Model R-90 Continuity Test System
INSTRUCTION MANUAL

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Litho in U.S.A.

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Limited Warranty

CheckSum, Inc. products, exclusive of fixturing products, are covered by a one-year limited parts and labor warranty for defects in materials and workmanship from time of original product shipment. Fixturing products (Model TR-3 series and Model GS-850) include a 90-day limited warranty. This warranty extends only to the original purchaser and excludes products or parts that have been subject to misuse, neglect, accident, or abnormal conditions of operations.

CheckSum, Inc. reserves the right to replace the product in lieu of repair. If the failure has been caused, as determined by CheckSum, by misuse, neglect, accident, or abnormal conditions of operation, repairs will be invoiced at a nominal cost. In such case, an estimate will be submitted before the work is started, if requested.

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1. Contact CheckSum for a returned material authorization number (RMA).

2. Pack the product in its original packing material or suitable equivalent and return it postage-paid to CheckSum, Inc. Mark the package clearly with the RMA number.

3. CheckSum will repair the product and return it postage-paid. Repairs are typically completed within two working days of receipt.

In the event that expedited repair is necessary, call CheckSum for information. In many cases a replacement module can be provided immediately.

Introduction

Getting Started

In order to best serve your long-term needs, the Model R-90 Continuity Test System contains a number of features and capabilities. Because of this, it may take you some time before you want (or need) to use all the features of the System.

To help you get your System up and testing as quickly as possible, you might want to expedite your initial reading of this manual. The manual has been organized to support you in doing so.

First, read this System Overview. You might want to look over Appendix E, the Glossary, to become accustomed to the terminology used with the System. Then read through Appendix F, the Operational Overview. By this time, you will have a good general knowledge of what the System can do and how to navigate your way around.

Finally, using the remainder of the manual as reference material, you can install your hardware and software, and begin experimenting with the System as you become familiar with its use.

If you run into problems or have questions, don't hesitate to call CheckSum for assistance. We are here to help you.

System Overview

The CheckSum Model R-90 Continuity Test System allows an IBM PC (or compatible) to efficiently test assemblies (such as cables, harnesses and backplanes) containing up to 200 test points for point-to-point continuity. The System makes high-speed measurements of each connection in the unit-under-test (UUT) and compares the outcome against user-defined test thresholds to determine whether a connection exists for each pair of test points. A different threshold may be specified for opens and shorts. The System can also test for diode junctions and for the presence of resistors installed in an assembly.

The Model R-90 includes:

- One Model R-50 200-point I/O Module that is installed into the IBM PC. All of the System electronics are included in the Model R-50.

- Four 50-Pin Ribbon Cables for connecting the Model R-50 I/O Module to the unit-under-test or to a fixture
- A Diskette containing CheckSoft Software that executes on the IBM PC
- This Instruction Manual

The System can be expanded up to 3200 test points with the addition of optional Model R-50 I/O Modules, each containing 200 test points.

Model R-50s can be connected directly to the test unit, or can be connected to either a user-supplied or CheckSum-supplied fixture unit to facilitate ease in connecting various test units to the System.

The Model R-90 can be connected to the unit-under-test via various methods:

1. You may design your own fixturing that is compatible with the 50-pin ribbon cables coming from the Test System.
2. You may use the optional CheckSum Model CBX Adapters that provide a transition the ribbon cables from the System to discrete wire terminals.
3. You may use the optional CheckSum Model GS-850 Fixture that provides the capability to use various universal or prewired adapter boards for mating to the unit being tested.
4. You may use the optional CheckSum Model TR-3 Bed-of-Nails Fixture to connect to the unit being tested.

The CheckSoft Software Package included with the System provides a menu-driven operator interface to the System. It is easy to use, yet provides a wide variety of features such as these:

- Testing a UUT
- Self-learning a known-good UUT
- Learning the UUT test specifications from a text file
- Saving specification data to hard disk or diskette
- Pin or wire locating
- Adjustable test thresholds
- Making measurements of specified connections
- UUT assembly aids
- Test printouts
- Test specification data printouts
- Batch test reports
- System self-tests
- System configuration

The CheckSoft Software Package also allows for assigning operator instructions and long pin and wire names that can be displayed to help document or to repair faulty UUTs.

Specifications

Model R-90 Continuity Test System

Includes:

- Model R-50 I/O Module and Cabling
- CheckSoft Software
- Operator/User Manual

Model R-50 IO Module

- 200 test I/O pins, each of which can be assigned to any test point. Under software control, each Module can be configured to activate or ignore its I/O pins to provide maximum speed and compatibility with specific UUT needs.
- Test threshold can be specified from 100 Ω to 100 MΩ.
- Test threshold provided in decade ranges from 1 KΩ to 100 MΩ. Programmable in approximately 1% steps of each range. Typical accuracy approximately 20% of range.
- Test speed: Approximately ten seconds to self-learn an assembly with 200 points. Less than one second to test a typical assembly. Times given are with an 8 MHz, one wait-state, 80286 computer.
- Memory requirements: 512 KBytes
- PC control: Jumperable I/O port addressing. Uses 32-byte addresses on the PC I/O bus. Default Base Address is 768 (300 hex).
- Computer requirements: One full-length slot in an IBM PC/XT/AT, PS-2 Model 30, or compatible.
- Mating connectors: Includes four ribbon cables terminated by 50 pin (25 X 2) female connectors on .10" centers. Cables protrude from back of computer approximately 34".
- One-Year limited parts and labor warranty

CheckSoft Software

- Media: 3.5" floppy diskette
- MS-DOS compatible

- Configured for operation on monochrome, CGA, EGA, VGA, or Hercules-compatible displays

Functions provided:

- Learn UUT from known-good sample
- Learn UUT test requirements from text file created independently
- Enter or edit connection data from keyboard
- Save learned specification data on disk
- Set test threshold
- Test resistive or diode-junction components
- Test learned UUT
- Chain together spec-data files (next-file capability)
- Loop test UUT (for intermittents)
- Self-test of each I/O pin and control circuitry
- Wire identification via probe
- Interactive measurement of user-specified points
- Assign special operator instructions
- Assign pin names
- Assign wire names
- Print test results
- Print test report for batch
- Print test specification data

Installation Instructions

Overview

There are several steps in the installation process. The first step is installation of the R-50 Module(s) into your PC. The next step is installation of the CheckSoft Software. Finally, the fixturing to the unit-under-test (UUT) is installed. You should read through this entire installation section before beginning.

Note

This installation procedure requires that you remove the cover from your PC for internal installation of the R-50 Modules. If you are not experienced with such procedures, you should obtain the help of a qualified person to do the installation.

Model R-50 I/O Module Installation

The first step of the installation procedure involves installing the R-50 I/O Modules in the PC.

Step 1.

Remove the power cord from your PC and turn off the power to minimize safety hazards and to ensure that no damage is done to circuitry in the PC or in the R-50s.

CAUTION

Ensure that you have removed the power from your PC. The power cable should be completely disconnected from its receptacle and the power switch should be turned off.

Step 2.

Remove the cover from your PC. Typically, the cover is secured with five screws on the back, one in each corner and one in the center top.

Step 3.

Discharge static electricity. Use an antistatic wrist strap when doing the following steps to minimize potential electrostatic discharge (ESD) damage to your computer or to the R-50 electronics. If you do not have one, place your hand on the chassis of the PC to discharge any electrostatic potential your body may contain.

Step 4.

Ensure that your R-50s are jumpered correctly.

As shown in Figure 1, the default configuration has jumpers on BASE ADDRess positions ADR 7, 6, and 5 (which is Base Address 768 decimal/300 hex). For ease of installation, use the same BASE ADDRess for all of your R-50s. If you have more than eight R-50s, it is necessary to use a second base address. A recommended choice is 512 (200 hex), which requires jumpers on ADDRess 8, 7, 6 and 5.

Note

Many Leading Edge brand computers use Base Address 768 for their own internal purposes. These computers will work with the Model R-50 if the I/O Modules are rejumpered to Base Address 512.

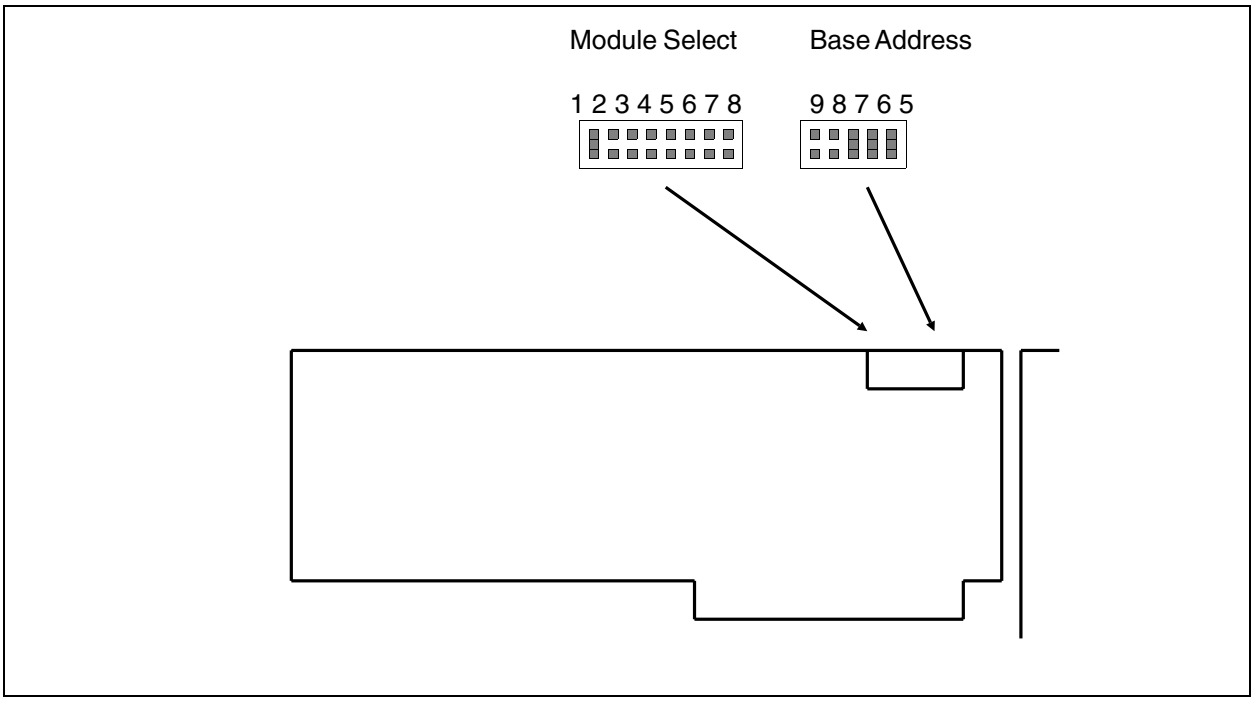

Figure 1 - R-50 Jumpering

If you have one R-50, the MODULE SELECT jumper should be installed for MODULE SELECT position 1 (the leftmost pair). If you have more than one R-50, jumper each one sequentially. There should never be more than one jumper installed on the MODULE SELECT header.

Step 5.

For each of your R-50s, install as described below and as shown in Figure 2. The instructions assume you are positioned in front of the computer, facing the front panel.

If you are installing several cards, install them from right to left. Install the cards with the addressing (MODULE SELECT jumpers) in sequential order, beginning on the right. They will work in any order, but it is easier to keep track of the cabling if you use this convention.

Note

If there is a card installed in the slot to the left of that desired for the R-50, temporarily remove it to provide additional working room.

1. Remove the blank slot cover from the desired slot. Save the screw for reinstallation in step 5.

2. Slide the card into the desired position, but without the board-edge fingers engaged into the motherboard connector.

   Position the bracket end of the R-50 to the left to provide working room.

3. Install the first of the four cables to JP4 on the R-50. Pin one (typically indicated by a red tracer on the cable) should be toward the bottom. Install the end of the cable without the white handle and strain relief to the R-50. Fully seat the cable by pressing the cable connector onto its corresponding header.

4. Install the other three cables to JP 1 through 3 on the R-50. Pin one (typically indicated by a red tracer on the cable) should be toward the bottom. Install the end of the cable without the white handle and strain relief to the R-50. Fully seat each cable.

5. Ensure that the cables are nested in their proper position on the R-50's back panel bracket.

   Reposition the R-50 over the motherboard connector and fully seat it.

   Install the screw removed in step 1 through the top of the back panel bracket into the PC chassis to hold the R-50 in place.

Step 6.

Reinstall the cover of the PC.

Step 7.

Reinstall power to the PC and boot it up.

Figure 2 - R-50 Module Installation

CheckSoft Software Installation

The next step of the installation procedure involves installing CheckSoft Software in your computer.

CheckSoft Software is provided on a 3 1/2" DS/DD (1.44 MByte) floppy diskette drive.

Depending on your hardware configuration, there are two installation procedures. The first is used if you have a hard disk drive in your System. The second is used if you do not have a hard disk drive. In this case, the System is run from the floppy disk drive.

Note

Throughout this manual, computer keys to be pressed are represented with their name surrounded by square brackets. For example, the Escape key is represented by [ESC].

Hard Disk Drive Installation

If you have a hard disk drive in your System (drive C:), you will want to install the CheckSoft Software onto it. The installation procedure installs it in a new subdirectory called CHECKSUM.

Step 1.

Start your computer and go to the root directory of C: by typing:

C:[Enter]

CD \[Enter]

Step 2.

Insert the CheckSoft Software diskette into your A: drive.

Step 3.

The installation procedure creates a directory on your hard drive (C:) named \CHECKSUM. A file called R90.BAT is copied onto the root directory to allow you to start the System from the root directory when you first power up the computer. Ensure that these directory and file names do not conflict with any existing ones on your disk.

To install the software as described, type:

A:INSTALL[Enter]

Follow the instructions shown on the computer display.

Step 4.

Remove the CheckSoft Software diskette and store it in a safe place.

Step 5.

Start the CheckSoft Software by typing:

R90[Enter]

In this configuration, the operating software and test spec data is stored in \CHECKSUM. Continuity testing can be initiated by typing R90 from within either the root or \CHECKSUM directories.

Floppy Disk Drive Installation

If you do not have a hard disk drive in your System, use this procedure.

Step 1.

Begin by backing up the CheckSoft Software diskette. Have a spare floppy diskette ready. Insert the CheckSoft diskette into the disk drive. Type:

DISKCOPY A: B:[Enter]

Follow the instructions with the source disk being CheckSoft Software and the destination disk being your blank diskette. If you need additional instructions for this operation, refer to your DOS manual. There are no hidden files or software protection of CheckSoft Software, so the DOS COPY command for all of the files can be alternatively used.

Once this operation is complete, store the original CheckSoft Software diskette in a safe place for future use.

Put your copy of the CheckSoft diskette into Drive A:

Step 2.

You are now ready to start the CheckSoft Software. Type:

R90[Enter]

To initiate continuity testing in the future, insert your diskette in A: and type:

A:[Enter]

R90[Enter]

In this configuration, your operating programs and spec data are stored on A:. You may insert a different disk in A: to save and retrieve spec data once CheckSoft Software is running. Alternatively, you can save spec data on the same disk as the CheckSoft Software. If you have a two-drive System, you can change the data path to be B: with the *Configure/Install System* menu.

Completing the Software Installation

At this point, you should see the main directory which is called the *System* menu. All System operations are accessed beginning at this directory.

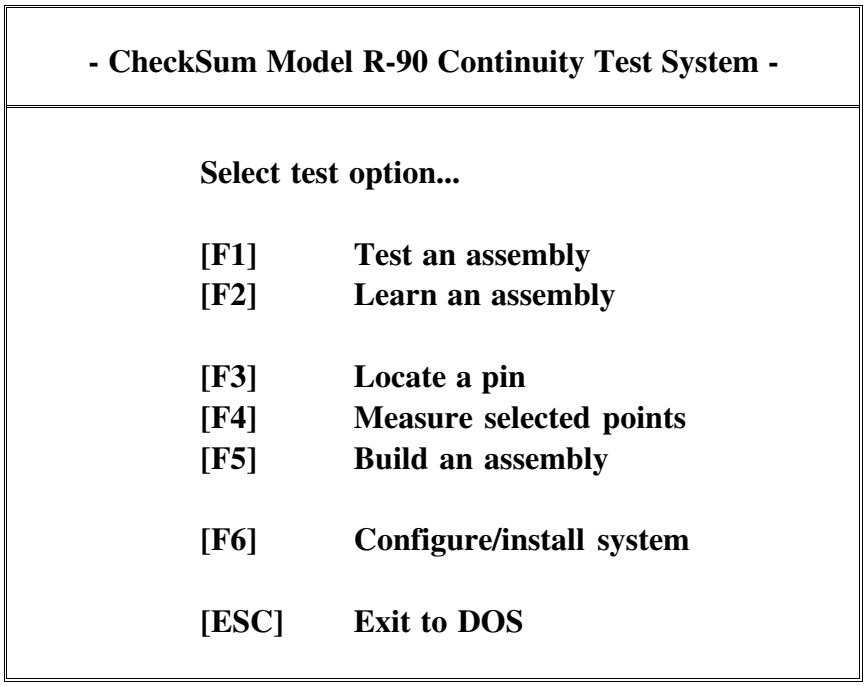

Figure 3 - System Menu

Select '[F6] - Configure/Install System.' You then see the *Configure/Install System* menu shown in Figure 4.

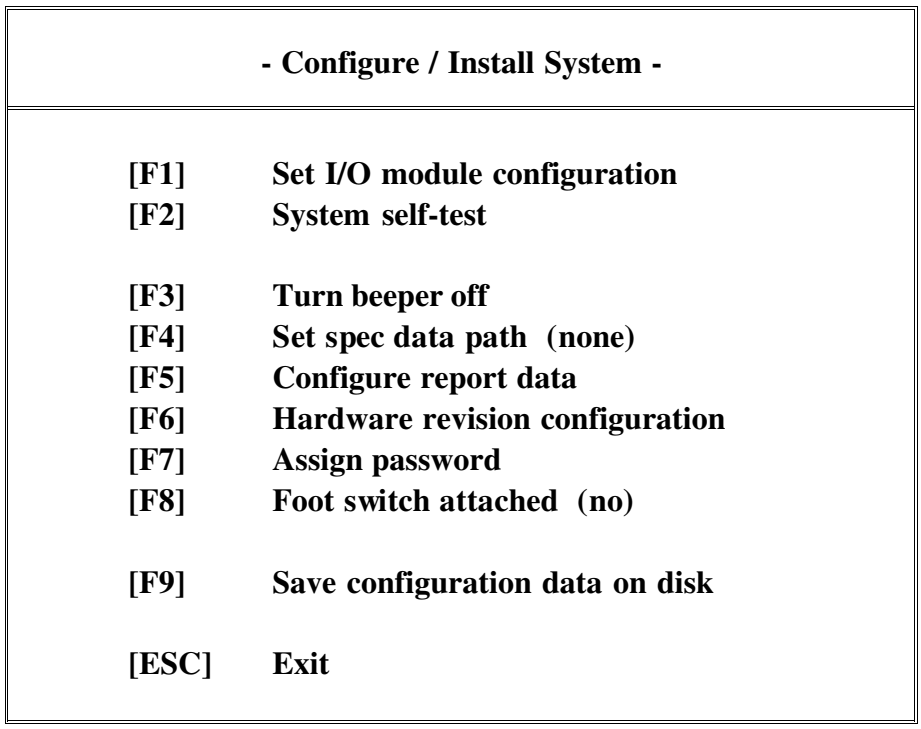

Figure 4 - Configure/Install System Menu

If you have installed a different number of R-50 Modules than the number shipped with your System, select the [F1] option to change the number of modules selected.

If you have installed your I/O modules with a different BASE ADDRess than the default (768 decimal) or with MODULE SELECT other than sequential starting at MODULE SELECT 1, then select [F1] to obtain the *I/O Module Configuration* menu. The *I/O Module Configuration* menu allows you to tell the System how you have jumpered the IO modules. For detailed instructions in use of the *I/O Module Configuration* menu, refer to the Configure/Install System section of this Instruction Manual.

If you have changed any settings, press [F9] to save the changes to the disk. If you are running from drive A:, ensure that the disk containing CheckSoft Software is installed.

Press [F2] from the *Configure/Install System* menu to execute the System self-test. The self-test verifies that all of the I/O pins (called ports) on the R-50s are operational.

If you need further instructions in the use of the System self-test, refer to the System Self-Test section of this manual.

If errors are reported, refer to Appendix C for help.

Finally, select [ESC] to return to the *System* menu.

Software installation is complete at this time. Continue now with your fixture installation.

Model GS-850 Fixture Installation

Connecting the Model R-50 to the Fixture

Once the Model R-50 and software are installed, the test points may be connected to the fixturing used for the UUT.

If you have purchased a CheckSum Fixture System, refer to the included Instruction Manual for installation instructions.

Each of the ribbon cables coming from the System contains 50 test points (ports). The edge of the ribbon cable with the colored tracer contains the first of the 50 pins. The silk screening on the Model R-50 shows which test points are connected to which header. When facing the component side of the module, the left-hand header (JP1) provides ports 1-50, the next (JP2) 51-100, then next (JP3) 101-150, and the right-hand header (JP4) provides ports 151-200.

The order of the connections is not important, but once testing has begun and test spec data is saved, it is important that the cables are not changed. Doing so will require that the assemblies be relearned. Also, if you have multiple Systems, ensure that they are all connected the same to ensure compatibility of spec data.

If you are confused about which port is which, use the probing feature of the System to determine the pin out. Touch each pin with a grounded probe and the System will tell you which port you have touched.

Operating Instructions

Overview

This section tells you how to use your Model R-90 Continuity Test System for continuity testing. If you have not already installed the CheckSum hardware and software into your PC, refer to the Installation Instructions section.

- IMPORTANT NOTE -

The CheckSum Model R-90 Continuity Test System provides adequate protection against normal input voltages at the test points. However, the System can be subject to damage in environments of high electrostatic discharge (ESD). If this is the case in your testing application, ensure that the operator wears a wrist strap connected to the computer chassis and that the UUT is adequately discharged before connection. If it is not possible to take these precautions, contact CheckSum to discuss alternative forms of ESD protection.

If you do not have a hard disk drive, insert your copy of the CheckSoft disk into the A: drive. Type in the sequence:

A:[Enter]

R90[Enter]

If you have a hard disk drive in your computer and are presently in the CheckSum or root directory (\CHECKSUM or \), simply type:

R90[Enter]

You will then see the 'System' menu shown in Figure 5.

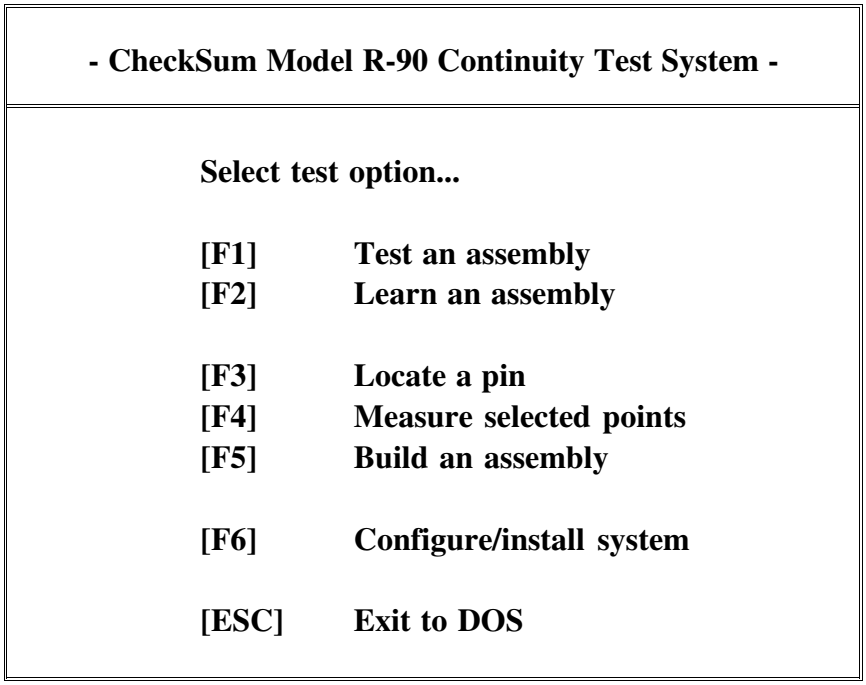

Figure 5 - System Menu

Each of the sections in this chapter describes one of the choices from this main menu. In general terms, this is what each option will do for you:

[F1] is used to test an assembly. The assembly must have been previously 'learned' by use of [F2]. The assembly can be tested once or repetitively for intermittent failures. The selection of [F1] also allows you to choose a test specification data file describing the UUT, and to display or to print test results.

[F2] is used if you want the System to learn the connections for a particular assembly. You can also use [F2] to assign alphanumeric pin and wire names, assign operator instructions, assign an assembly name, assign the test threshold, read the test specifications for an assembly from a PC file created separately, save specification information about an assembly on the disk, or get a test specification report for the assembly.

[F3] is used to identify a lead on an assembly. It allows you to probe a point and then the System identifies which point you have probed.

[F4] is used to make selected connection measurements. With this option you may specify two connection points (by tester port number or by pin name), and then measure whether a connection exists between these two points.

[F5] is used to help you build an assembly. It allows you to probe a pin on the assembly. Once you have probed the pin, the System will tell you where it should be connected.

[F6] is used to change the configuration of your testing environment. With this option you can select System self-test (which verifies proper operation), specify which disk and directory that test specification data is to be stored in, turn the beeper on and off, specify the destination of printed reports, and tell the PC how the hardware is configured. In addition, this option can be used to configure the reports generated by the System.

[F10] allows you to terminate operation of the System. Once this option is selected, you will return to the DOS environment.

Testing an Assembly

Selecting the Proper Spec Data

To perform a continuity test of an assembly, select **[F1]** from the *System* menu (Figure 5). You will then see the *File Selection* menu shown in Figure 6.

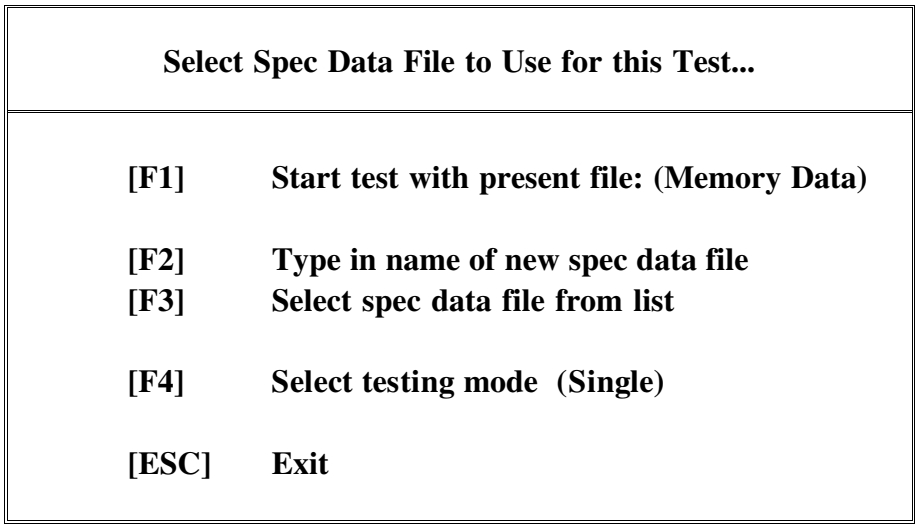

Figure 6 - File Selection Menu

When you initiate a test, the specification (spec) data information that is currently loaded in memory is used. At the end of the [F1] line on the screen, you will see a name in parentheses. This is the name of the file that is currently loaded into memory. If it is '(Memory Data),' no file has been loaded into memory.

If an assembly name has been assigned to the data in memory, it appears on the second line of the [F1] selection.

To start the test of an assembly, select **[F1]**.

If an assembly has been learned but not saved on disk, it is valid to continue with the test even though no file name is present, i.e., '(Memory Data).' If an assembly has not been learned, or spec data about an assembly has not been loaded into memory, the System will give a message that spec data is not loaded so that you can either learn the assembly or load a spec file.

To load a spec data file into memory from the disk, use either options [F2] or [F3].

[F2] allows you to type in the file name of a spec data file to be loaded into memory. Type in the name of the file (with up to eleven characters that do not include spaces or special characters such as colons or periods). The System automatically adds on the path name as defined in the *Configure/Install System* menu. The System advises you if the file is not found. Other errors that might occur are listed in Appendix D.

[F3] allows you to choose the data file from a list of those available on the disk that you have chosen. A sample screen is shown in Figure 7.

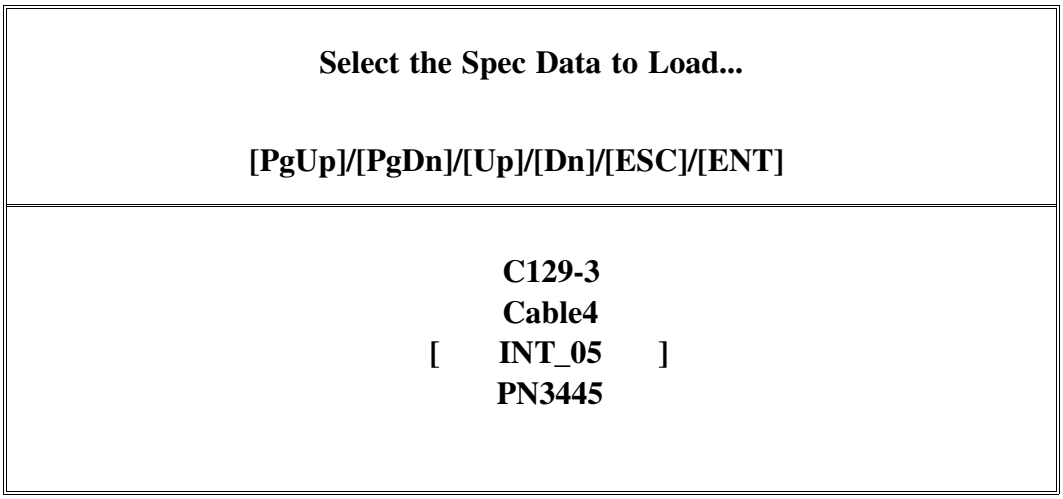

Figure 7 - File Selection List

You may move up and down the displayed list with the up and down arrow keys or page up and page down keys. When you press [Enter], the file name that has square brackets around it is loaded into memory. If you do not wish to load a file into memory, press [ESC] to exit.

[F4] allows you to specify the type of testing to be performed. Pressing [F4] toggles between 'single' and 'continuous.' 'Single' mode allows the System to halt between each UUT so that you may obtain test results, repeat the test, or select to test the next UUT. 'Continuous' mode is used for quickly sorting a batch of UUTs for pass or fail. The System continuously tests the assembly without halting for failures. Each time it detects a pass condition, it beeps and indicates PASS on the screen. With 'continuous' mode it is not necessary for the operator to press any keys between tests. This gives the advantage of faster testing, but does not provide for obtaining test results.

Performing the Test

[F1] starts a test. If operator instructions have been assigned, those are presented first. When you are finished reviewing the instructions, press any key to continue on to the test.

If you are in continuous mode, the System provides the screen shown in Figure 8.

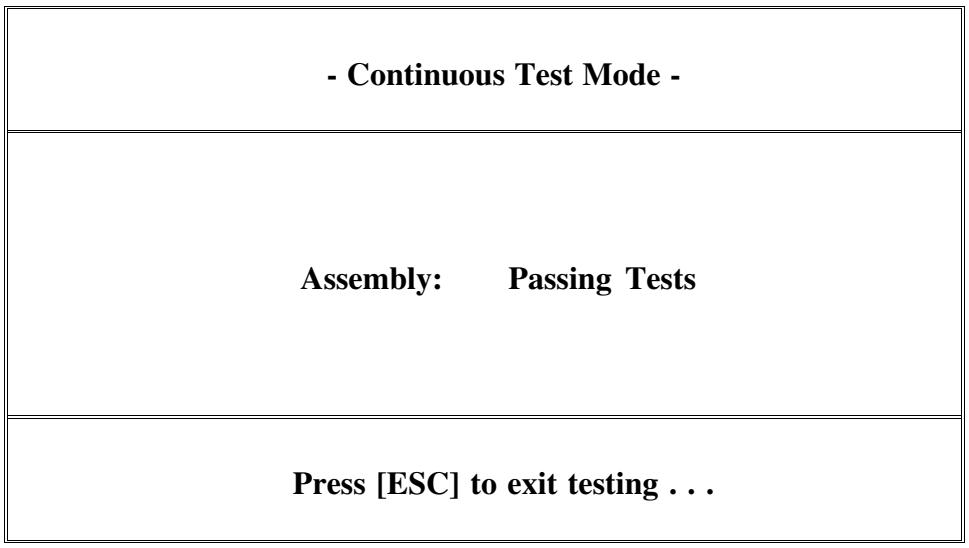

Figure 8 - Continuous Test Mode Display

The System displays pass or fail in the middle of the screen. If you have a color monitor, the colors change during the transition from fail to pass. In all cases, the System beeps once a passing assembly has been detected. A number at the bottom right of the screen shows the number of errors that were detected during the last test pass. Pressing the [ESC] key returns you to the main *System* menu and terminates testing.

If you are in single test mode, the System briefly presents a message indicating that a test is in progress. If a failure occurs, you will see the *Test Failure* display shown in Figure 9.

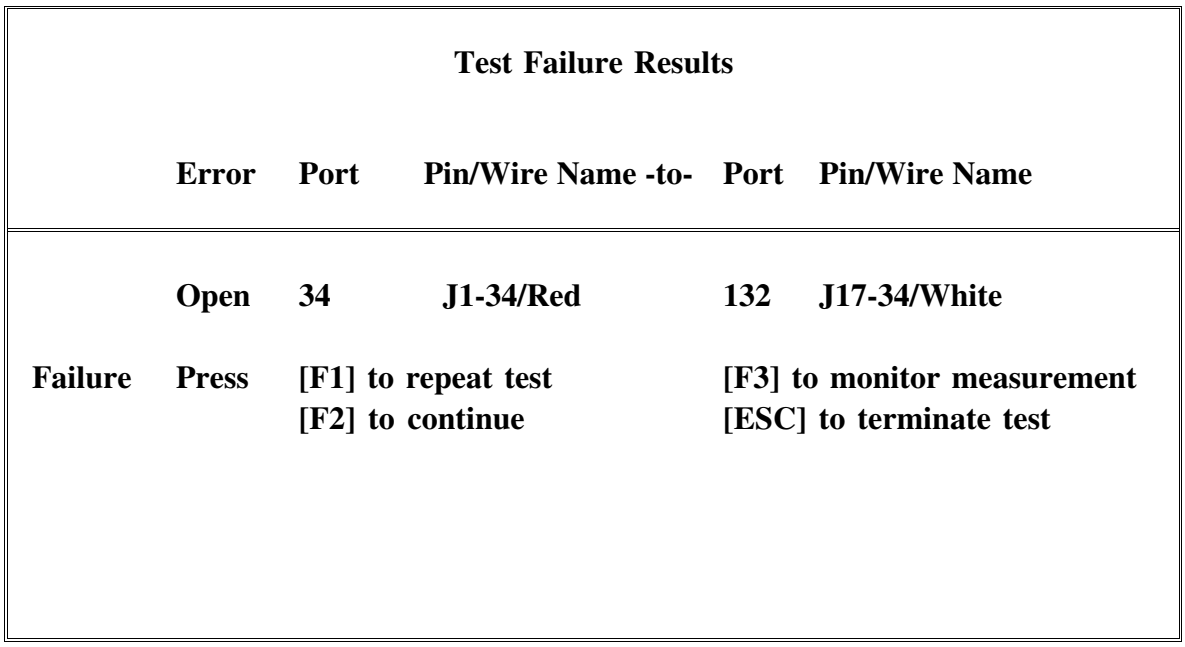

Figure 9 - Test Failure Display

The first column indicates whether the failure is due to a short or an open, and the following columns give information about the two connections involved in the failure.

The 'Port' columns indicates the I/O pin number of the R-50 Module installed in the PC. The first R-50 (the one closest to the left of the PC when looking from the back) generally contains ports 1 - 200, the second R-50 contains ports 201 - 400, and so on. When looking from the back of the PC, the left cable from each R-50 contains ports 1-50 (starting from the bottom), the second cable ports 51-100,....

The Pin and Wire Names are optionally assigned when the assembly is learned. Consequently, they may be blank or may contain up to twelve characters each. The system first displays the pin name, then if present, the wire name separated by a /. The total length allowed is up to 17 characters. If this length is exceeded, the remaining data is not displayed.

Pressing **[F1]** from the *Test Failure* display repeats the measurement that just failed.

Pressing **[F2]** from the *Test Failure* display logs the reported error and continues with the test.

Pressing **[Alt]-[F2]** from the *Test Failure* display logs the reported error, and then continues the test without halting for any future failures. This way you can complete the test of an assembly with massive failures without the need for operator intervention after each failure. If you are using a mouse interface, there is an asterisk (*) on the [F2] line that can be used to perform the same function by pointing to the * and pressing the left mouse button.

Pressing **[F3]** from the *Test Failure* display continually repeats the measurement that failed. You are aware that it is active by a moving dot on the left of the display.

> *If [F1] or [F3] is selected, and the measurement changes to a pass condition, the red 'Open' or 'Short' indication turns to a white 'None' (for no error) indication. If this is the case when [F2] or [ESC] is selected, no error is logged for the measurement.*

Pressing **[ESC]** from the *Test Failure* display returns you to the *Test Completed* menu.

Concluding the Test

Once the test is completed (either with or without errors), you are presented with the *Test Completed* menu shown in Figure 10.

- Test Completed -

(Test Time 1 Sec)

No Errors

[F1]	**Test the next assembly in this batch**
[F2]	**Retest this assembly**
[F3]	**Test this assembly for intermittents**
[F4]	**Obtain failure report for this assembly**
[F5]	**Obtain test report for this batch**
[F6]	**Select report device (CON)**
[ESC]	**Return to the main menu (batch completed)**

Figure 10 - Test Completed Menu

This display shows the total number of errors encountered in the test and the amount of time taken to execute the test.

[F1] is used to test the next assembly in this batch. Operator intructions are not redisplayed with this selection. The counter for the total number of assemblies in the batch is incremented each time [F1] is selected.

[F2] allows you to retest the present assembly without incrementing the total number of assemblies in the batch.

[F3] is used to test the present assembly for intermittent failures. In this mode, the System repetitively executes a test for the assembly. While this is occurring, you may flex or move the assembly to induce faults. The total number of passes is displayed. Any key can be pressed to exit repetitive testing and return to the *Test Completed* menu. If errors occur during repetitive testing, they are displayed and the System pauses for you to observe the failure. This choice does not affect the total number of assemblies being counted in the batch.

[F4] allows you to get a test report for this assembly. The report goes to the destination selected in the '[F6] Select Report Device' selection. If CON (for console) is selected, the report is displayed on your CRT. Other choices include your PC's printer or a disk file. The format of the report is shown in Appendix B.

The test report includes the name of your facility (optionally assigned in the *Report Configuration* menu), the Assembly ID (the optional name assigned when the assembly is learned) and the date and time. It also contains the number of failures and an identifier for the tester. Even though a failure may have occurred more than once, it is only counted as a single failure. This prevents excessively long reports after intermittent testing.

Each test failure is listed in the report. The same information is presented as in the *Test Failure* display. In addition, user-assigned wire names are reported.

[F5] allows you to get a test report for this batch. The report goes to the destination selected in the '[F6] Select Report Device' selection. If CON (for console) is selected, the report is displayed on your CRT. Other choices include your PC's printer or a disk file. The format of the batch report is shown in Appendix B.

The batch (yield) report includes the name of your facility (optionally assigned in the *Report Configuration* menu) and the Assembly ID (the optional name assigned when the assembly is learned). Depending on the configuration of your System (determined by the *Report Configuration* menu), the System may solicit the Batch ID after you have requested a batch report. Your entry is printed in the report to describe which batch of assemblies (for example, your internal purchase order number) is being reported on.

The connection threshold tells the resistance (in ohms), below which the tester assumed there was a connection. This value is set in the *Assembly Learn* menu.

The report then includes a count of how many assemblies were tested in this batch, how many assemblies had one or more failures, and the yield as a percentage of the batch that passed the tests.

Finally, the report contains the date and time and the tester identification. Optionally, the report can contain a test specification for the assemblies tested. Whether or not the test specification is included or not, as well as its format, is determined by the *Report Configuration* menu.

[F6] is used to specify the destination of reports. You may toggle between several choices. If CON(sole) is selected, the reports will go to the PC's CRT display. If PRN is selected, the reports will go to your printer. You can also individually select the COM and LPT ports if you have more than one printer.

You may choose FILE.TXT to send the output to a disk file named FILE.TXT. Note that if this option is used, the file is saved in the same directory as the CheckSoft Software. It does not use the data path. After the file is saved you can leave CheckSoft Software and rename and/or move the file with the DOS COPY command. If you save more than once to FILE.TXT, the file is appended (added) with the new data. Because of this, you can use FILE.TXT to accumulate results, then periodically you may archive these results and start over.

[ESC] Escape allows you to return to the main *System* menu to select a new assembly to test or begin a new batch.

Learning an Assembly

Overview

Learning an assembly is the process of entering test specification information about the assembly into the System so that it can be tested. The Model R-90 Continuity Test System provides the capability for this information to be entered in three ways.

1. In the first method of learning about the assembly to be tested, the connections can be automatically learned by the System. To do this, you simply connect a known-good assembly, then tell the System to learn the connection pattern that is present.

2. The second method of learning a cable involves entering the data via a text file generated on your PC with external methods, such as a spreadsheet, CAE package, or word processor.

3. The final method of entry is manual. You may use the keyboard to enter or edit the connections of the assembly being programmed.

Once an assembly is 'learned,' the System provides the capability to save this information (called spec data) on a disk for future use. This way, you don't have to keep a known-good assembly as a reference.

The System also provides a number of additional features to help you obtain better operator instructions and more readable test results.

These features are all available from the *Assembly Learn* menu shown in Figure 11.

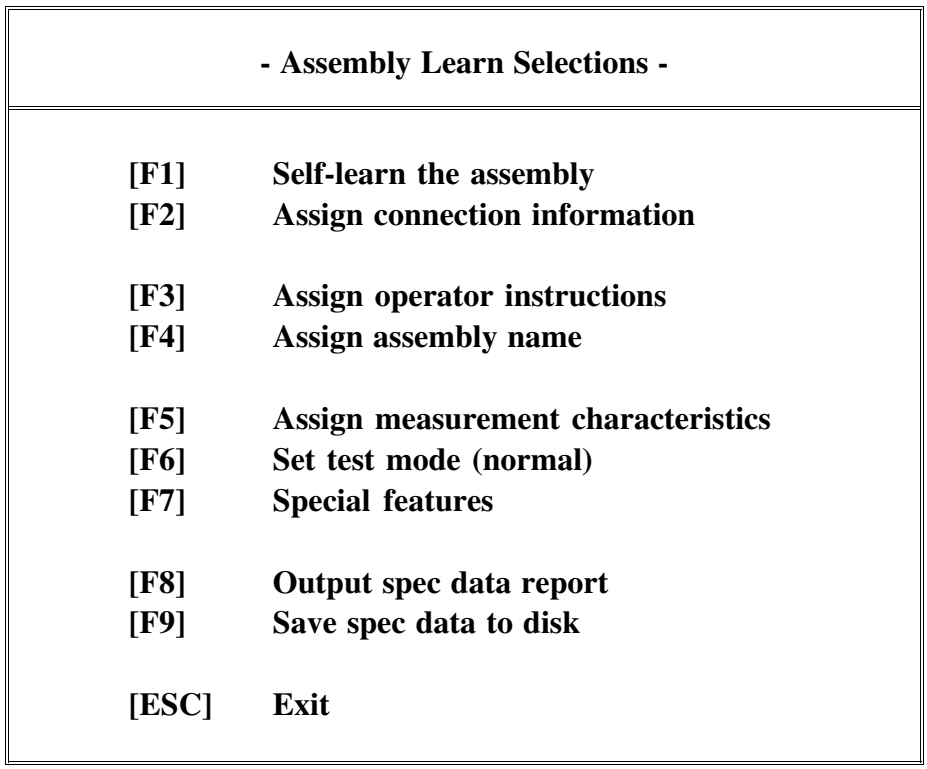

Figure 11 - Assembly Learn Menu

Autolearning the Connections

Pressing [F1] from the *Assembly Learn* menu causes the system to automatically learn each of the connections for the assembly that is connected to the Test System at the time.

Once the connections are learned, an asterisk (*) appears to the right of the [F1] selection so that you are reminded that the connections have been learned.

Note

An option of importance is assignment of the connection threshold, which is set in the 'Assign measurement characteristics' selection. The connection threshold tells the System what value to use when determining if a connection is present. If the threshold is set too low, you could miss some connections. If the threshold is set too high, the System may not test your assembly to stringent enough standards. While learning an assembly, the System uses the 'Short' threshold exclusively.

After the self-learn process, the System displays the number of networks and connections it has found. A network is a series of connections that are electrically equivalent. A

connection is a test point (port) that has a connection. As such, if the assembly has two test points connected together, it will report one network and two connections.

Assigning Connection Information

Selecting [F2] from the *Assembly Learn* menu allows you to enter information about how you have connected the unit being tested to the System. It also allows you to enter or edit UUT wiring information with the keyboard. Once you have selected [F2], you see the *Assign Connection Information* screen shown in Figure 12.

You may assign pin and wire names to the assemblies that you are testing. If you use this feature, the reports and error messages that you obtain from the System will be much more useful to you. There can be a pin name and wire name for each port of the Test System. Each name can be up to twelve characters in length. Each name can contain spaces and any normal text.

You can also specify which pins are to be used during testing (ports that are 'Active'). In most applications, only a subset of the full number of test points is necessary for any individual UUT. You can tell the System to ignore unused test points (make them 'Inactive'). This allows the System to operate faster.

The active ports information is saved with spec data files for a UUT. Consequently, you can set the active ports for a particular UUT, then save the spec data. When the spec data is subsequently retrieved from the disk, the active ports are reset to the previous setting and remain so until the System is restarted or a new spec data file is loaded. Ports can be turned on and off by module (200 points at a time).

The active ports information is also saved with the System configuration data. If you select [F9] from the *System Configuration/Installation* menu, the active ports information is saved. When the System is restarted in the future, it will reflect the active ports present when the configuration information is saved.

Finally, you can specify whether the System should use the standard or alternate measurement characteristics for a test point. The '[F5] Assign Measurement Characteristics' selection of the *Assembly Learn* menu allows you to specify the measurement characteristics of the System. It sets the connection thresholds and delay time between making a connection and taking a measurement to allow for settling.

If you have test points that have special measurement needs, the System can use an alternate set of measurement characteristics for these ports. For example, you might have a test point with capacitance that needs a longer delay time (to allow the capacitor to charge). Or you may have one or more points with which you would like to use a different threshold. You can use the alternate measurement characteristics for these "problem" test points without compromising the speed or accuracy of the other measurements.

- Assign Connection Information -					
Port #	**Pin Name**	**Wire Name**	**- to -**	**Port #**	**Pin Name**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Select:	**[PgUp]/[PgDn]/[←]/[→]/[↑]/[↓]**		**[F6]**	**Measure component**
	[F1]	**Show previous connection (←)**	**[Alt-M]**	**Alternate Measurement(*)**
	[F2]	**Show next connection (→)**	**[Ins]**	**Insert a connection**
	[F3]	**Activate displayed module (♦)**	**[Del]**	**Delete a connection**
	[F4]	**Probe a pin [F5] Auto-increment**	**[ESC]**	**Exit**

Figure 12 - Assign Connection Information Screen

The *Assign Connection Information* screen works much like a spreadsheet. Use the page up and down and the arrow keys to move the brackets to the row and column for adding the pin or wire name. After you have entered a name, the System automatically moves to the next position to make entry of a list faster.

If a connection is present for the port that is selected (bracketed), you will see a left and/or right arrow under the word '-to-' of the title. In addition, you will see the port # and pin name (if assigned) of the port to which it is connected. If the left arrow is present, there is a previous connection to this port. This previous connection can be moved to the middle of the display by pressing the **[F1]** key. If there is a right arrow, there is a connection from this port. You can move the connected port to the middle of the screen with the **[F2]** key.

If both arrows are present, there is both a connection to this port and a connection from this port. If there are connections to other ports shown on the display (that aren't on the bracketed line), a double bar (--) is shown on the line. By moving the line with the double bar to the center of the screen, you can see the destination of the connection.

Note

When you have advanced to the last connection of a network (by pressing the [F2] key), a left arrow is displayed, and the connection TO the port is shown. In all other cases, the connection FROM the port is shown on the right of the CRT.

The **[F3]** key is used to choose whether the ports are active (used for testing) or not. A double arrow appears on the left of each active port number. If the double arrow is not present, the port is inactive (ignored). [F3] toggles all 200 of the ports for the module being displayed between active and inactive.

If you press the **[F4]** key, you can use the probe to locate the port number. With this feature you do not need to know the specifics of how the UUT is connected to your Continuity Test System. [F4] toggles between probing on and off as indicated by a > > mark at the bottom of the display. If probing is enabled, each time the System detects a probed point, it moves the entry area to that port. Using this method you can probe each point and then type in its name.

You may either use the probe that comes with the Model GS-850 Fixture or your own probe. The probe needs to be connected to the PC chassis to be effective since the System is searching for a grounded input.

By selecting the **[F5]** option of the *Assign Connection Information* screen, you can select auto-increment of pin and wire names while probing. The system uses the pin name in the center of the screen as the base. When the next point is probed, it is assigned the same name, but incremented by one. If the last digit of the pin name is alphabetic, it becomes the next alphabetic character, moving from lower case to upper case. Note that no alphabetic characters are skipped, so it may be necessary to probe a point twice to skip over unused pin names (such as an 'i' in some cases). If the last characters of the pin name are numeric, they are incremented to the next numeric character. Pressing [F5] a second time disables auto-increment.

By selecting the **[F6]** option of the *Assign Connection Information* menu, you can specify component measurement parameters. You can use this capability to test for the presence of a resistor or diode junction between two test points. This screen is shown in Figure 12. For each measurement, you can specify the two measurement ports (with measurement polarity), delay time between switch closure and the measurement (in mSec), and the upper and lower test threshold in ohms. The delay can be beneficial when testing capacitive elements that need time to charge, or when measuring very high resistance values. Be sure to consider the accuracy of the Test System (which is approximately + /- 20% of each decade range) when specifying upper and lower test limits.

To specify a less-than measurement, set the low limit to 0. To specify a greater-than measurement, set the high limit to 100M.

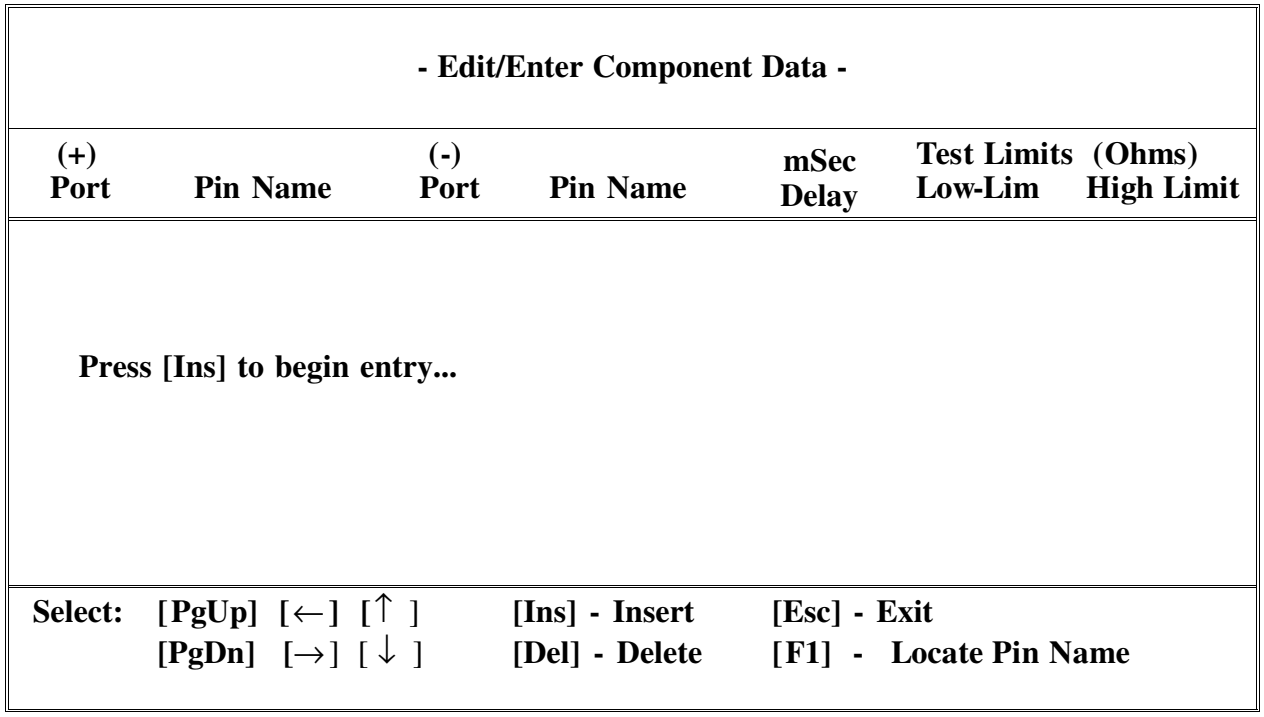

Figure 13 - Edit/Enter Component Data

You may use **[Alt-M]** to tell the System to use the alternate measurement characteristics for the port that is presently bracketed. If the port number has an asterisk (*) beside it, it will use the alternate measurement delay time and threshold. Pressing [Alt-M] again sets the port back to use the standard measurement characteristics. [Alt-M] is selected by holding down the [Alt] key, then pressing the [M] key.

[Ins] is used to insert a connection for the UUT. After pressing [Ins], the System will ask you to type in the destination of the connection that you are adding from the bracketed port number. Once you have typed the number, the connection is added.

Note

The System maintains the connections in ascending order by port number. After inserting a connection, it will be electrically equivalent to your entry, but the connection may be made between other ports than those shown at the time of the entry. Using the [F1] and [F2] keys will allow you to locate the new connection if desired.

[Del] is used to delete the connection shown on the center line of the display.

Note

Connections are maintained as a sequential list of each connection in each network. Unless care is taken when deleting a connection, you may inad-

vertantly cause other disconnections in a network. However, the desired effect can always be obtained with use of the [Ins] and [Del] keys.

When entry of connection information is completed, press **[ESC]** to move back to the previous menu.

Assigning Operator Instructions

Selecting [F3] from the *Assembly Learn* menu allows you to enter operator instructions. Operator instructions are a way of giving information to the operator previous to each test. The notes are presented to the operator and then a key is pressed to continue with the test.

Operator instructions are presented each time a new assembly is tested, but are not repeated for subsequent assemblies while testing a batch.

Operator instructions are handy for such things as connection information, special precautions, fixture adapter installation, or special instructions such as testing the assembly for intermittent failures. The comments screen can include line graphics such as - or = along with corresponding corners and vertical single and double lines.

Comments are entered in the *Operator Comments Entry* screen shown in Figure 14.

Enter an information screen to the operator that will be displayed prior to each test for this assembly. Press ESC to return...
Select [→]/ [←]/ [↑]/ [↓]/ [F1]-Line()/[F2]-Save/[F3]-Merge/[F4]-Erase/ [ESC] - Exit

Figure 14 - Operator Comments Entry Screen

Use the arrow keys to move to the desired position for text or graphics. To enter text, just type it. To erase a character position, use the space bar or backspace key.

To draw lines, use the [F1] key to toggle between the following:

( ) no lines
(-) single lines
(=) double lines

When in a line-drawing mode, the arrow keys draw lines in the direction indicated by the arrow key. By turning lines on and off, you can achieve most line drawings. By redrawing over lines, you can erase junctions to lines that you may have erased.

The drawing is saved with the spec data that you are creating at the time. In addition, the [F2] key allows you to save the present screen to the disk for future recovery (for example, if you would like to read it into another spec file) rather than recreating it. The drawing is saved as the name you specify with an extension of .CMT.

The [F3] key allows you to merge a comment file on the disk (created with the [F2] option) with the screen presently shown. Any non-space character in the disk file overwrites those at the same position on the display. Other characters are left undisturbed. To read a file, enter the name. The System automatically adds the .CMT extension.

By merging the appropriate files, you can make outlines as necessary, then add text to describe additional instructions. Other active keys are given below:

[Alt]-[F3]	unmerges the specified file name
[F10]	shifts the displayed figure one place to the right
~	left triangle
‘	right triangle
[Home]	moves cursor to extreme left
[End]	moves cursor to extreme right
[PgUp]	moves cursor to top
[PgDn]	moves cursor to bottom
[F4]	erases the display

Assigning the Assembly Name

Selecting [F4] from the *Assembly Learn* menu allows you to type in a descriptive name for the assembly. Any alphanumeric text up to 32 characters in length is allowed.

The assembly name shows up in the *File Selection* menu and on any reports that are generated.

Assign Measurement Characteristics

[F5] is used to specify the connection threshold and delay time. These values configure the System for the resistance value to use when determining whether a connection is present or not. The System considers any measurement below the connection threshold to be a connection and any value above the open threshold to be an open. The connection or open thresholds may be set to any value between 100 Ω and 100 MΩ. The System does not restrict you from setting the threshold to a value below 100 Ω, but if it is set lower, there is a risk that the System may find nonexistent connections because of the 25 Ω uncertainty of the threshold at that level.

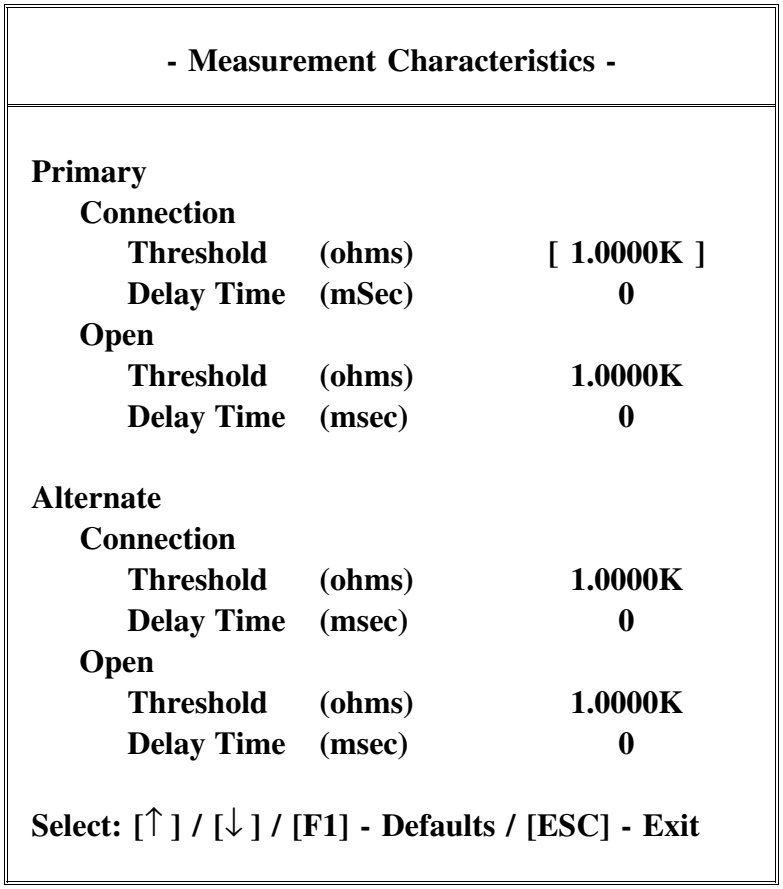

Figure 15 - Assign Measurement Characteristics Screen

The delay time specifies how long to wait between making a connection and taking a measurement. You may enter any value between 0 and 30,000 mSec. Delay time can be used if the UUT contains capacitance, or if very high threshold values requiring some time to settle to a solid reading are present.

Note

At very high threshold values (for example, above 10 MΩ), the System typically requires about 2 - 3 mSec delay time. This delay may vary due to your particular UUT and fixturing, so you should experiment until you obtain the smallest delay (for the fastest testing) consistent with solid, repeatable results.

The alternate set of values for the connection thresholds and delay time are used for any ports in the spec data that are specified as alternate measurement points.

Note

The alternate measurement characteristics apply only if alternate measurement characteristics for a test point are selected, and if the test point is a 'measure-from' point that attempts to bring the test point to a positive voltage potential. This is the case for the lowest numbered port number of any connection network, or for an unconnected port when testing in 'extensive' test mode. In other cases, the alternate measurement characteristics are not used.

The measurement characteristics are saved along with the spec data on disk. In addition, the measurement characteristics are saved with the System configuration data. Consequently, you can specify new defaults by changing these values, then saving the configuration data on the disk via the *Configure/Install System* menu.

When the System tests for opens to ensure that unexpected connections are not present, it tests a number of points simultaneously. If it detects a connection, it then goes through the points one at a time to find out the problem point. Because of this method, if the delay time is too small and the threshold is a high value (greater than a few MOhms), the System may operate very slowly since it will always fail the first test (due to insufficient delay time), then go through the points one at a time. If you find this happening, you may find that test speeds increase with a larger delay time.

Setting Test Mode

The [F6] selection of the *Assembly Learn* menu allows you to specify the test mode that the System uses. There are three alternatives.

'Connections-only' verifies that every connection in the spec data is present. It does not test to see if any shorts exist.

'Normal' mode performs 'connections-only' testing, and also tests for any shorts to the connections present. After each connection network is verified, the System ensures that no other active ports are making a connection to the network.

'Extensive' mode performs 'normal' mode testing, and also tests to ensure that there are no interconnections between the ports that do not have any connections in the spec data. Typically, shorts that fall into this category are not important, so testing speed can be increased by using 'normal' mode.

Note

If it is important to verify that there are no unexpected connections between unconnected ports of the UUT, you must use 'extensive' test mode.

Special Features

Selection of [F7] in the *Assembly Learn* menu allows you to perform special operations, such as reading and writing ASCII files and erasing the spec data in memory. The *Special Features* screen is shown in Figure 16.

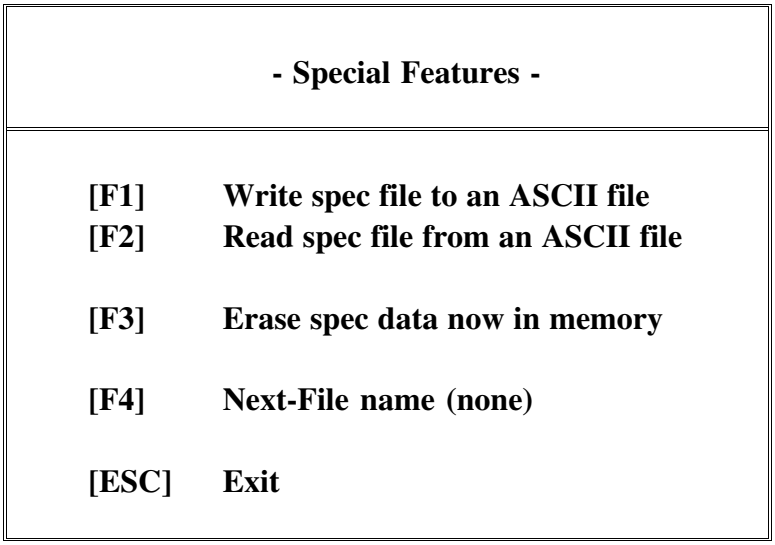

Figure 16 - Special Features Screen

Reading and Writing Spec Data in ASCII Format

Selection of [F1] from the *Special Features* menu allows you to write the spec data presently loaded into memory as an ASCII file on the disk. This is a handy way to output data in a form that can be edited, then read back in with [F2] of the *Special Features* menu. Also, you can use this feature to generate a dump (by port number) of all the pin and wire names that have been assigned.

Note that not all of the spec data is written. All of the primary data such as connections, pin and wire names, operator comments, and component test data is included, but not information relating to measurement characteristics, active ports, and other secondary data.

Selection of [F2] in the *Special Features* menu allows you to read spec information that has been created with [F1] or elsewhere. For example, you may wish to use a word processor or spreadsheet to describe an assembly. This option allows you to read in that file and convert it into the internal format used by CheckSoft Software.

Note that the old spec data in memory is not erased prior to reading ASCII data. Because of this, you can use the input from ASCII function to selectively read in portions of spec data, such as pin names, without losing data already present.

The text file can contain the assembly name, connections, pin names, and wire names for an assembly.

The file typically has several sections, each of which is optional. Each section is prefaced by a keyword followed by a colon (:). Valid keywords are NAME:, THRESHOLD:, PIN NAMES:, WIRE NAMES:, PORT CONNECTIONS:, PIN CONNECTIONS: and COM:. Keywords may be entered in either upper or lower case and must be the only thing on the line.

After each keyword are one or more lines of data applying to the keyword. Valid data includes the following:

Name: Followed by an assembly name with up to 32 characters.

Threshold: Followed by a number representing the value in ohms, below which the measurement is considered a connection.

Pin Names: Followed by one or more lines, each of which contains the R-50 port number, a comma, then a pin name with up to twelve characters.

Wire Names: followed by one or more lines each of which contains the R-50 port number, a comma, then a wire name with up to twelve characters.

Port Connections: Followed by one or more lines, each of which contains, at a minimum, a 'from' port number, the word *to*, a comma, and a 'to' port number. The 'to' port number listed can be a range of port numbers separated by a hyphen (-). The second port number in the range must be larger than the first. There can be a series of destinations or destination series on a single line, with each separated by at least one blank space.

Pin Connections: Same as the port connections except each line contains the 'from' port name, a comma, and the 'to' port name.

Com: Followed on the same line by an operator instruction (comment). These are read in order and appended, line by line. As an alternate to 'Com:', you may use an asterisk ('*') at the beginning of each line.

! : An exclamation point is used to start a comment. Everything after it on the line is ignored when the System converts the file.

Blank lines These lines are ignored. Blanks at the beginning or end of a line are ignored also.

Figure 17 shows an example of a text file used to define an assembly.

! This is an ASCII spec definition for a simple cable

Name:

Cable PN 123-434

Threshold:

1000.0

Pin Names:

1, J1 Pin 1
3, J3 Pin 3
5, J3 Pin 5

Wire Names:

1, Red
2, Blue (RTS)
3, Black (CTS)

Port Connections:

5 to 7
11 to 30
12 to 13-17 19

Pin Connections:

J1 Pin 1, J3 Pin 3

Figure 17 - Sample Text File

In Figure 17, a cable is described that has connections from Port 5 to Port 7, from Port 11 to Port 30, from Port 12 to Ports 13 through 17 and to Port 19.

The R-50 port 1 is connected to J1 Pin 1, port 3 is connected to J3 Pin 3, and port 5 is connected to J3 Pin 5. Wire names are Red, Blue (RTS), and Black (CTS) for R-50 ports 1, 2, and 3 respectively. Cable connections will be tested to be less than 1 KΩ.

In general, each of the sections is optional and may be placed in any order. However, the pin names must be assigned prior to their use in the 'Pin Connections' section of the file.

Erasing Spec Data in Memory

Selecting [F3] from the *Special Features* menu allows you to delete all of the spec data that is stored in memory. Use this option when you are ready to learn a new cable. Specification data stored on disk is not affected by use of this selection.

Next-Files

Selecting [F4] from the *Special Features* menu allows you to specify use of 'Next-Files.' This feature allows you to combine several spec-data files into one. For example, you may have an original spec-data file with a switch on the unit-under-test (UUT) in one position. The next-file operator comments could instruct the operator to change the switch to another position, then test the connections in that state.

If a spec-data file has a next-file specified, the next-file is loaded and executed immediately after the present spec-data file. There can be a number of spec-data files executed in series. Once a spec-data file is loaded that does not have a next-file specified, the chained execution stops, and the original spec-data file is reloaded so the sequence can start over again. Results are recorded for all spec-data files, up to a maximum of 1000 step results. If a test failure report is generated at the end, it uses the port names of the original spec-data file, regardless of whether port names were assigned in the next-files.

If operator instructions are specified, they are presented between next-files during every test. The beginning spec-data file's operator instructions are also presented each time, unlike the normal case in which they are only presented the first time a UUT in the batch is tested. Next-file's operator instructions are ignored in continous mode.

The next-file name entered in the *Special Features* menu is any normal spec-data file name. To erase a next-file name, press the enter key without entering anything.

Printing Specification Data

Selection of [F8] from the *Assembly Learn* menu allows you to print out a report of the test specification data for an assembly.

After selection of printing specification data, you are presented with the *Select Report Device* menu shown in Figure 18.

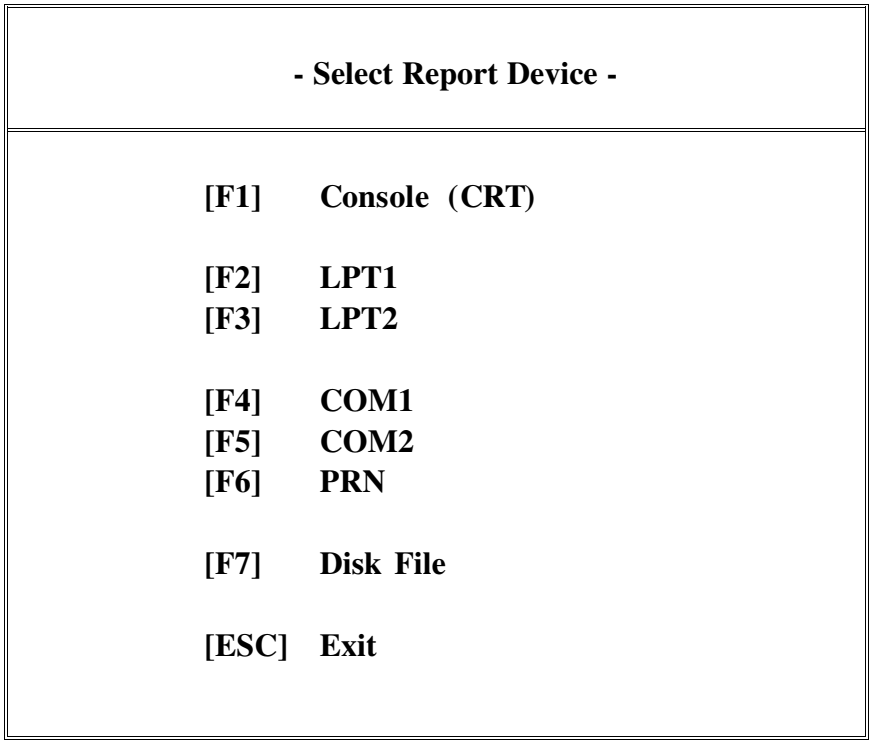

Figure 18 - Select Report Device Menu

From this menu, you may select the destination of the report. If you elect to send the report to a disk file ([F7]), the System solicits a file name. Enter any legal DOS file name. The format of the report is shown in Appendix B.

The spec data report includes the port numbers, pin names, wire names, the Assembly ID (the optional assembly name assigned when the assembly is learned), the test thresholds, and identity of the tester.

Saving Spec Data on the Disk

Selection of [F9] from the *Assembly Learn* menu allows you to save the information about the assembly that you have learned onto a hard disk or floppy disk.

After selection of [F9], you are prompted to enter a file name. Enter a file name with up to eleven characters that do not include spaces or special characters such as colons or periods. Your DOS manual describes valid file names for your version of DOS.

The System saves the file in the path defined in the *Configure/Install System* menu.

The file is written in binary. Consequently, you cannot look at it with normal editors. (You can look at it with some editors, but it probably won't make any sense to you.) The

advantage of this storage method is that the file is compact and also fast to load and execute.

The file contains a list of the connections, the assembly name, operator comments, the pin and wire names, the active pins, the measurement characteristics, and alternate measurement information.

Locating a Pin

Locating a pin is used for determining the identity of a particular pin in your UUT.

Pressing [F3] from the *System* menu invokes this function. The locating display is shown in Figure 19.

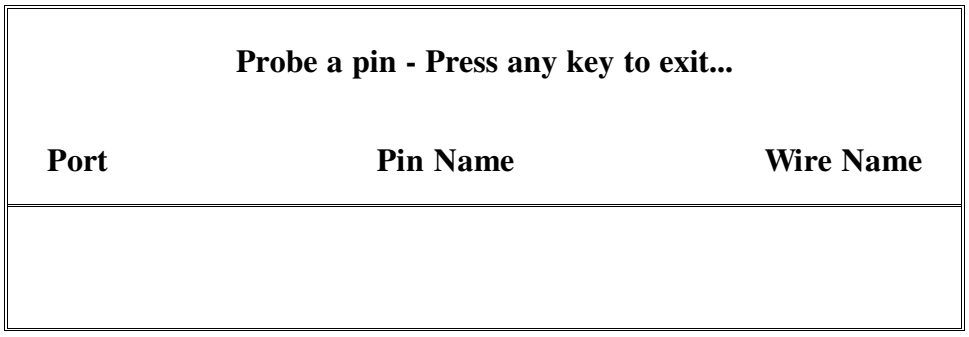

Figure 19 - Pin Locating Display

Simply probe a pin to find its identity. If a pin name and wire name have been assigned, they are displayed along with the test port number. The System scans all of the I/O ports until it finds a connection with resistance of roughly less than the connection threshold between the probe and a port.

You may either use the probe that comes with the GS-850 Fixture or your own probe. The probe needs to be connected to the PC chassis to be effective since the System is searching for a grounded input.

When you move the probe to another pin in the assembly, the new pin identity is displayed.

Measure Selected Points

Selecting [F4] from the *System* menu allows you to measure whether there is a connection between two ports that you specify. Figure 20 shows the *Measure Selected Points* menu.

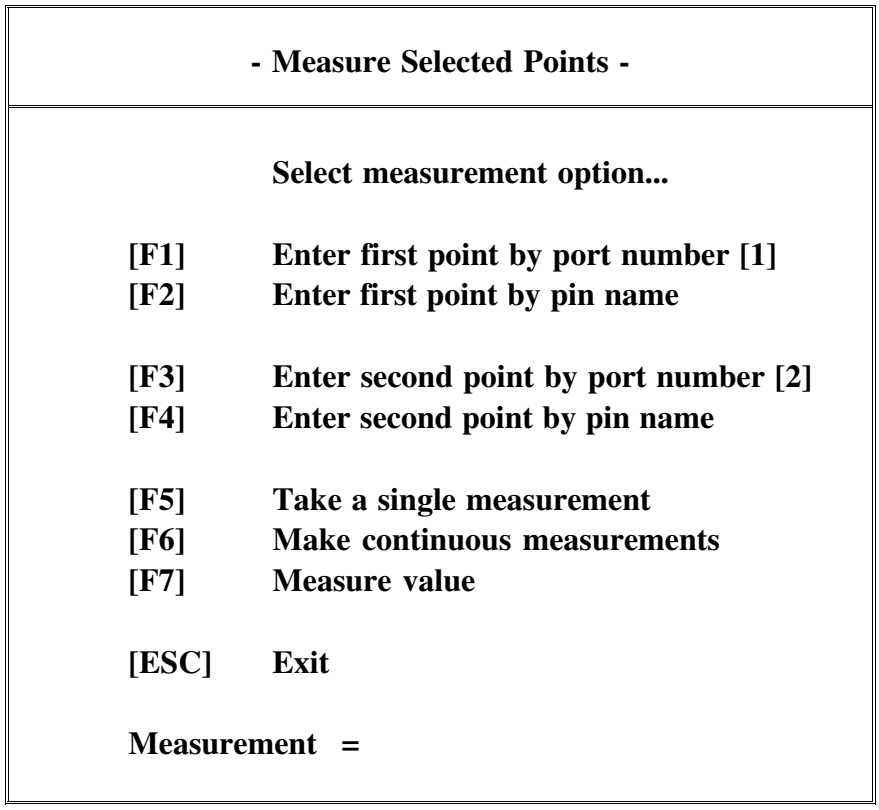

Figure 20 - Measure Selected Points Menu

Use **[F1]** and **[F3]** to enter the test points in terms of the R-50 port numbers or **[F2]** and **[F4]** to enter the test points in terms of the assembly's pin names that you have assigned when learning the assembly. The first port is the negative (ground) polarity of the measurement source and the second port is the positive polarity.

[F5] causes the System to make and display a single measurement.

[F6] places the System into a continuous measurement mode that continuously updates the readings that it takes.

[F7] causes the System to make a resistance measurement between the two points, and to display it on the CRT. The measurement resolution is approximately 5% of the reading. Values below 100 ohms are reported as '< 100 Ohms' regardless of the measurement.

[ESC] returns to the *System* menu.

Build an Assembly

The 'build an assembly' function is an aid for building or repairing assemblies. It provides the capability to locate a pin, then display the connections for that pin.

To invoke the 'build an assembly' function, select [F5] from the *System* menu. You are then presented with the *Build An Assembly* menu as shown in Figure 21.

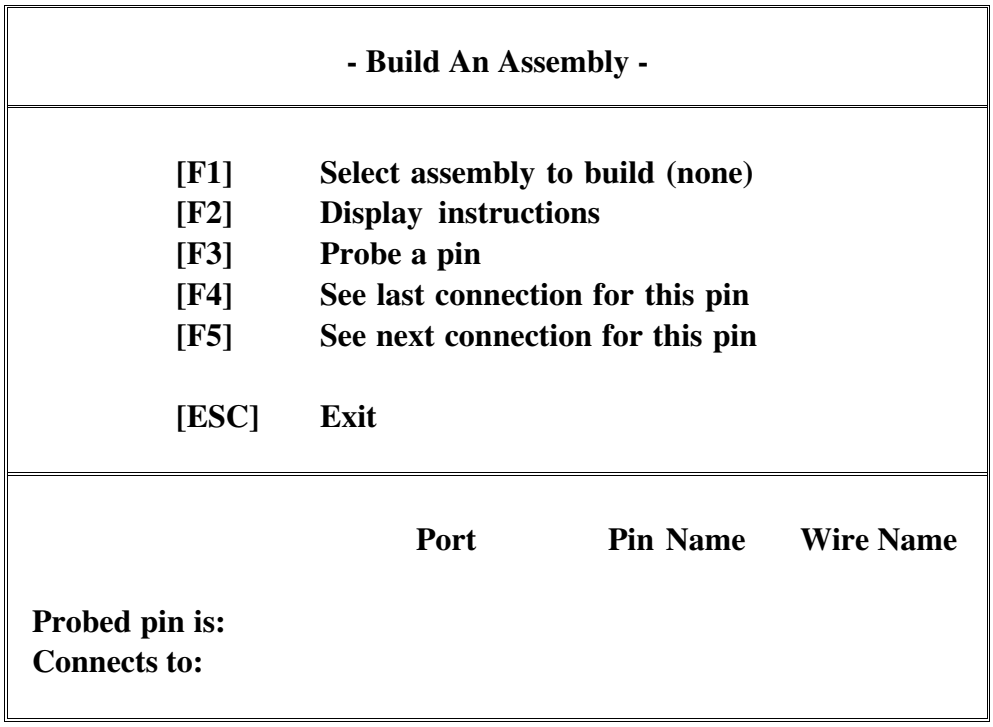

Figure 21 - Build An Assembly Menu

The System uses the assembly spec data presently in memory. If you would like to load different spec data, select **[F1]**. You may then select the name of a file containing the desired spec data from a list of those presently available on the computer.

Press **[F2]** to display the operator instructions that may be available. This page of instructions to the user can be generated with the *Learn* menu.

Press **[F3]** to locate a pin with a probe. You may either use the probe that comes with the GS-850 Fixture or your own probe. The probe needs to be connected to the PC chassis to be effective since the System is searching for a grounded input.

When you have selected **[F3]**, a 'scanning' message appears. Once a pin has been probed, the scanning message goes away and the port number, pin name and wire name of the probed pin appear in the 'Probed pin is:' row of the display.

The 'Connects to:' row of the display shows a description of the destination for the probed pin. If there is another destination, pressing **[F4]** and **[F5]** display the various destinations. An asterisk (*) at the end of the [F4] or [F5] option indicates that another connection is available for the probed pin.

Selecting **[ESC]** returns to the *System* menu.

Configure/Install System

The *Configure/Install System* menu is used to either temporarily or permanently change the configuration of the System.

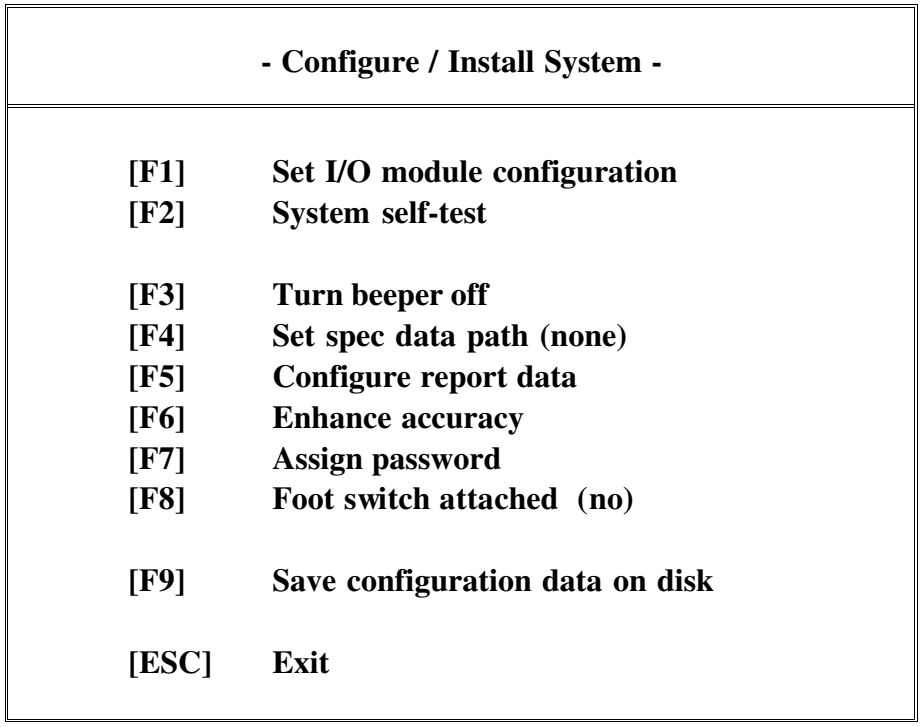

Figure 22 - Configure/Install System Menu

Set I/O Module Configuration

The [F1] 'Set I/O Module Configuration' option is used to specify the hardware configuration of the System. With use of this selection, you let the software know how many R-50 Modules are installed and how you have jumpered the I/O modules.

The I/O module configuration is changed by the *I/O Module Configuration* menu shown in Figure 21. To alter the configuration, use the arrow keys to move the bracketed area to the desired position. Once you are at the position that you desire, type in the new value followed by an [Enter] or an arrow key. Typing [ESC] returns to the *Configure/Install System* menu.

If you have more I/O modules installed than shown on the display, use the [Ins]ert key to increment the number of modules. By repeatedly pressing the [Ins] key, you may increment the number of modules up to sixteen, after which the System will start back at zero modules.

Refer to Appendix C for the specifics of determining the proper base address and module select jumpers.

- I/O Module Configuration -

Module	Ports	Base Address	Module Select
1	(1-200)	[768]	1
2	(201-400)	768	2
3	(401-600)	768	3
4			
5			
.			
.			

Select: [→]/[←]/[[↑]/[↓]/[Ins]-Add Module / [ESC]-Exit

Figure 23 - I/O Module Configuration Menu

System Self-Test

Selecting [F2] of the *Configure/Install System* menu, System self-test, tests each I/O port and measurement range to verify correct functioning of the System.

The first step consists of characterizing the zero offset of each measurement range for the Model R-50.

Then the System connects each I/O port and verifies that it returns an appropriate value. This provides confidence that each solid-state relay in the System is working properly.

Note

Ensure that no test assemblies are connected during the self-test. Otherwise, you may get incorrect test results.

To initiate a self-test, select [F2] from the *Configure/Install System* menu. As the System executes each of the steps, messages display the test name that is in progress.

If you select [Alt]-[F2] in place of [F2], the System will generate a report showing the outcome of the self-test. The report destination is that selected for test reports in the *Test Completed* menu.

In the event that a failure occurs, you are presented with an error message describing the nature of the failure.

If you see massive self-test failures, it is likely to be an installation or compatibility problem. If you see one (or a few) repeatable failures, you can suspect an R-50 hardware failure. In this case return the R-50 to be fully tested.

Set Beeper

[F3] is used to turn the System beeper on and off. The beeper is used to let you know when an error occurs, a test is completed, or you have probed a point. [F3] toggles the beeper either on or off for all uses of the beeper in the System.

Set Spec Data Path

[F4] is used to set the path for the spec data files that are saved and retrieved. If you do not specify anything here, the files are stored in the same directory and media as the CheckSoft Software. If you use this feature, make sure that you include a "\" or ":" at the end. Examples of proper data paths are "\CHECKSUM\DATA\", "B:", and "A:\DATA\".

Configure Report Data

[F5] is used to configure the reports generated by the System. When you select [F5], you are presented with the *Report Configuration* menu. The choices made in the *Report Configuration* menu can be saved on the disk by use of [F9] from the *Configure/Install System* menu shown in Figure 24.

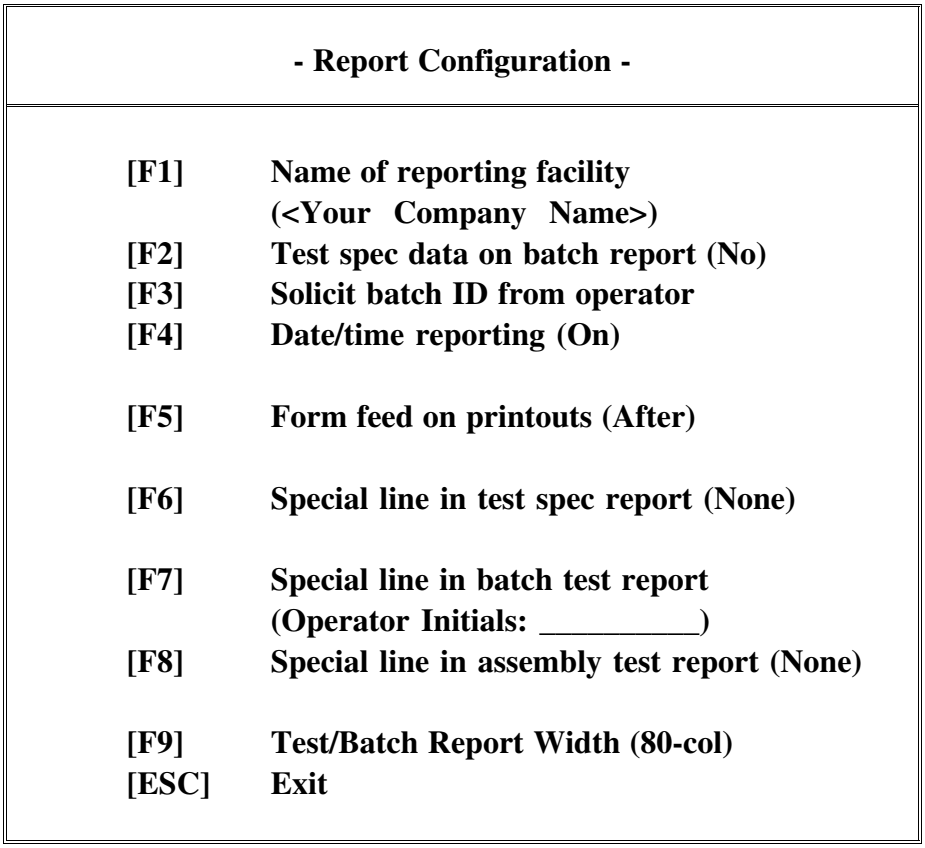

Figure 24 - Report Configuration Menu

[F1] is used to enter the name of your company or organization. This name (up to 32 characters) appears on all of the reports generated by the System. If nothing is entered, the line does not appear on the reports.

[F2] is used to specify whether to print out test specification information in batch reports. Pressing [F2] toggles between Yes and No. If Yes is selected, the System will print the test spec data along with the batch report.

[F3] is used to select whether the System asks the operator to type in the name of a batch prior to printing the batch report. If this feature is utilized, and the operator types in the batch identification, a line on the report appears titled 'Batch ID:' followed by the operator entry. In addition, if this feature is activated, and a batch report is not requested at the end of testing a batch, the System verifies that this is the operator's intent, since the data about the batch could be accidently lost.

[F4] is used to specify whether to print the date and time on the System reports. If enabled, the date and time (in 24-hour format) when the report is printed are included in the report.

[F5] configures page breaks while printing reports to a printer (PRN, COM, or LPT) port. Pressing [F5] toggles between None, Before, After and Before/After. In the default mode, 'After,' the System prints a form feed after each report to set the printer for the next report to be on a new sheet of paper.

[F6], **[F7]**, and **[F8]** are used to place a special line of text in the respectively named reports. You may enter a line of up to 32 characters. If nothing is entered, 'None' is displayed and the reports do not contain this special line. If something is entered, it is placed in the header of the report, left-justified. If the line contains a colon, the information before the colon (including the colon) is placed in the left column, and the information after the colon is placed in the second column aligned with the other header items. Special lines of text can be used for any special information that you would like included in the reports. For example, if you would like to have the operator initial each batch test report, you would select [F7], then type in 'Operator Initials:_____.' The outcome of this entry is shown in the example batch report in the Appendix of this manual. If the special line in the assembly test report (entered with [F8]) includes the keyword **{total}**, the keyword is replaced by the batch sequence number (which assembly in the batch). This can provide information about which assemblies in the batch are passing and failing.

[F9] allows you to specify use of a 40-column printer for test reports and for batch reports. In 40-column mode, the first line if each failure lists the failure type (open/short) between it and the following line. When in 40-column mode, do not enable test report listing ([F2] of this menu) in the batch file.

[ESC] returns to the *Configure/Install System* menu.

Accuracy Enhancement

[F6] of the *Configure/Install System* menu is used if you wish to improve the accuracy of the test system thresholds. In typical installations the Model R-90 is accurate enough to easily perform the tasks that it was designed to accommodate. In some cases inaccurate internal PC power supply voltages can cause the performance to degrade. This is typically a result of either the +12V or -12V PC supply being significantly different than nominal (e.g., more than 250 mV from the nominal voltage). The accuracy can be improved upon by using the *Accuracy Enhancement* menu to determine scale factors that are applied to the threshold on each range. In addition, a threshold offset can be determined for low resistance to improve the accuracy below 500 Ohms.

To use this capability, go to the *Accuracy Enhancement* screen, then press the function key for each range value that you would like to characterize. After you have made a selection, it will ask you to install the resistor between ports 1 and 2 of the test system. Low-power resistors (1/8W or more) can be used, with accuracies of 1% being sufficient.

Once you have determined the desired values, save the configuration data on disk, then the new values are available each time that you restart the R-90 system. As well as

automatic entry, you can manually type in scale values by pressing the [Shift] key in conjunction with the [Fx key].

Assign Password

[F7] is used to assign a System password. The password can be used to prevent unauthorized modification of spec files. When a password is active, the operator must enter the password before having access to the *Assembly Learn* menu. Consequently, spec files cannot be generated or modified without the password. If a password exists, the System prompts you to enter it before changing to a new password. It also asks you to enter the new password twice before accepting it. Terminate each entry with the [Enter] key. The password can be up to twelve characters long and can contain any normal keyboard characters. If you assign a password of nothing (just the [Enter] key), password protection is disabled. The System does not discriminate between upper- and lower-case characters in the password.

Configure Foot Switch

[F8] is used to specify that you have connected a foot switch to the System. A foot switch is available from CheckSum that connects to an unused printer port on your PC. When the foot switch is activated, it performs the same function as the [F1] key on the keyboard. Pressing [F8] toggles between none and the various printer ports (LPT1, LPT2,...) on the PC. Toggle through the various options until the display shows the printer port to which you have connected the foot switch.

Save Configuration Data on Disk

[F9] is used to save the configuration selections that you have made to the disk drive. When you save the configurations, each time you restart CheckSoft Software you will not need to reconfigure your System. The configuration file is transparent to you. It is named "$CONFIG$.CSL" and is stored in the same directory as the CheckSoft Software. Selection of [F9] saves the test mode, the I/O module configuration, the active ports, the measurement characteristics, the printout configuration parameters, and the System calibration constants.

Returning to the System Menu

[ESC] causes a return to the *System* menu.

Command Line Parameters

Overview

The Model R-90 allows you to specially tailor operation with command line parameters.

Command line parameters are used when you first invoke CheckSoft Software. Each of the parameters is entered on the DOS command line following 'R90.' Each parameter is separated by one or more spaces and can be in upper or lower case.

Command line parameters can be incorporated into a batch file that is used to start the System. See your DOS manual for the specifics regarding batch files.

Parameters

Command Line Parameters	
Parameter	**Action**
/r < file name>	load and begin execution of the specified spec file.
/ra <file name>	load, convert from ASCII to internal format, and begin execution of the specified ASCII spec data file name.
/q	run in "quiet" mode. Used in conjunction with the /r flag. When in quiet mode, the System performs the test without any I/O to the screen (unless operator instructions are included in the spec file). Once the test is complete, the System returns to DOS. The DOS ERROR LEVEL is set to 1 if there were any errors during testing. Otherwise, the ERROR LEVEL is set to 0.
/l1 <file name>	log file name. After each test is completed, the System automatically writes a test failure report to the specified file name. If the file is not present, it is created. If the file is present, it is appended. If the file name is a device (e.g., 'prn' or 'com1,' or 'lpt1'), the output is routed to the specified port and form feeds are added as configured into the System.
/l2 <file name>	second log file. Same as /l1, but allows reports to be specified to another simultaneous destination.

/ss <file name> /ss <file name> cont.	saves results in spreadsheet format. If /ss is specified, the system automatically generates a file of the specified name. If the file already exists, it is appended. Each line contains the following: "spec file name" - a. name of spec file "hr:min:sec", - b. time test completed "fails", - c. number of failures "fail type", - d. OPEN/SHORT "port:pin name", - e. 'from' pin "port:pin name" - f. 'to' pin The System generates at least one line as above for each test completed. If the test passes, field c = "000" and fields d-f are not present. If there is more than one failure, there is a line for each failure, with fields a-c being replicated for each. If the file name * is used (e.g., R90 /ss *), the System automatically generates a new file each day with the spreadsheet data. The file name is 'yymmdd.DAT'. Data generated by the /ss flag can be read into spreadsheets such as Lotus 123 as numeric data for failure analysis. In Lotus, the sequence '/fin' can be used to import the data.
/f <number>	specifies the maximum number of failures that can occur before the System stops logging and reporting errors. The default is 10,000. By setting the number to 0, the System won't halt on failure.
/p	allows use of a Microsoft mouse pointing device. If /p is specified, the System allows operation with a mouse and/or a keyboard. All typical testing actions are supported. The operator is restricted to testing operations and cannot exit from the System when using the mouse. The mouse driver must also be installed to allow operation. The mouse driver (typically called MOUSE.SYS) must be previously installed in the CONFIG.SYS file with an entry such as: DEVICE = MOUSE.SYS The System uses a dot as the cursor. In the *System* menu, the dot is at a fixed location, since only one choice is available. The System selects the choice next to the dot when the left mouse button is pressed. The right mouse button selects escape. If you use a three-button mouse, the middle button is the same as pressing the [F1] key.

/fst <file name>	causes the System to perform a self-test, then return to DOS. Nothing is written to the CRT. If there are errors, they are written to < file name> . The DOS ERRORLEVEL is set to 1 if there are failures; otherwise, it is set to 0. If this function is used, there should be no other command line flags used.
/nf	causes the System to disable checking for a spec file to be loaded prior to execution. If /nf is not specified, and you are testing an assembly with no connections in the spec file, the system will not allow you to continue since it will assume that a spec file is not loaded.
/cm	causes the System to start in continuous test mode rather than single test mode.
/cmef	causes the System to start in continuous test mode and then exit on a failure. In this mode, the System stays in the continuous mode screen testing until an error occurs, in which case an automatic exit occurs. When used in conjunction with quiet mode (/q), the System then exits back to DOS with an error-level set. In /cmef mode the assembly being tested must be installed prior to starting the test, otherwise an immediate exit will occur. Escape can also be used to exit the testing screen.
/fix <delay>	causes the System to delay the specified number of milliseconds prior to starting each test. This can be used, for example, if the system is used with automated handling equipment and time is necessary to allow the part to be in place after the start signal is received.
/mark <delay>	causes the System to output a low digital signal for the specified number of millisec after each test that passes. This can be used, for example, to actuate a marker device. The digital signal comes from the top left pin of JP0 on the test module.
/offset <ohms>	causes the System to offset all readings by the specified resistance amount. This can be used when a known series resistance is contained in the signal paths. For example, if each signal path contains 1Kohm resistance, use the */offset 2000* parameter.
/fss	causes the System to use the footswitch input to start tests. When /fss is specified, the System waits for footswitch input only when starting a test from the *File Selection* menu, the *Test Completed* menu, and the *Operator Instructions* screen. Because it only looks at these times, the system will not hang up waiting for a footswitch transition if there is a step failure.
/pwe	causes the System to require the operator to enter the password before exiting back to DOS from the *System Menu*, and when selecting [ESC] from the *Test Completed* Menu. A password must be entered for this option to be active.

/pwi	causes the System to require the operator to enter the password when selecting *[F3] Test this assembly for intermittents* from the *Test Completed* Menu. A password must be entered for this option to be active.
/nc	causes the system, when executing chain-files, to only show operator comments in the main spec file the first time in a batch. Operator comments are always displayed in chain-files.

Following are examples of using command line parameters:

1. Automatically load and begin execution of the spec file 'PN324.'

   R90/r pn324

2. Automatically load and execute the spec file 'PN324.' Do not write anything to the CRT except operator comments that are in the spec file. Print failure results to the printer on LPT1 and save all test results to the disk file 'RESULTS.DAT'.

   R90/r pn324 /q /l1 lpt1 /l2 results.dat

3. Start the System in monochrome mode.

   R90 /m

4. Run the spec files without halting for failures.

   R90 /f 0

5. Run two spec files (named SPEC1 and SPEC2) in succession, transparently, from a batch file. Print a message to the operator telling whether each passed or failed. Log failure results to the file TEST.DAT.

   echo off
   R90 /r sec1 /q /l1 test.dat
   if ERRORLEVEL 1 echo "part 1 fail"
   if NOT ERRORLEVEL 1 echo "part 1 pass"
   R90 /r spec2 /q /l1 test.dat
   if ERRORLEVEL 1 echo "part 2 fail"
   if NOT ERRORLEVEL 1 echo "part 2 pass"

6. Ignore checking for a spec file to be loaded prior to beginning test execution.

   R90 /nf

7. From a batch file, prompt the operator to install the cable, then start a test in continuous mode. Automatically exit if a failure occurs. Otherwise exit when the operator presses the escape key.

```
echo off
echo Install the Cable to be tested
pause
R90 /r specfile /q /l1 results.txt /cmef
if ERRORLEVEL 1 echo Error(s) Occurred!
if NOT ERRORLEVEL 1 ECHO Test Passed!
```

Appendix A

Wiring Diagrams

Appendix B

Sample Reports

Figure A2 - Test Report With Failures

Figure A6 - Test Report With No Failures

Figure A7 - Spec Data Report

Figure A8 - Batch Report

Appendix C

In Case of Problems

If you suspect problems in the operation of your Continuity Test System, you should run the self-test that is available from the *Configure/Install System* menu. Directions for running the self-test are included in the Operating Instructions section of this manual.

If the self-test reports a number of errors, it is likely to be caused by an installation problem such as improper jumpering, or the jumpers on the modules do not match the configuration of the system software.

If a single port (pin) or group of ports give errors that are the same each time you run the test, there may be a failed component on the R-50. If this is the case, you may want to inspect the R-50 for damage, call CheckSum for advice, or return the module to be checked.

Ensure that the MODULE SELECT jumpers are installed properly. There should be only one MODULE SELECT jumper on each R-50 Module. If you have more than one R-50 at a particular BASE ADDRess, each must be at a unique MODULE SELECT address.

If you also have other CheckSum I/O Modules installed in your computer, ensure that you do not have any modules installed at the same base address/module select combinations.

The R-50s do not use interrupts or DMA channels so there can be no conflicts in these areas.

If you still have problems, there may be a conflict on the PC's I/O channel. The R-50 uses 32 sequential byte addresses on the I/O channel. The default Base Address is 768 (300 hex). I/O space up to 799 (31F hex) is used by the R-50. These addresses are reserved by IBM for use with the prototype card so there should be no conflicts with standard PC hardware.

To determine if there are address conflicts, you may wish to remove suspected cards from your computer and try the R-50 Modules again. (Don't forget to remove power and observe static-sensitive rules when you do this!)

In the event another card in the PC is using this I/O space, you may rejumper that card to another spot. Otherwise, you may wish to rejumper the R-90 to another base address. Normally, if 768 doesn't work, you might want to try 512 as the second choice.

The following table shows how the BASE ADDRESS jumpers are used:

Jumper Pair	Address Bit
ADR5	**32 (20 hex)**
ADR6	**64 (40 hex)**
ADR7	**128 (80 hex)**
ADR8	**256 (100 hex)**
ADR9	**512 (200 hex)**

Table A1 - R-50 Base Address Jumpers

The base address is the sum of the above numbers for each of the ADR5-ADR9 jumpers which are REMOVED. For example, in the default case, there are no jumpers on ADR8 and ADR9 so the Base Address is 256 + 512 = 768.

When you change the R-50 base address or module select, you must also go to the 'Configure/Install System' menu and change the corresponding base address and module select entries to match the jumpers of the I/O modules.

The following table shows how the IBM PC/XT and AT use their I/O ports:

User	PC/XT	AT
DMA Controller	000-00F	000-01F
Interrupt Controller	020-021	020-03F
Timer	040-043	040-05F
PPI	060-063	n/a
Keyboard	n/a	060-06F
DMA Page Register	080-083	080-09F
NMI Mask Register	0A	070-07F
Interrupt Controller 2	n/a	0A0-0BF
DMA Controller 2	n/a	0C0-0DF
Math Coprocessor	n/a	0F8-0FF
Joystick/Game Controller	200-20F	200-20F
Expansion Unit	210-217	n/a
Parallel Printer	n/a	278-27F
Serial Port (Primary)	3F8-3FF	3F8-3FF
Serial Port (Secondary)	2F8-2FF	2F8-2FF
Prototype Card	300-31F	300-31F
Fixed Disk	320-32F	1F0-1F8
Parallel Printer (Primary)	378-37F	378-37F
SDLC	380-38F	380-38F
Bisynchronous Com.	n/a	3A0-3AF
Mono Adapter/Printer	3B0-3BF	3B0-3BF
CGA Adapter	3D0-3DF	3D0-3DF
Diskette Controller	3F0-3F7	3F0-3F7

Table A2 - Computer I/O Port Assignment

Test Point Electronics

The Model R-50 I/O Modules use high-performance FET multiplexers to switch the test signals. These are very reliable parts, but can be damaged from electrostatic discharge or abuse. The parts are socketed on the circuit boards for ease of replacement without damage to the assembly.

On the R-50 I/O Modules, the ICs are arranged as follows. The multiplexer ICs are indicated by bold-faced type:

U1	U2-3	U4		U5	U6		U7	U8	U9	
	U10	U11		U12	U13		U14	U15		U16
	U17	U18	**U19**	**U20**	U21		U22		U23	U24
U25	**U26**	U27	**U28**	**U29**	**U30**	**U31**	U32	**U33**	**U34**	U35
U36	**U37**	U38	**U39**	**U40**	**U41**	**U42**	U43	**U44**	**U45**	U46
U47	**U48**	U49	**U50**	**U51**	**U52**	**U53**	U54	**U55**	**U56**	U57
U58	**U59**	U60	**U61**	**U62**	**U63**	**U64**	U65	**U66**	**U67**	U68
U69	**U70**	U71	**U72**	**U73**	**U74**	**U75**	U76	**U77**	**U78**	U79
U80	**U81**	U82	**U83**	**U84**	**U85**	**U86**	U87	**U88**	**U89**	U90

Figure A3 - Model R-50 IC Locations
(component side shown)

The table on the following page shows the correlation between the test points on the R-50 Modules and the FET switches on the I/O Module in the computer.

If the test point ignores probing, it is likely to be the IC shown in the HIGH column.

If the problem is found during a self-test, it could be due to either the LOW or HIGH column. If the error shows as 'Failure (1),' it is probably the LOW column IC. If the error shows as 'Failure (2),' it is likely to be the IC shown in the HIGH column.

TEST POINT MULTIPLEXER ICs Multiplexer: DG408 or ADG508AKN		
Model R-50 Port No.	**Multiplexer IC**	
	High	*Low*
1 - 8	U80	U81
9 - 16	U69	U70
17 - 24	U58	U59
25 - 32	U47	U48
33 - 40	U36	U37
41 - 48	U25	U26
51 - 58	U84	U83
59 - 66	U73	U72
67 - 74	U62	U61
75 - 82	U51	U50
83 - 90	U40	U39
91 - 98	U29	U28
101 - 108	U85	U86
109 - 116	U74	U75
117 - 124	U63	U64
125 - 132	U52	U53
133 - 140	U41	U42
141 - 148	U30	U31
151 - 158	U89	U88
159 - 166	U78	U77
167 - 174	U67	U66
175 - 182	U56	U55
183 - 190	U45	U44
191 - 198	U34	U33
49/50, 99/100, 149/150,199/200	U20	U19

Table A4 - Test Point Multiplexer ICs

Repair/Troubleshooting of Faulty Modules

This section provides further information regarding repair of the Model R-50/90. This section presumes that the module is installed properly, such as if the module was working at one time, then started to exhibit faulty behavior.

Almost all failures are due to the Test Point Multiplexer ICs. Early revisions of this module used DG-508 ICs, but the DG-408 has proven to be more reliable. Since the DG-408 has lower on-resistance, when switching a module from DG-508s to DG-408s, some resistors should also be changed to retain the best threshold accuracy. These resistors are in the upper left hand corner of the module:

Multiplexer IC	R1	R6
DG-408	1.96K	174
DG-508	1.83K	32

Most faults are the result of the MPX ICs becoming "leaky" from ESD damage. Repairs almost always consist of finding the faulty MPX ICs. There are several ways to isolate faults.

1. Run self-test on the module. Make sure that there are no connections to the end of the cables, or the cables are removed. If self-test shows one or a few test points failing, find the test point numbers in table A4, then replace both the "High" and "Low" ICs for the faulty test points.

   Note:

   Even though replacing one of the ICs for the test points may solve the immediate problem, it is a good practice to replace both. Since the most likely cause of the fault was ESD input, both ICs were exposed to the ESD and the other is probably a "walking-wounded" part.

2. If the fault can not be identified in step one, this step can help find faults. Power up the computer, and start the R-90 software. You should be viewing the main screen (the first one you see when you boot up). In this screen, all of the R-90 hardware is in the reset state. Using a DMM (such as a Fluke handheld meter) set to DCV, connect one probe to computer chassis. Then, with the other probe, touch one pin (port) at a time. Voltage at these pins will typically be less than + /- 0.3V. If you encounter any pins with voltages outside that range, replace the MPX ICs associated with the test points (see table A4).

3. If you still have not detected the problem, it is necessary to remove ICs until the fault is gone, then put them back until you find the faulty parts. Here is one method for doing this:

   a. Remove all of the MPX ICs in the lower right corner of the module (U30 would be the upper left corner of these ICs and U89 would be the lower right corner of these ICs). Run self-test.

   b. If the system passes self-test up to test point 101, the bad IC(s) are in the group that you removed. Replace them two at a time (starting with U85/U86 and moving up that column, then U88/89 and moving up that column). Each time a pair is installed, run self-test and it should pass eight more test points. If it fails the points just installed, replace them and continue the process.

   c. If the system fails after step a, remove all the other MPX ICs other than those for points 1-8: Remove the ICs in the block with upper left U19, lower right U84, and the block upper left U25, lower right U70. This leaves U80, U81 for points 1-8. If it fails the self-test for points 1-8, replace U80 and U81. If it still fails, return the module to CheckSum for repair. It is passing, start replacing the MPX ICs two at a time, (starting with U69/U70 and moving up that column, then U83/84 and moving up that column). Each time a pair is installed, run self-test and it should pass eight more test points. If it fails the points just installed, replace them and continue the process.

To confirm proper operation, the system should pass self-test.

As an added check, you can use the 'Measure Selected Points' ([F4] from the main menu). Use [F7] to make a measurement between two points (e.g., 1 and 2). The reading should be > 100M. Then reverse the polarity (e.g. 2 and 1) and press [F7] again. Again the reading should be > 100M. If either of these tests fail, one or more of the MPX ICs are leaky and should be diagnosed as above.

Appendix D

Error Messages

Errors that could occur while reading or writing to and from the computer's disk include:

Error Number	Error Description
Error 3	**Path not found**
Error 4	**Too many files open**
Error 5	**File access denied**
Error 12	**Invalid file access code**
Error 15	**Invalid drive number**
Error 97	**Incorrect spec file revision**
Error 99	**Not a valid spec data file**
Error 100	**Disk Read error**
Error 101	**Disk out of space**
Error 103	**File Open error**
Error 150	**Disk is write-protected**
Error 152	**Drive is not ready**
Error 156	**Disk seek error**
Error 162	**Hardware failure**

Table A5 - File Error Messages

Appendix E

Glossary

Active Port - Port that is being used by the System. Inactive ports are ignored when an assembly is learned or tested. Ports are assigned to be active or inactive from the *Learn Assembly* menu selection 'Assign Connection Information.' Data specifying which ports are active is stored with the spec data.

Alternate Measurement Characteristics - A second set of measurement characteristics (delay time and connection threshold) that can be used with selected test points of a UUT.

Assembly - The unit being tested. A typical assembly might be a cable, harness, back-plane, or circuit assembly.

Assembly Name - An optional name that can be assigned to spec data that identifies the UUT. The assembly name can be up to 32 characters in length. The assembly name is included in reports about the UUT and in some of the System menus.

Base Address - Jumpers on the Model R-50 that allow the installer to specify where in the computer's I/O address space the Model R-50 resides. The base address must not conflict with other hardware installed in the computer.

Batch - A collection of UUTs that share common spec data. Batches might be a shipment of assemblies that need testing or a single assembly with a number of common identical circuits to be tested.

Batch Report - A report describing the outcome of testing more than one UUT with common spec data. The batch report includes yield (percent OK), date and time of the test, batch identification, tester ID, testing facility name, and optionally the spec data for the batch.

CheckSoft Software - Software that runs on the PC to perform the testing. CheckSoft Software is menu-driven and runs in the DOS environment.

Configuration Data - Information saved on disk that tailors the System's setup to a particular application so that the System does not need to be configured each time it is used. The configuration data is specified and saved with selections in the *Configure/Install System* menu.

Connection Threshold - A value (in ohms) which the Test System uses to determine whether a connection is present or not.

Data Path - A string of characters added to the beginning of the file name when spec data is being retrieved or saved. The data path can be used to specify a device or directory. For example, if the data path were set to 'B:\DATA\,' all of the spec data would be saved and retrieved from the directory 'DATA' on disk drive B.

I/O Addressing - The internal bus used for controlling hardware with the 8086/8088/80286/80386 series of computers.

Inactive Port - Port that is being ignored. See 'Active Port.'

Measurement Characteristics - The user-configurable table of data that describes how the System takes measurements. Measurement characteristics are delay time and connection threshold.

Model R-50 Continuity I/O Module - The electronics for the Test System that are installed in the PC. Each R-50 Module contains 200 ports for testing the UUT. A single System can have up to sixteen R-50s.

Model R-90 Continuity Test System - A Test System consisting of one or more Model R-50 Continuity I/O Modules, CheckSoft Software, and cabling to the UUT. These elements are installed into the user's PC for testing assemblies.

Model GS-850 Fixture - An optional fixture that connects between the Model R-50 Continuity I/O Modules and the UUT. It allows the user to quickly and reliably change "adapters" for interfacing to different UUTs.

Model TR-3 Fixture - An optional Bed-of-Nails Fixture that connects between the Model R-50 Continuity I/O Modules and the UUT. This Fixture can be used for bare-board or loaded assembly testing.

Model T-120 System Controller - PC available from CheckSum that can be used in conjunction with CheckSum testing hardware and software.

Module Select - A header on Model R-50s that allows the installer to set the module's identity to the computer. Each module has eight possible module select positions. Each module that uses the same base address must have a unique module select position.

Operator Comments (or Operator Instructions) - An optional screen of information that can be displayed to the System operator when beginning the test of each type of UUT. Operator comments can be used for various purposes such as to describe how to connect the UUT to the System, which adapters to install, or special precautions for the UUT.

Pin Name - An optional string of characters assigned by the user that describe the connection to the UUT. Examples might be 'J4 Pin 7a' or 'U7 Pin 3.' Each pin name can contain up to twelve characters. There can be a unique pin name for each tester port.

Ports - The test pins of the Model R-50 Continuity I/O Module. Each port is connected to a particular test point of the unit being tested.

Report Device - The computer device that will receive information from the computer. The report device can be configured to be the CRT (CONsole), the printer (PRN), a file on the disk (FILE.TXT), or other alternatives.

Reporting Facility - Name of the organization doing the testing. If the System is configured with a reporting facility, all of the reports contain a line with the facility name. The reporting facility can be up to 32 characters long and is configured from the 'Report Configuration' menu.

Spec Data - Spec(ification) data describing how the UUT is tested. The spec data includes information about each connection such as the port numbers, and pin and wire names. In addition, the spec data includes a list of active pins, the measurement characteristics and the assembly name.

Test Report - A report describing the outcome of testing a single UUT against its spec data. This report includes information about each failed measurement (e.g., port numbers, pin and wire names), the test threshold, the facility name, and tester identification.

UUT - Unit-Under-Test. The assembly being tested by the Test System.

Wire Name - An optional string of characters assigned by the user that describe the UUT. Examples might be 'Red Wire' or 'VCC Bus.' Each wire name can contain up to twelve characters. There can be a unique wire name for each tester port.

Appendix F

Operational Overview

This section guides you through typical complete sequences for each major use of the System. These sequences include:

- Installation
- Fixturing
- Creation of a spec file for a UUT
- Testing a UUT

Read over this section to get an overview of each activity. Complete detail is not given in this section, so you will probably want to refer to the sections of the manual that describe each action in detail as you perform the task.

Installation

The Model R-50 Continuity I/O Modules are first installed in your PC. They are jumpered properly upon delivery from CheckSum for immediate installation (set to Base Address 768 with sequential Module Select addresses, starting at 1). If you have more than eight modules, choose a second base address and use sequential Module Select addresses starting at 1 for the new base address.

Plug the modules into your PC, taking normal safety and electrostatic discharge (ESD) precautions: turn off the power and ground your body to the PC prior to installation. Ensure that the 50-pin I/O cables are installed with each Module.

Once the hardware is installed, install the CheckSoft Software in your PC. Put the CheckSoft disk into A:, assign A:, then run the INSTALL program (type INSTALL[Enter]).

Start the CheckSoft Software by typing R90 [Enter]. At this point, you will see the *System* menu which is the hub of all System operations.

When first installing the System, you should run a self-test. This ensures that the hardware is installed properly. Self-test is executed by selecting 'Configure/Install System' from the *System* menu ([F6]), then 'System Self-Test' ([F2]). Once self-test has started, strike keys as prompted to sequence through the self-test.

'Saving configuration data on disk' saves the current value for most selections of the *Configure/Install System* menu and its submenus. Saved values include most of the System operating characteristics such as hardware configuration, report configuration, active ports, and measurement characteristics. Press [ESC] to return to the *System* menu.

Connecting to the UUT

The System's measurements are made via test points available at the end of the 50-pin ribbon cables that come from the back of the R-50 Continuity I/O Modules. Each pin is called a port. Each port is completely bidirectional and can be connected to any UUT test point.

The System can test using specified or all ports. Ports not specified as 'active' are ignored, speeding up testing. Ports (in module groups) are specified as active or inactive in the 'Assign Connection Information' ([F2]) selection of the *Assembly Learn* menu.

If you are not concerned with detailed pin and connection names for operator interaction and reports, it is not even necessary to know how the UUT is connected to the system. The system can self-learn a UUT without concern for user-assigned pin and connection names.

The pin out of each R-50 is shown in Appendix A. Ports 1 - 200 are on the first I/O module shown in the *Set IO Module Configuration* display of the *Configure/Install System* menu. Ports 201 - 400 are contained on the second I/O module shown in the display, and so on.

If you are not sure about the pin-out, use the 'Locate a pin' feature available from the *System* menu. If you enable this feature and touch a grounded probe to the port in question, the System will display the port number.

Creating a Spec File

The specification file (spec file) tells the System how to test an assembly (also called the unit-under-test or UUT). The spec file is typically generated once, saved on the disk, then used each time one or more of the same UUTs are tested.

The spec file contains a list of the correct connections for the assembly. In addition, the spec file contains pin and connection names (optionally assigned), the measurement characteristics (i.e., connection threshold and delay time for each reading), active ports, the assembly name (optional), and operator comments (optional instructions to the operator).

Generating a spec file can be performed in three ways. All are available from the 'Learn an Assembly' ([F2]) selection of the *System* menu. You may use the System in random sequences of configuration, learning, testing, and other operations. When you are satisfied that your PC's memory contains the proper spec data, save it to disk.

Typically, the System is used to self-learn an assembly ([F1]). In this operation, the System measures all combinations of all active ports and saves the outcome in memory. Alternatively, you can read in an ASCII file created separately with a word processor or spreadsheet with the 'Special Features' ([F7]) option. Finally, you can edit or enter connection information from the keyboard via the 'Assign connection information' ([F2]) option of the *Assembly Learn* menu.

The 'Assign connection information' ([F2]) selection allows you to enter names specific to your UUT into the System. When you do this, the System displays and reports will contain the names that you enter. Each pin and wire name can be up to twelve characters. The 'Assign connection information' selection also allows you to specify which module's ports are active and inactive (ignored), whether to use alternate measurement characteristics for a test point, and to edit or enter connection information.

'Assign operator instructions' ([F3]) can be used to create a screen of text that the operator sees prior to beginning a test for each UUT. This text can be used for precautions, connection information, or other items that you would like to convey to the operator.

'Assign assembly name' ([F4]) allows you to specify up to 32 characters describing the UUT. This information is presented to the operator and included in the reports generated by the System.

The connection threshold allows you to specify a value (in ohms) that the System uses to determine if a connection exists or not. The open threshold specifies the value to test open circuits against. By specifying a low connection threshold and a high open threshold, you can ensure integrity of your UUT. The default for both the open and short threshold is 1 KΩ. The thresholds are set with the [F5] option of the *Assembly Learn* menu.

The 'Test mode' ([F6]) tells the System how thoroughly to test the UUT. In 'normal' mode, each connection is verified, and each connection is tested against all other points (collectively) to ensure that the connection is not shorted to another network. 'Connections-only' mode does not do any short testing. 'Extensive' mode verifies that unconnected pins are not shorted together.

'Output spec data report' ([F8]) lists information about the spec data presently in memory. The destination of this report is solicited right after pressing [F8]. Reports may be sent to the CRT, a disk file, or a printer.

'Save spec data to disk' ([F9]) is used to save the spec data for future use. When creating a new spec data file, make sure that the active ports and test thresholds are set properly. This information is saved with the spec data on disk. Consequently, when the spec file is loaded in the future this information will be restored to match the conditions when the spec file was saved.

Testing an Assembly

Once you have generated a spec file for a UUT, the UUT may be tested. To test a UUT, select 'Test an Assembly' ([F1]) from the *System* menu. You are then presented with the *Select Spec Data File* menu. Either enter [F2] and type in the spec file name or use the 'Select Spec Data File From List' ([F3]) to choose the proper spec file. Once the proper spec file is loaded into memory, select 'Start Test With Present File' ([F1]) to actually start the test. [F4] allows you to choose continuous or single test modes (see below).

In the continuous mode, the System continually tests the UUT and displays a pass or fail result. When it detects a pass, it beeps and continues to test. Continuous mode is good for quickly sorting batches of assemblies for pass/fail and without operator interaction, except for installing new assemblies to be tested. However, it does not allow for obtaining test reports and failure specifics as outlined for single mode described below.

If the test fails any points, you are presented with a failure display describing the failure. You may either abort the test ([ESC]) or continue with the test.

Once the test is completed or aborted, you see the *Test Completed* menu. This menu allows you to either continue on to the next assembly in this run, retest the present assembly, or loop test the present assembly looking for intermittent faults.

At any point you may also generate a report. The test report ([F4]) contains any failures for the UUT. The batch report ([F6]) gives a summary of all of the UUTs tested in this run.