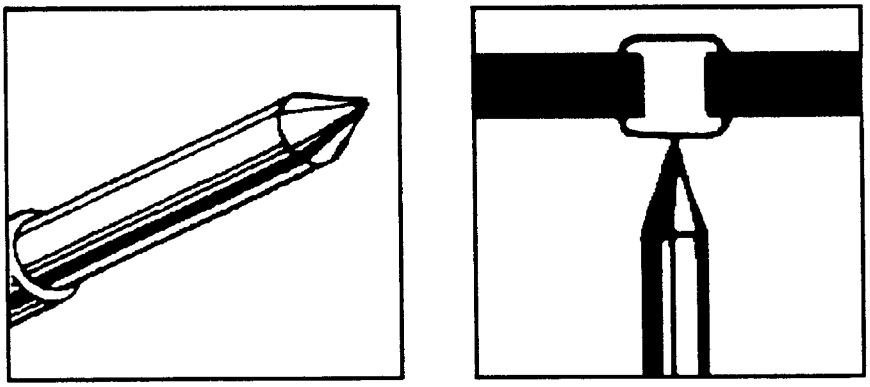


Figure AN7-2. 30 Degree Spear Point Probe.

30 DEGREE SPEAR POINT PROBE

- Use this probe for testing land pads and plated through holes. The spear point penetrates thin layers of oxides or contaminates.
- Extended length for densely packed components.
- IDI part number SR-25-B-6.3-R (Huntron P/N 07-2106)

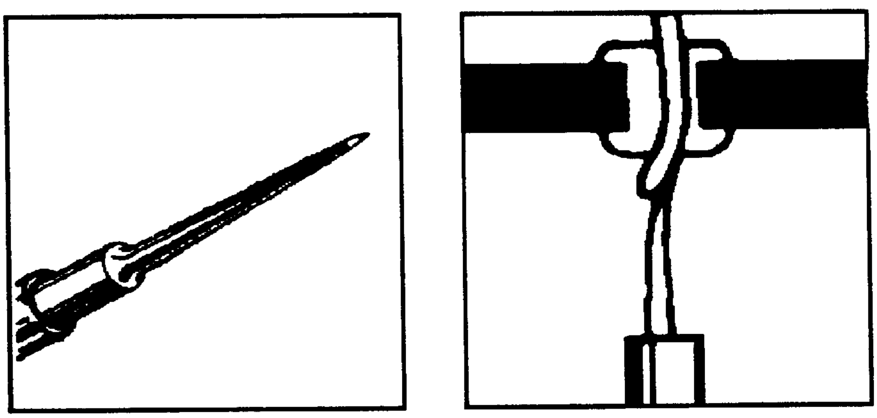


Figure AN7-3. Flex Tip Spear Probe.

FLEX TIP SPEAR PROBE

- Used for testing contaminated boards or conformal coatings.
- Fine pitch devices can also be tested with this probe.
- IDI part number S-25-FX-5.5-R (Huntron P/N 07-2111)

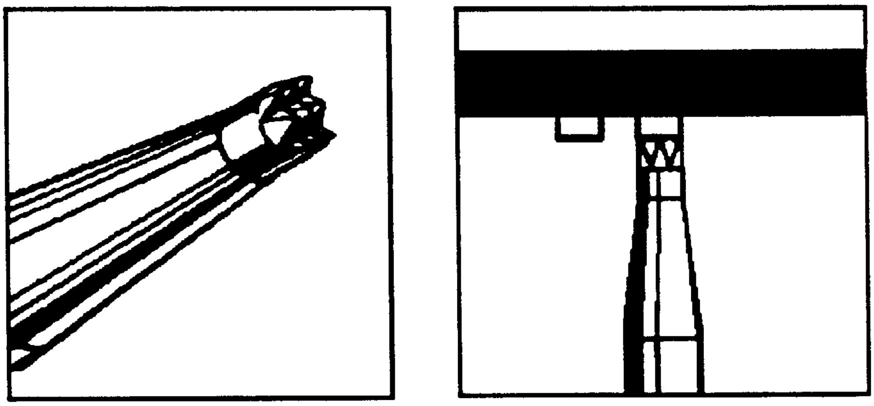


Figure AN7-4. 9 Point Tapered Serrated Probe.

9 POINT TAPERED SERRATED PROBE

- Used to test leads, lands and pads.
- Used for densely populated boards and fine pitched devices.
- Best for 50 mils or wider spaced leads or pads (tip diameter = 25 mils).
- IDI part number S-25-HT-10-R (Huntron P/N 07-2107)

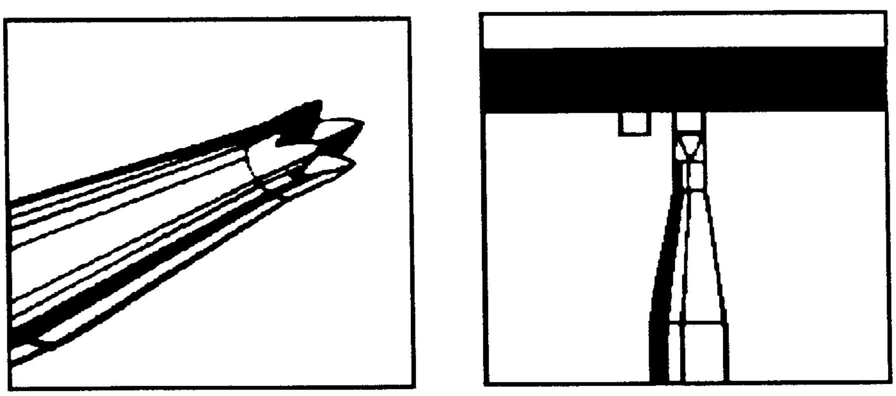


Figure AN7-5. 4 Point Tapered Crown Probe.

4 POINT TAPERED CROWN PROBE

- Used to test leads, land and pads on densely populated boards.
- Best for small pad or SMD testing (tip diameter = 11 mils).
- IDI part number S-25-UT-6.7-R (Huntron P/N 07-2120)

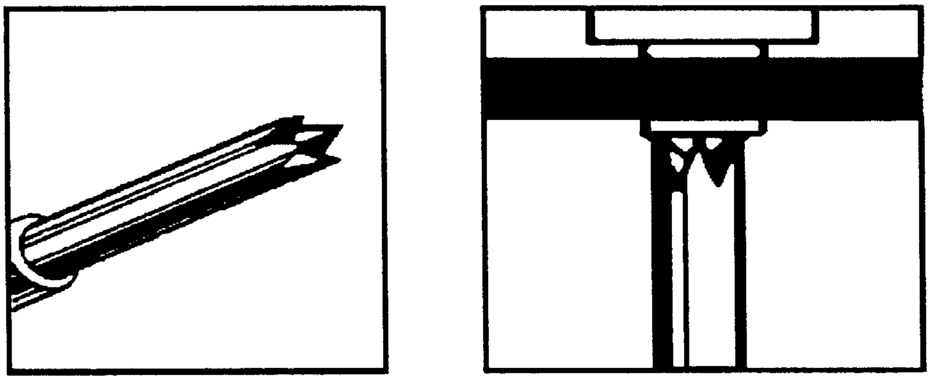


Figure AN7-6. 4 Point Crown Probe.

4 POINT CROWN PROBE

- Used to test leads, land and pads.
- Best for 100 mils or wider spaced leads or pads (tip diameter = 40 mils).
- IDI part number S-25-U-8-R (Huntron P/N 07-2112)

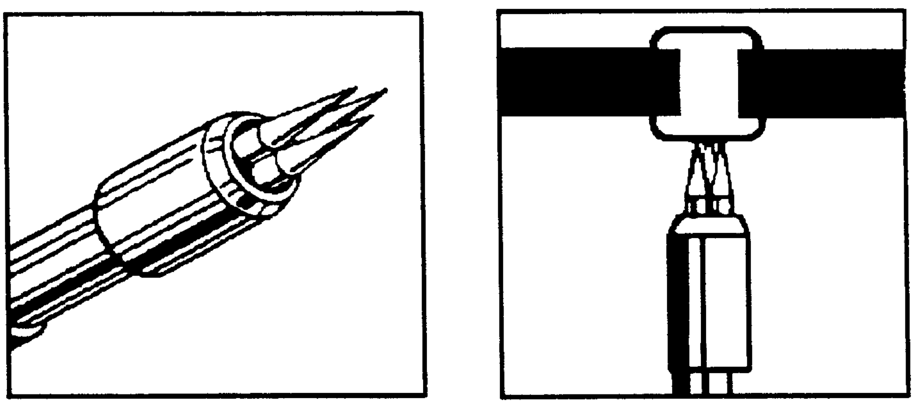


Figure AN7-7. Tri-Needle Probe.

TRI-NEEDLE PROBE

- Used to test contaminated boards or pierce conformal coatings.
- Best for 100 mils or wider spaced leads or pads.
- IDI part number S25-TN-6.8-E/N (Huntron P/N 07-2108)

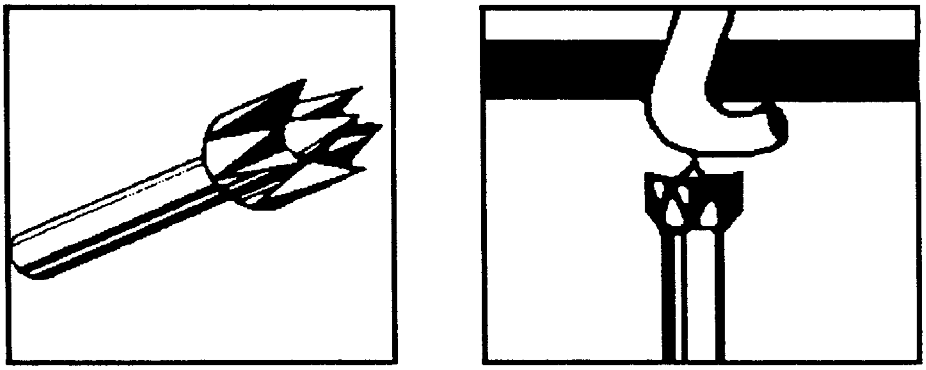


Figure AN7-8. Tulip Probe.

TULIP PROBE

- Used to test long leads, terminals and wire wrap posts.
- Best for 100 mils or wider spaced leads or pads (tip diameter = 55 mils).
- IDI part number S-25-Y-6.3-R (Huntron P/N 07-2113)

MANUFACTURERS OF CONTACT SPRING PROBES

1. Interconnect Devices, Inc. (IDI)
   5101 Richland Avenue
   Kansas City, Kansas 66106

   Phone: (913) 342-5544
   FAX: (913) 342-7043

2. Contact Products, Inc.
   700 East Harrison Avenue
   Pomona, California 91767

   Phone: (714) 625-5551
   FAX: (714) 624-9746

3. QA Technology Company, Inc.
   4 Merril Industrial Drive
   Hampton, New Hampshire 03842

   Phone: (603) 926-1193
   FAX: (603) 926-8701

SPECIFICATIONS FOR THE RP388 PROBE RECEPTACLE

The probe receptacle is press fitted into the RP388 probe holder.

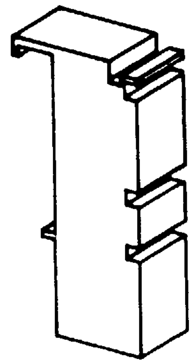
The general specifications for the probe receptacle are as follows:

The IDI part number of this receptacle is R-25-SC (Huntron P/N 07-2109).

Receptacle Size:	25
Connection Style:	SC - solder cup
Material:	Nickel/silver, gold plated
Total Length:	1.165 inch (29.59mm)
Overall Outside Diameter:	0.066 inch (1.68mm) outside
Use Spring Probes Size:	0.054 inch (1.37mm)

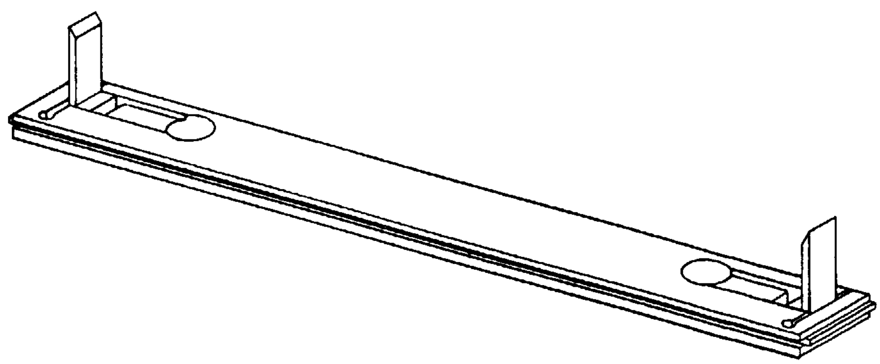
APPLICATION NOTE 8
RP388 TEST BOARD SUPPORT ACCESSORIES

This note describes the test board support accessories for use with a Robotic Prober Model RP388. These accessories are used in various combinations to hold different types of boards in the RP388. The description of each accessory includes a picture, the Huntron part number and some examples of what it is used for.



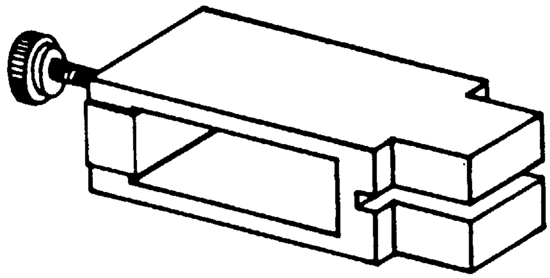
Board Spacer (P/N 98-0111).

Board Spacers move the test board away from the slotted walls. The RP388 can only probe components that are approximately 0.5″ (13mm) away from the slotted walls of the RP388. Board Spacers snap onto and slide along the slotted walls. They allow the probing of components on the edge of boards and the supporting of boards with protruding components. Board spacers are stackable to create more space between the test board and the RP388 walls.



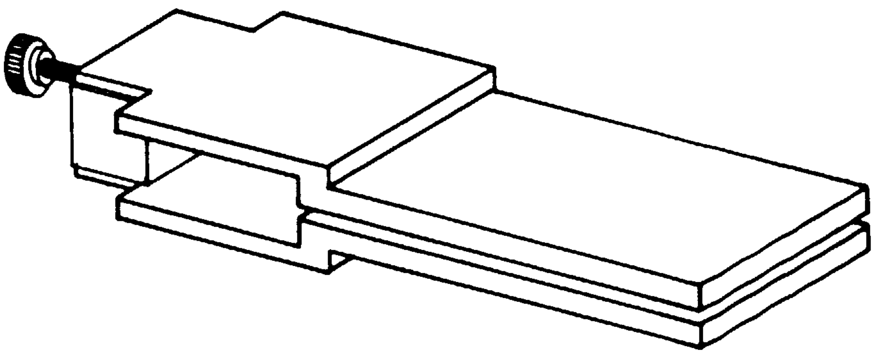
Crossbar (P/N 98-0110).

The Crossbar is normally used to hold the front side of the test board. A Crossbar in the middle slot underneath the test board with an Extended Slide Bar (P/N 98-0133) can give support to the unsupported side of the test board. Also, a Crossbar in the middle slot is the main support for holding test boards in the top slot that protrude from the front of the RP388. In this case, use the Crossbar with two Slide Bar Extensions (P/N 98-0132) and two Extended Slide Bars.



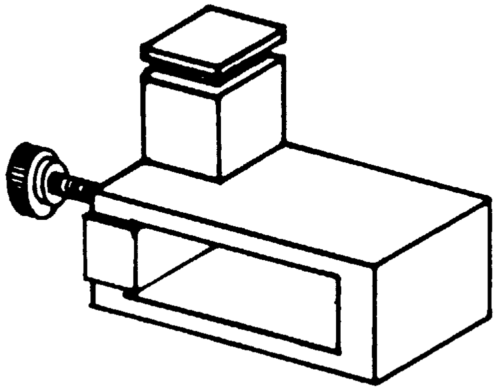
Slide Bar (P/N 98-0109).

The Slide Bar on a Crossbar (P/N 98-0110) holds the left front corner of the test board. The front of a Slide Bar on a Crossbar can hold the test board away from the Crossbar to allow components on the front edge of the board to be reached by the probe tip. Use a Slide Bar and a Slide Bar Extension (P/N 98-0132) on a Crossbar to hold the unsupported side of the test board.



Slide Bar Extension (P/N 98-0132).

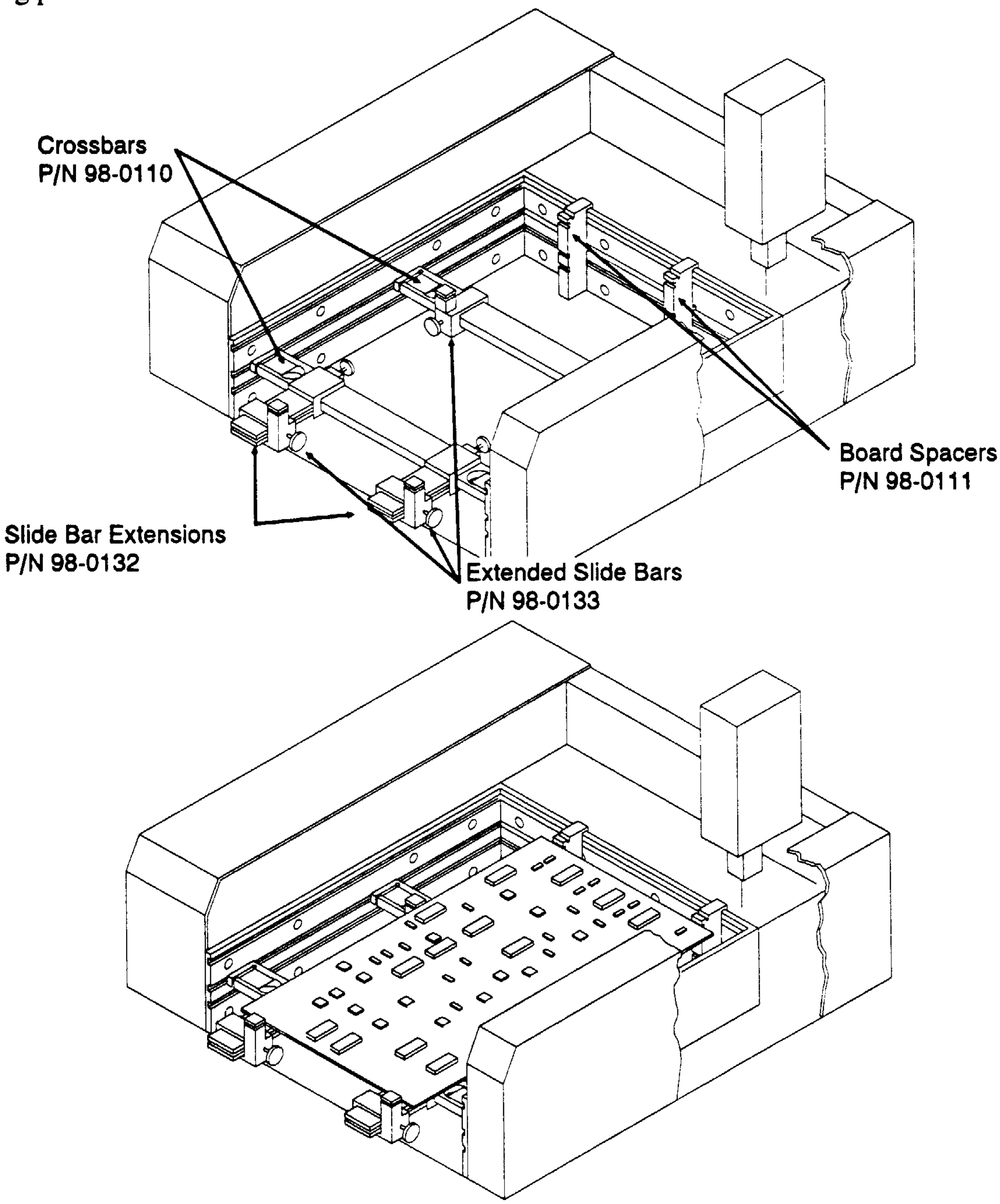
The Slide Bar Extension on a Crossbar (P/N 98-0110) can hold the unsupported side of the test board. An Extended Slide Bar (P/N 98-0133) on a Slide Bar Extension can hold test boards that protrude from the front of the RP388. The Slide Bar Extension with a Slide Bar (P/N 98-0109) can hold the unsupported side of the test board.



Extended Slide Bar (P/N 98-0133).

Extended Slide Bars are used with Slide Bar Extensions (P/N 98-0132) to hold test boards that protrude from the front of the RP388. An Extended Slide Bar with a Crossbar (P/N 98-01 10) can hold the unsupported side of the test board.

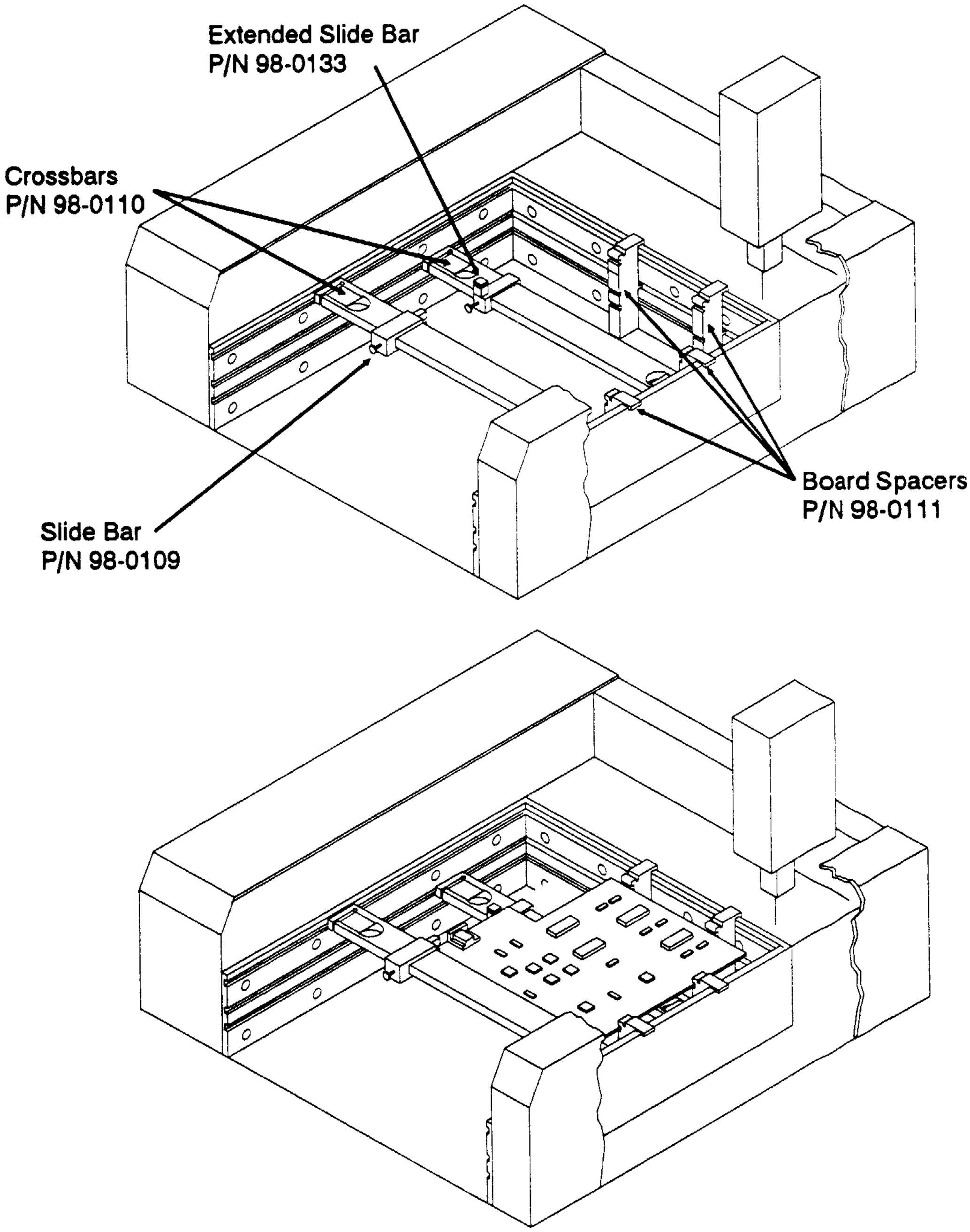
The following figure shows how to mount a board that is larger than the normal clamping area. By using Slide Bar Extensions and Extended Slide Bars, the effective clamping area grows from 12.5" X 13.5" to 12.5" X 17.5". While the clamping area will be increased, the probing area will not change. If you use Board Spacers to allow probing out to the board edge which is next to the back wall of the RP388, the clamping area will only increase to 12.5" X 16.75". The additional Crossbar and Extended Slide Bar holds the middle of the unsupported edge of the board and prevent the board from flexing while being probed.



Clamping an Oversized Board.

When using Extended Slide Bars, the board must be mounted in the top slot of the RP388. The Crossbars (which hold the Slide Bar Extensions and Extended Slide Bars) are then mounted in the middle slot.

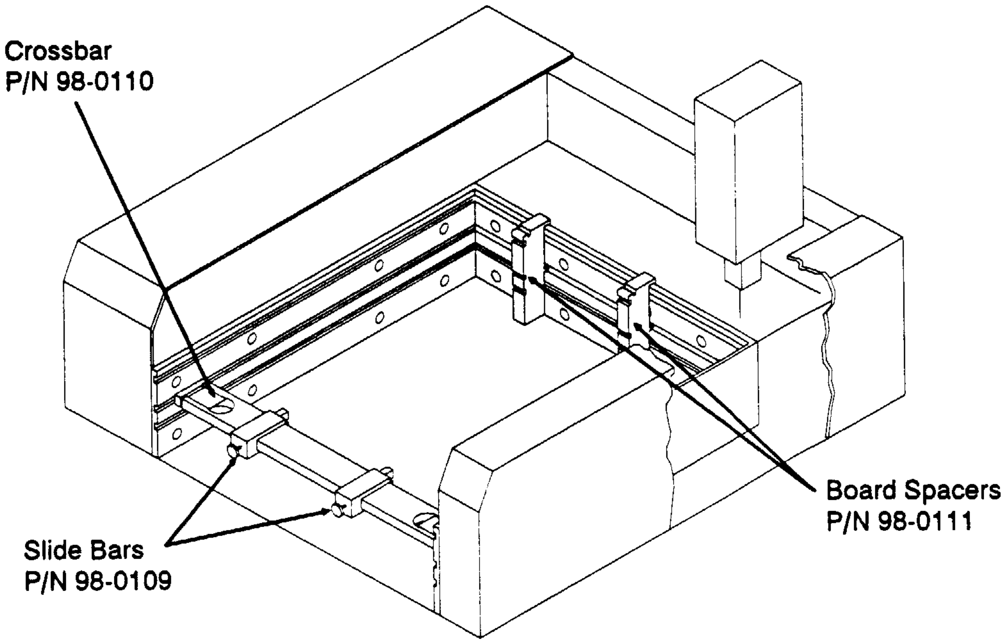
‾he following figure shows how to mount either an irregularly shaped board or a long and narrow ‿oard. The additional Crossbar and Extended Slide Bar hold the middle of the unsupported edge of the board and prevent the board from flexing while being probed. The Board Spacers allow the RP388 to probe components that are mounted within 0.5″ (13mm) of the slotted wall edge of the board.

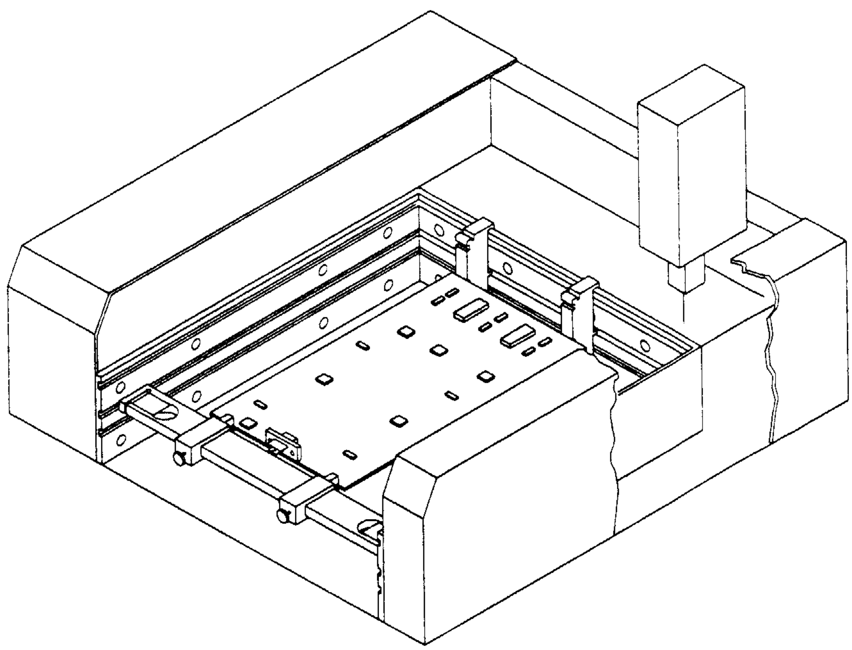


Clamping an Irregularly Shaped Board.

‾Vhen using the Extended Slide Bar, the board must be mounted in the top slot of the RP388. The ‿dditional Crossbar (which holds the Extended Slide Bar) is then mounted in the middle slot.

The following figure shows how to mount a board that has components along all of the edges. The Crossbar and Slide Bars together with the Board Spacers allow the RP388 to probe components that are mounted within 0.5" (13mm) of the edge of the board.

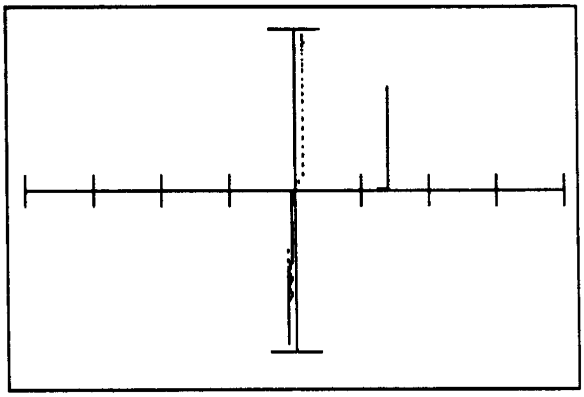




Clamping a Board with Components along all of the Edges.

APPLICATION NOTE 9
USING THE SHORTRACK TO FIND A DEFECTIVE BUS IC

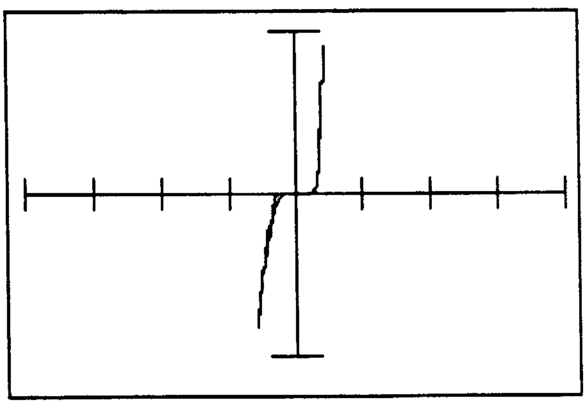
It is common in testing TTL integrated circuits to see a very narrow chair signature (≈ 1 Volt) where the correct signature should be 7 or 8 Volts when viewed in the MEDIUM 2 range of a Huntron Tracker. Referring to the following figure, the solid line shows the correct signature and the dotted line shows the defective signature.



Signatures of TTL Inputs - MEDIUM 2 Range

When this problem occurs on a bus where multiple inputs are tied together in parallel, it is very difficult to determine which IC is causing the defective signature using a Tracker alone. You can tell that the signature is not normal because most of the bus lines will show the solid line signature and only one will show the dotted line signature. Usually all lines on a bus should have the same signature.

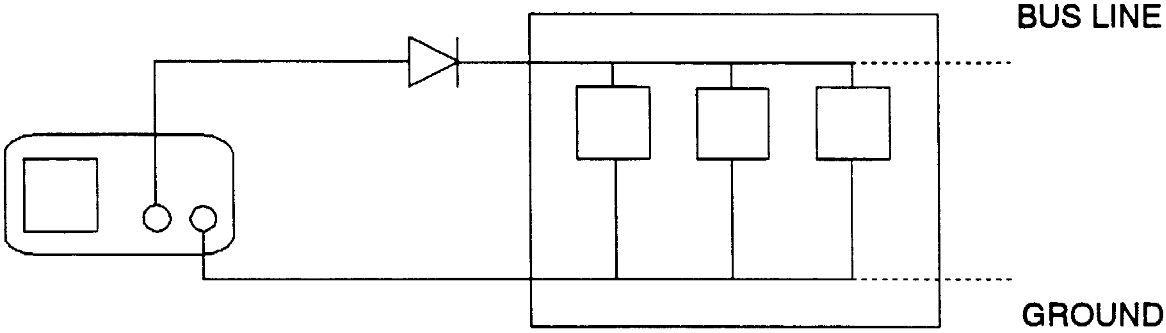
To find out which IC is causing the fault, switch to the LOW range so that maximum current flows out of the Tracker. You should get a signature like the following figure:



Signature of Defective Bus Line - LOW Range

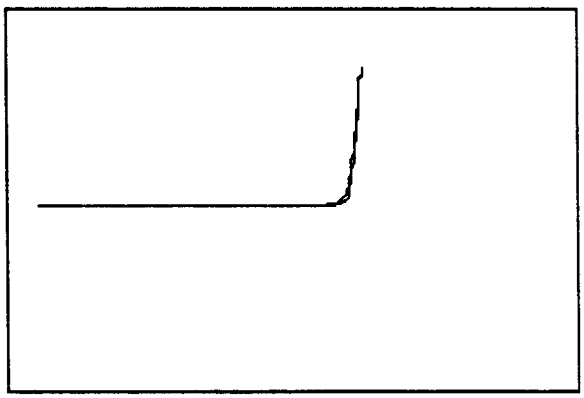
The positive half (right side) of this signature represents the current flowing through the fault because in the LOW range the normal signature would be open or nearly open for positive voltage. The negative half (left side) of the signature represents the current flowing through all the substrate clamp diodes on each of the parallel inputs.

We need to eliminate the negative current so that current is only flowing in the defective IC. To do this, disconnect one lead from the Tracker to the board and insert a diode in series between the Tracker and the defective bus line (see the following figure).



Tracker with Diode Test Circuit

With the series diode the signature will change to the following:



Signature of Defective Bus Line using Test Circuit - LOW Range

At this point current is only flowing in the faulty IC. This is where the Shortrack can be used to trace that current. Turn on the Shortrack and adjust the GAIN to maximum (fully clockwise). Then put the probe on a trace which you can see must have all the current flowing through it. If this is not possible due to board layout, put the probe against the Tracker lead (be sure to align it properly) and press hard to get the maximum reading. The exact value of the reading is not important, however it should be greater than 30 counts to obtain good results.

Now take the probe and look for the IC on the bus that gives a significant reading. Place the probe on the PCB right next to the IC pin that is connected to the bus line. If there is only one faulty IC on the bus you should only get a response at that IC; all other ICs should be at the "floor" reading which the Shortrack shows when the probe is not near any magnetic field.

To make sure you have found the correct IC, remove it from the board and see if the MEDIUM 2 signature on the Tracker is now back to the good signature of the first page.

This technique should work with other types of ICs (CMOS, NMOS, etc...) if the signature of the faulty bus line in LOW range has very low forward voltage.

NOTES: