Touch 1

Getting Started Guide and User's Reference

Version 5.0D

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CIRRIS®

Touch 1 Getting Started Guide and User's Reference

Version 5.0D

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Table of Contents

Chapter 1: Setting up the Touch 1

Check that you have all the required items

The following items are supplied with every Touch 1 test system:

- The **Touch 1** Analyzer.
- A **Power Cord** that matches the electrical requirements of your country.
- A hand-held **Probe**.

Optional items you may have purchased with the Touch 1 test system:

- Test Point **Expansion boxes** - adds 128 test points per box (1024 points maximum).
- A variety of **Cirris Mating Adapters** in many types, sizes, and quantities.
- **Touch 1 Performance Check Kit** consisting of three special adapters and a manual.
- A **Network Card** which is preinstalled by Cirris.
- The **AC Voltage** option, preinstalled and activated by Cirris.
- The **Scripting** option, preinstalled and activated by Cirris.
- The **SPC Data Collection** option, preinstalled and activated by Cirris.
- The **Networking Made Easy** software allows a PC to be a server so all your Touch1's can share data.
- The **SPC Link** software for your PC, a data conversion and storage utility.
- The **SPC Made Easy** software for your PC, a full featured data analysis tool.
- The **Zener Diode Test Kit** consisting of a special adapter and a power supply.

You may need some of the following items based on your test requirements:

- A **Printer**, either serial or parallel. "Windows Only" printers are not compatible.
- A **Printer Cable** to match your printer.
- A computer **Keyboard** for non-touch screen control.
- A **Video Monitor**, VGA or better resolution for remote or expanded display.
- A **Power Strip / Surge Protector** to protect your analyzer.
- A variety of **Digital Controls** such as external switches, relays, solenoids, etc.

Plug in your Touch 1 analyzer:

New Touch 1 analyzers auto adjust to a line voltage of either 120V 60 Hz or 240ACV 50 Hz.

On older Touch 1 analyzer models you need to manually select the line voltage.

Hipot Warning!

Possible electric shock! 

Cirris hipot testers are designed to be safe for operators. Injuries from hipot test equipment are rare; however, not every hipot test situation is safe. Hipot testing is not dangerous to healthy individuals; although at times a mild electric shock may be experienced. A small shock will only occur during a hipot test when the operator touches an energized connection point. A shock from the tester may result in a hipot test failure.

Medical Warning!
A child or individual wearing a cardiac pacemaker, insulin pump, or electronically controlled medical device should NOT perform Hipot testing.

Improving Hipot Safety

- **Set Hipot Test to Manual**

  When this option is set to Manual (see Setting Test Controls on page 34), the analyzer does not automatically Hipot test. Instead, the analyzer's display prompts "Ready To Hipot" after testing for continuity and resistance. This requires the operator to manually press the Function switch or Hipot button to conduct a Hipot test. Having manual control of the Hipot test should give the operator ample time to remove their hands from any cable connections and prevent the possibility of shock.

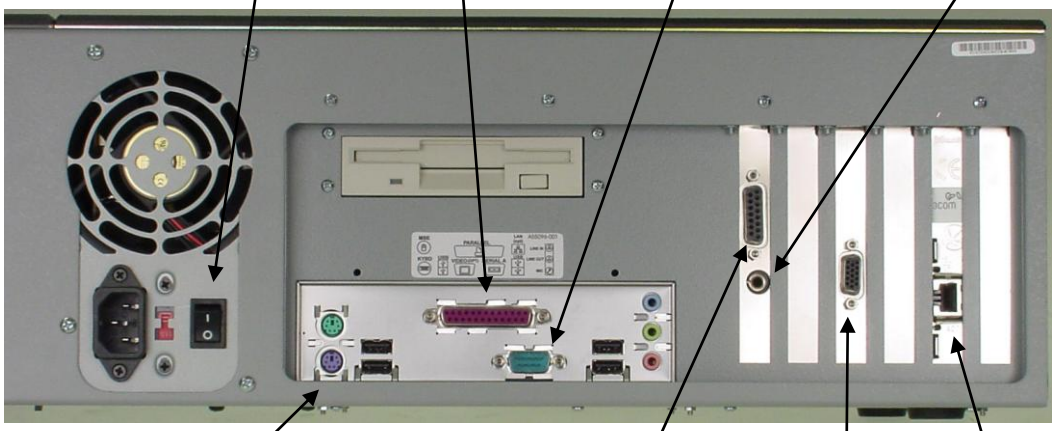
- **Wear Rubber gloves**

  Latex rubber gloves should be sufficient for insulating the operator's hands from electric shock. However, do not use gloves designed for electrostatic discharge (ESD). These gloves increase the potential for shock and test failures**.**

For more information on improving hipot safety visit:

www.cirris.com/testing/guidelines/hipot_safety.html

Setting up the Analyzer



Important!

Be sure to connect all of your peripheral devices to the analyzer before turning on the power.

The analyzer may not recognize that the device is attached and the device may be damaged in the process if the power is on when the device is plugged in to the back of the analyzer.

Installing Add-on Scanners

You can install up to 7 add-on scanners for a total of 1024 points in a system.

On the Touch 1 main unit, remove the scanner cover plate by rotating the twist-lock fasteners 90 degrees so they go from vertical to horizontal.

With the add-on connector cable sticking straight up, align the pins one-at-a-time on the add-on scanner chassis with the holes in the main chassis. Then push the add-on scanner up against the main unit so the pins seat.

On the front and back, secure the latches that connect the main unit to the add-on.

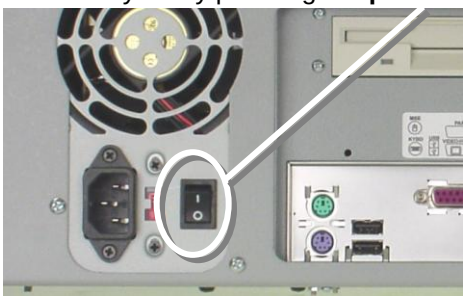
Lift the main unit scanner assembly out of the chassis so the free connector on the main unit cable is side-by-side with the connector of the add-on scanner.

Connect the main unit cable to the add-on scanner cable.

While lowering the scanner assembly of the main unit back into the chassis, gently guide the connected cable so it folds into the main unit in a manner that allows the scanner to sit easily on the chassis.

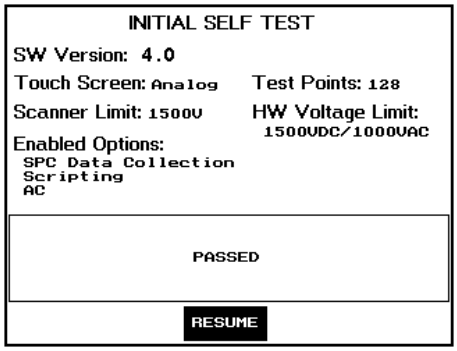
Powering up and verifying the software is running

Turn on the Touch 1 analyzer by pressing the **power switch** on the back of the analyzer.



The power-up Self Test is automatic and will go away when it is finished.
To freeze this window, press and hold Pause. Press again to Resume.

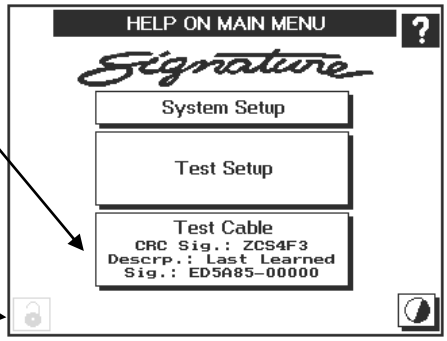
The current software version and options that are enabled are shown here.



If there are errors during the Self Test, write them down.

The system begins at the **Main Menu** with the wirelist that was last used loaded and ready for testing.

This button indicates whether the **Security** system is active.



This button is the **Help** Icon. Use it wherever it is available to get Help on nearly every aspect of your Touch 1 analyzer.

This button allows you to set the screen **Contrast**. This setting will affect all of the screens on this machine. (also available in System Setup)

Using the Help System

There are two different kinds of Help:

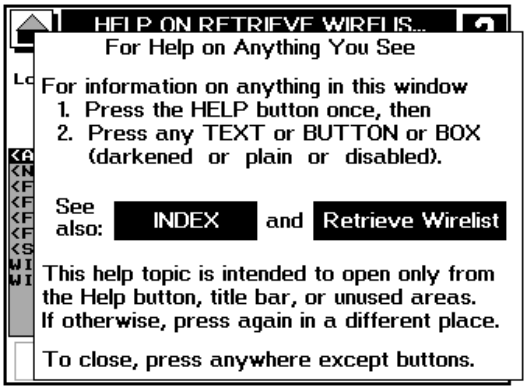
- Index Help – A wide array of topics that are selected from a master list from anywhere in the system.
- Context-sensitive Help - Information on a specific item or task in a specific window, whether active or disabled - buttons, boxes, or text.

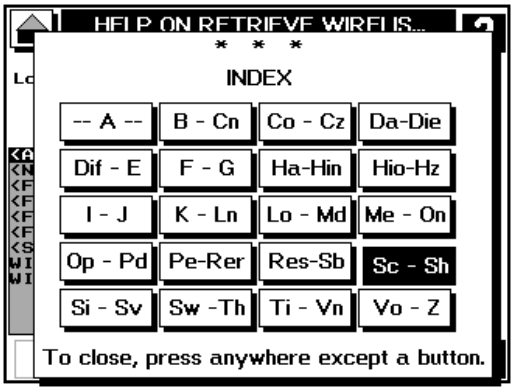
Using the Index Help system

You can open the index from any window that has a Help button. The help button is a “Question Mark” in the upper right hand corner of the screen. Press the Help Icon twice to open the index.

To exit the Help system, press the touch screen anywhere except a button.

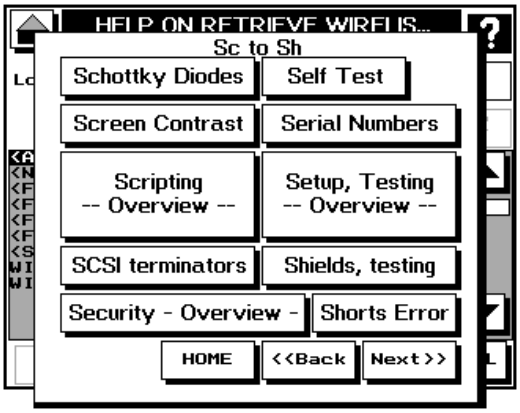
You will be returned to where you were before the Help system was accessed.





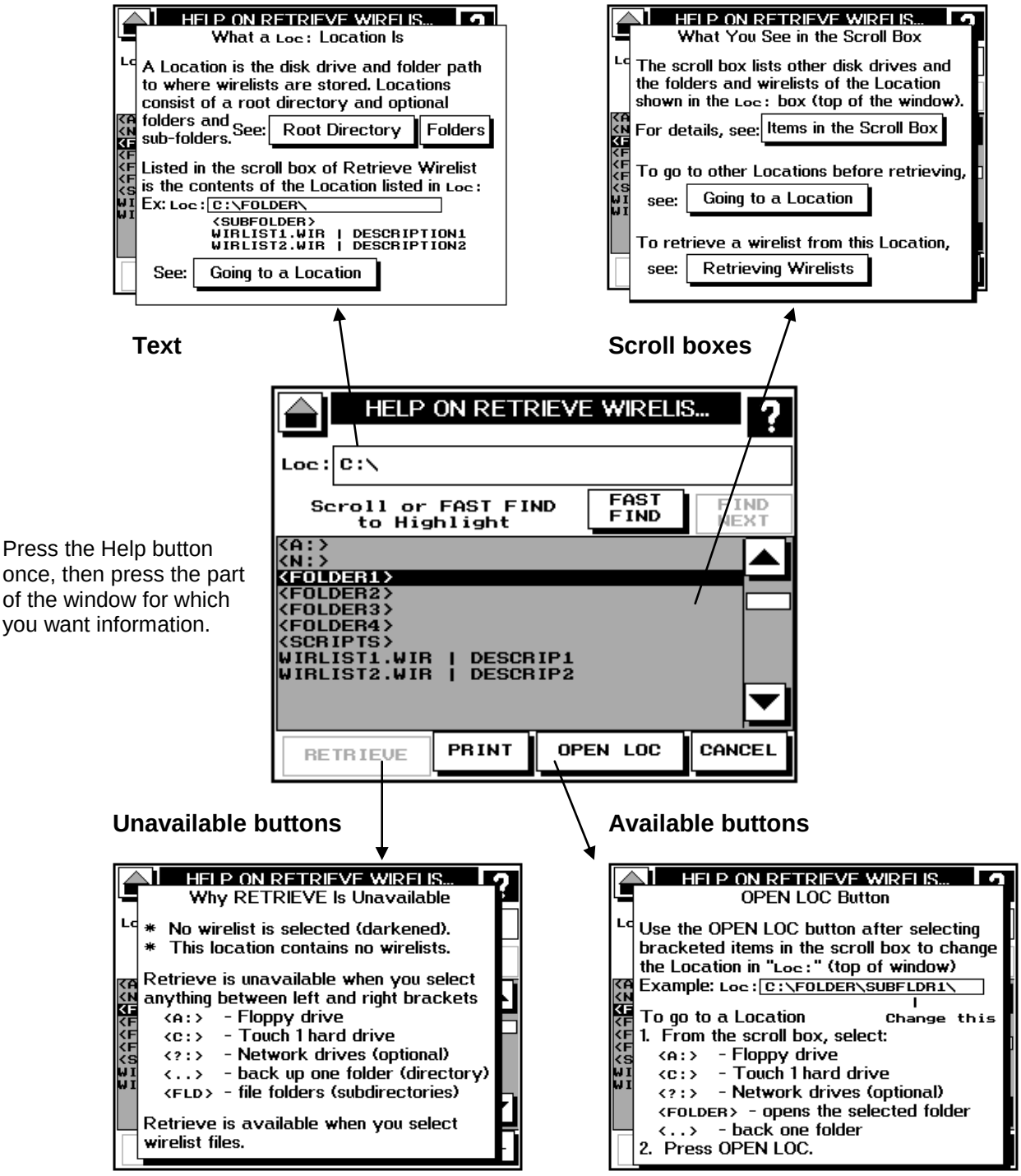
Choose from the alphabetical list to see a list of topics.

Many topics link to other related topics.



Using Context-sensitive Help

You can get Help on any item you see in a window, whether it is text, a button, or a list.



Press the Help button once, then press the part of the window for which you want information.

Press anywhere on the Help topic except a button to close the Help system.

Installing Optional Software

You may have purchased software to install on a PC that will be used with your Touch1 tester.

If you have purchased the **Networking Option,** you have also received **Networking Made Easy** which allows multiple Touch1 testers to share the same information. Full instructions for Networking Made Easy are available at this time on the Cirris Web site at http://www.cirris.com/software/networking_made_easy.html.

If you have purchased the **SPC Data Collection Option**, you should have received **SPC Link** and an accompanying SPC Link Manual. If you have received **SPC Made Easy**, you should have received a manual. Also see Appendix C in this manual for enabling SPC data on the tester.

If you have purchased the **Scripting Option**, you should have received a Scripting Manual. Also see *Appendix D* and *Chapter 6* in this manual to enable and begin to use scripting.

Using Cirris Adapters

Connector adapters snap directly into the Touch 1 and mate to the device-under-test. You can mix or match the various kinds of adapters in combinations that work for you.

Standard Adapters

Standard Adapters consist of a connector mounted on a PC card that inserts directly into the "J" positions of the tester's scanners. Each adapter is “strapped” to create an Adapter Signature and pin count that the analyzer can sense automatically.

Standard adapters are identified by a part number starting with an "A" using a seven character format: Axxx-nn. Adapters are also labeled by what connector they mate to on the device under test. Example: AHED-26 Mates to: 26 POS .1" FEM

Custom Adapters

Custom Adapters are limited-production adapters based on the design rules of Standard Adapters. They do not appear in the Price List.

Custom adapters are identified by a part number in the format AA<nn>-<nnn> where the first number <nn> is the number of pins and the second number <nnn> is the "nth" custom built by Cirris.

Example: AA10-690

When listed in the analyzer, unless a custom name is entered by you, the adapter is shown by its “J” position and signature only.

Example: J3 D507F1
| |
J pos. Signature

High Voltage (H) Adapters

When using voltages higher than 1000 VDC or 707 VAC, special adapters are required.

A High Voltage Adapter is identified by a part number that starts with an “H”. Smart adapters and easy-wire adapters do not indicate their voltage rating. You can verify the voltage rating of any adapter by installing the adapter in the Touch 1 and then using the **Adapter Info** utility in **System Setup**.

Chapter 2: Creating a Wire List (Learning)

Wirelists can be created by self learning, from a sample cable, manual input, or importing. You can "learn" a wirelist using an existing device that can be connected to the analyzer or you can modify an existing wirelist to meet your testing requirements. To change an existing wirelist, see **Chapter 5: Editing Wirelists.**

Learning uses a group of settings that you can adjust in order to meet your specifications. The Touch 1 will store your settings and use them for any subsequent learn.

Some of the learn settings are always in place, you must enable others in order to be considered by the analyzer during the learning process. Even so, any facet of the wirelist can be modified after the learn to achieve the desired test.

What is always learned

- **Connections** or wires whose resistance falls beneath the Connection Resistance setting.
- **Adapters** that are installed on the analyzer at the time of the learn.

What can be enabled or disabled before learning

- **Components** - resistors, diodes, capacitors, etc.
- **Child wirelists** (multi-pass testing) – See Appendix E for more information on Parent/ Child wirelists.
- **Four-wire implementations**. See Appendix B for more information on four-wire wirelists.
- **SPC** (statistical process control) data collection. See Appendix C for more information on SPC Data Collection.
- **Scripting**. See Appendix D for more information on scripting applications.

Learning vs. Testing Ranges

There are differences between the ranges used for learning and those ranges that are used for testing. Refer to the table below for a comparison of learning and testing capabilities.

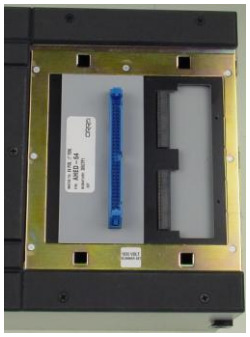
Item	Learning Range	Testing Range
Wires	0.1Ω to 100KΩ, 500K, 1 M, 5 M (extendable to 0.001Ω with 4-Wire)	0.1Ω to 100KΩ, 500K, 1 M, 5 M (extendable to 0.001Ω with 4-Wire)
Capacitors	400nF to 100uF (Tolerance defaults to 10%)	5nF to 100uF Tolerance: 1-99 %
Diodes	Silicon – all, Zeners - limited detection	Silicon, Germanium, Zeners ?? v to 19v (4 to 19 v requires the optional zener kit
Grounded points	Requires setting "High Cap Shield Allowed" and "Allow Grounded Points"	Yes
LEDs	LEDs are not learned as LEDs. Some may be learned as diodes depending on their characteristics.	Can be tested as a custom component. Otherwise, tested as diodes.
Resistors	0.1Ω to 100KΩ (Tolerance defaults to 10%)	0.1Ω to 1.0MΩ (extendable to 0.001Ω with four-wire) Tolerance: 1-99 %
Relays	Can learn both states (on or off) by using Multi-Pass Testing	Testing for both on and off states requires Multi-Pass Testing
SCSI Terminators	n/a	50-68 pin, powered or un-powered
Switches	Can learn all positions (on or off) by using Child Wirelists (Multi-pass testing).	Testing for all positions (on or off) requires Multi-Pass Testing
Twisted pairs	Min twisted length: 6 ft Min wires in cable: three	Min twisted length: 6 ft Min wires in cable: three

Installing Adapters Before a Learn

Adapters must be installed in the same "J" positions for testing as when the device was learned. If they are in a different order when you start a test, the analyzer will ask you to reposition them where they were in the original learn.

To install an adapter into the analyzer, first remove the cover plate on the scanner assembly.

Place the adapter so that it rests in the intended position, the pins on the bottom of the adapter facing to the left.

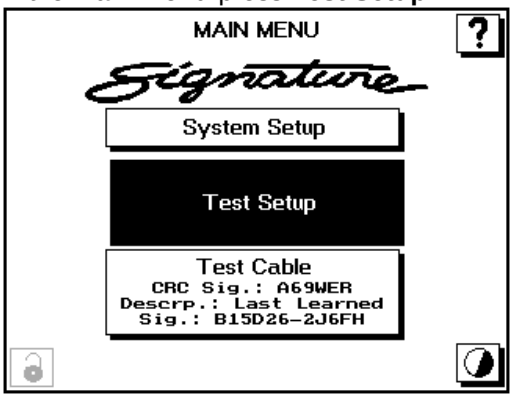


Carefully but firmly slide the adapter to the left until the cover plate pin holes show on the right side of the adapter.

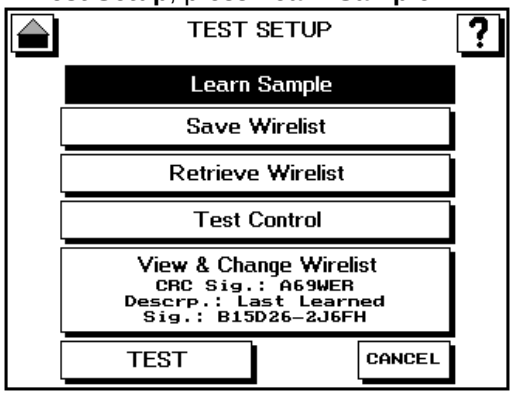
Replace the cover plate to secure the adapter(s) in place.

Setting Up a Learn

From the **Main Menu** press **Test Setup**.

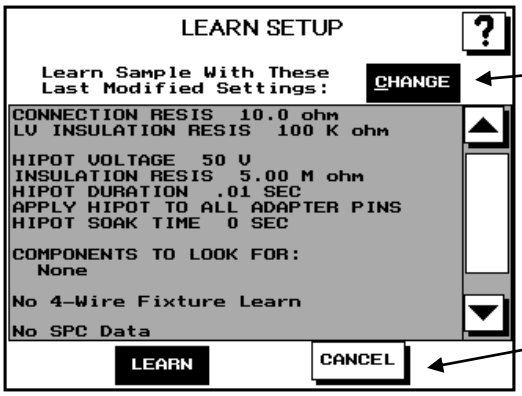


In **Test Setup**, press **Learn Sample**



In **Learn Setup**, press **LEARN** to begin learning.

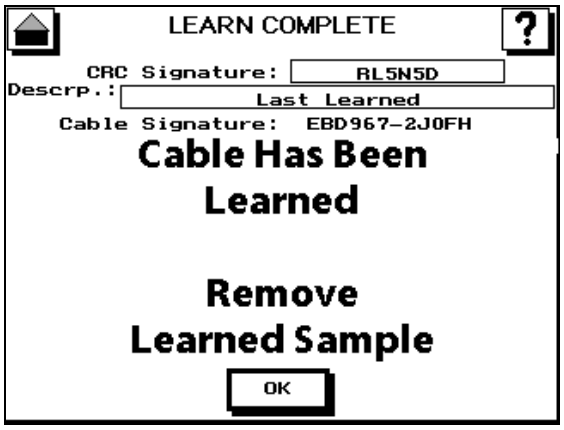
OR



You can change any of the learn settings by pressing CHANGE.

You can view the current learn settings by pressing the up or down arrows through the list.

You can abort the learning process by pressing CANCEL.



The analyzer will then learn the device.

These Signatures are described in the **Help Index** under **Signatures: Overview**.

Note: If a test program has components, the paramater signature is –MULTI. If a test program has advanced hipot settings or a voltage greater than 1000 V, the parameter signature is -00000.

Relearning an assembly will replace the wirelist in the Last Learned position.

To save a wirelist that you have learned, see the **Saving a Wirelist** section in **Chapter 6**.

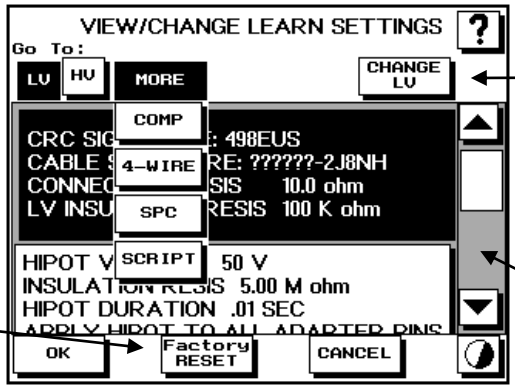
You are now ready to test devices. See **Chapter 3: Testing a Device** for your next step.

Changing Learn Settings

Pressing **CHANGE** in the Learn Setup window will provide access to all of the learn settings.

To view a specific section of the wirelist, use any of the buttons to highlight that area.

You can return all of the learn parameters to the default settings by pressing **Factory RESET.**

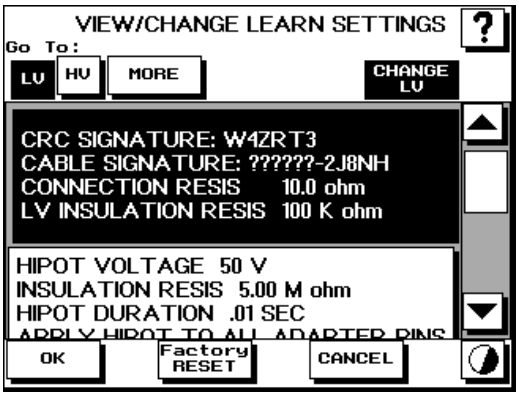


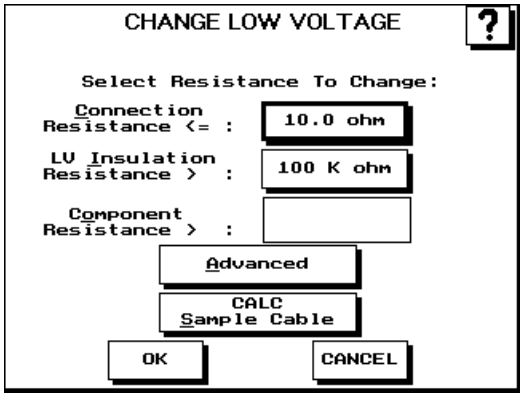
Use the **CHANGE** button to access the changeable items for the section that is highlighted.

You can use the arrows and slider to view the sections of the wirelist without selecting them.

LV - Low Voltage Parameters

Low voltage parameters influence the continuity portion of the test, which is performed first. The Continuity Test evaluates wires for connection resistance, opens, and shorts. Components like resistors, diodes, and capacitors are learned and tested separately.



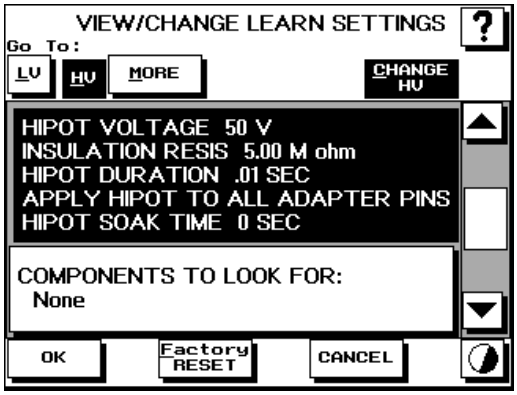


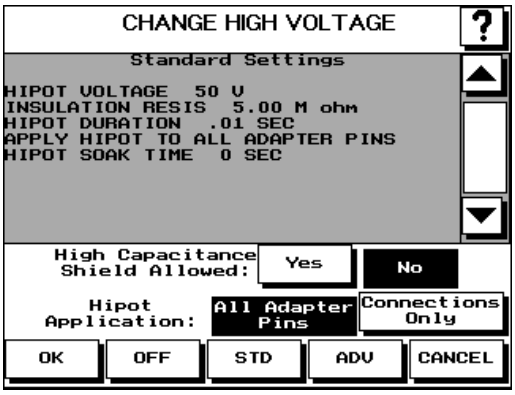
The definition of a good wire is based on the settings of Low Voltage parameters. Good wires have resistance less than the **Connection Resistance** setting. Opens are intended connections with resistance greater than the **Insulation Resistance** setting. Shorts are unintended connections with resistance is below the **Insulation Resistance** setting.
Before creating a wirelist by learning a sample, you can get the Touch 1 to find the resistance of all the wires of the sample. **Calc Sample Cable** allows you to establish a reasonable connection resistance parameter by comparing several sample devices.

LV Parameter Settings	**Range**
Connection Resistance <=	0.10 ohm to 100 k ohms
LV Insulation Resistance >	0.10 ohm to 5 M ohms (must be higher than the Connection Resistance setting)
Component Resistance >	Not a user setting for a learn. The parameter is automatically calculated when components testing is enabled.

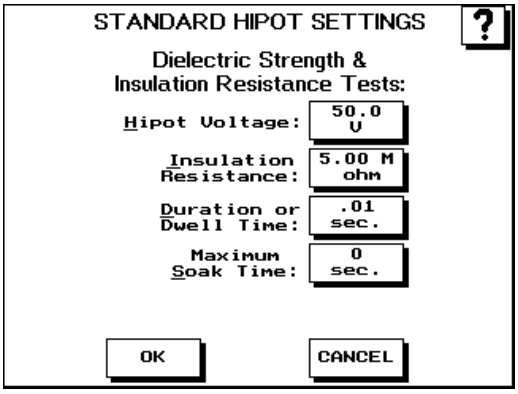
HV - High Voltage Parameters

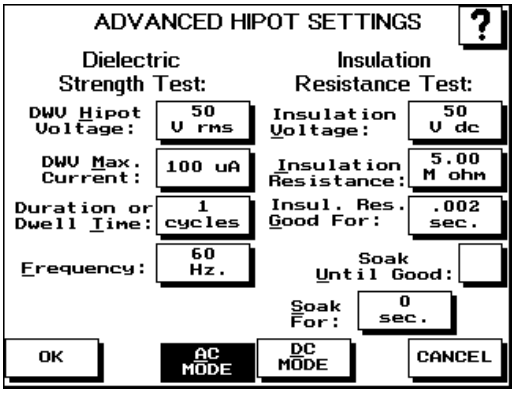
The High Voltage Parameters govern the second part of a test where a specified voltage is applied to each net in the wirelist, one at a time, while all other nets are held at ground.





The High Voltage Test evaluates insulation for dielectric strength and insulation resistance. You can set up the High Voltage Test using one of two sets of parameters, either Standard or Advanced. The Standard Test combines the dielectric strength test (DWV) and insulation resistance test (IR) into one test and the Advanced Test separates the two with the DWV test being performed before the IR Test. All tests are performed in succession on a net-by-net basis such that each net has all tests performed before advancing to the next net.





How HV parameter settings define insulation

Unless intentionally masked out from testing, Hipot Voltage is applied to each net or unused point for the duration of Dwell Time while all other nets and points are held at ground. Leakage current through insulation is then measured. Insulation leakage current is a function of the DWV Voltage setting and any other factor that contributes to current flow, such as: (a) charge capacitance, (b) insulation resistance, (c) contaminants, (d) moisture, (e) arcing or corona, etc. If the insulation resistance of the device-under-test stays above the Insulation Resistance setting, the device passes the test.

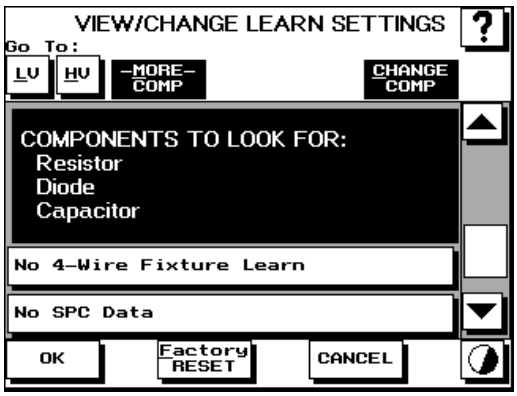
Standard parameters	**Range**
Hipot Voltage	50V DC to 1000V, 1500V, or 2000V depending on the model of analyzer.
Insulation Resistance	5 M ohms to 1 G ohms based on the Hipot Voltage
Duration or Dwell Time	0.01, 0.1, 1, 2, 5, 10, 30, 60, 120 seconds
Maximum Soak Time	0, 0.01, 0.1, 1, 10, 30, 60, 120 seconds

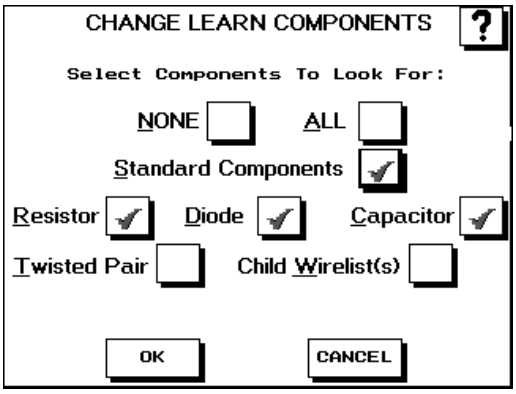
Advanced parameters	**Range**
Dielectric Strength Test	
DWV Hipot Voltage	50V to 1000V, 1500V, or 2000V depending on the model of analyzer. (Optionally 50V AC to 707V or 1000V)
DWV Maximum Current	0.1 to 1.5 mA
Duration or Dwell Time	0.01, 0.1, 1, 2, 5, 10, 30, 60, 120 seconds
Frequency	25, 30, 50, 60 Hz (AC voltage only)
Insulation Resistance Test	
Insulation Voltage	50V DC to 1000, 1500, or 2000 depending on the model of analyzer.
Insulation Resistance	5 M ohms to 1 G ohms based on the Hipot Voltage
Insulation Res. Good For	0.002 to 120 seconds
Soak Until Good	Yes or No
Soak For or Max Soak	0 to 120 seconds

Masking Test Points during High Voltage Testing

Point masking refers to removing from high voltage testing a selected set of test points. For details, see the Touch 1 Help Index under the **Masking Points** entry or look in **Appendix D: Scripting** under the **Selectively Applying Hipot Voltage** section.

COMP - Learning Components





Use **MORE COMP** to specifically enable the learning of components.

Item	Learning Range	Notes
Capacitors	400nF to 100uF (Tolerance defaults to 10%)	
Child Wirelists	Multiple child wirelists can be learned under a single parent wirelist.	Each child wirelist is learned along with a parent.
Diodes	Silicon – all, Germanium – no, LEDs – no, Schottky - maybe (call), Zeners - limited detection	
Resistors	0.1Ω to 100KΩ (Tolerance defaults to 10%)	
Twisted pairs	Min twisted length: 6 ft, Min wires in cable: three	

4-WIRE Settings

Important! You must build the fixture first according to a set pattern. Use **MORE, 4-WIRE** to enable the learning of first the 4-wire fixture and then the device-under-test attached to the fixture.

For more information, see **Appendix B: Four-Wire**, or download a copy of the four-wire application note from the Cirris website, or search the Help Index under ***Four-Wire Test - Overview***.

SPC Data Collection Settings

Use **MORE, SPC** to turn data collection on or off for each specific wirelist and to choose what data you want collected.

For more information on SPC Data Collection, see **Appendix C: SPC Data Collection** or search the Help Index under **SPC**.

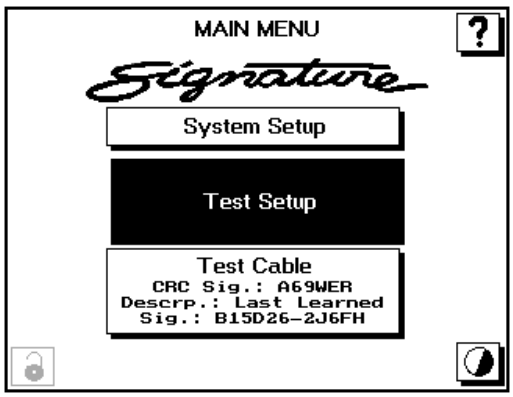
Scripting Settings

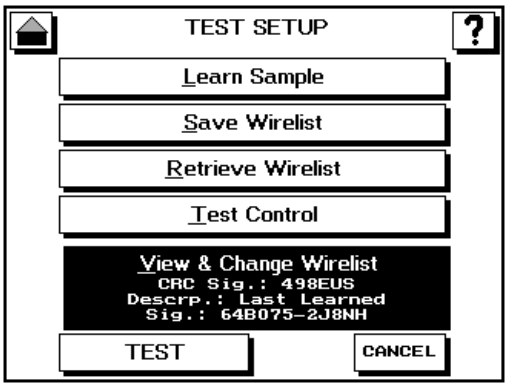
Use **MORE, SCRIPT** to attach Component scripts and Test Event scripts to a wirelist. “Attaching” refers to tying a specific script to a specific wirelist so the functionality of that script will be a part of that wirelist.

Important! In the case of .evt Test Event scripts and .cmp Components scripts, further setup is necessary.
For more information, see **Appendix D: Scripting**, or search the Help Index under ***Scripting - Overview*.**

Verifying the Wirelist

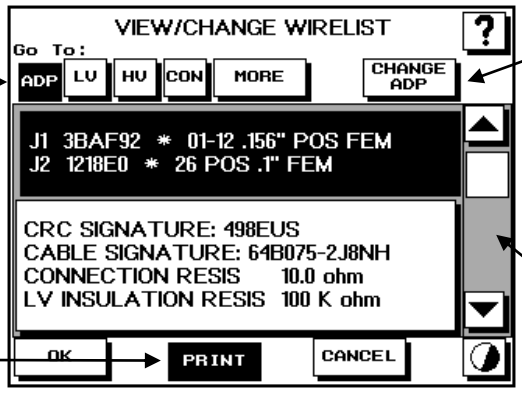
In the **Main Menu** press **Test Setup**. In **Test Setup**, press **View & Change Wirelist**





To view a specific section of the wirelist, use any of the buttons to highlight that area.

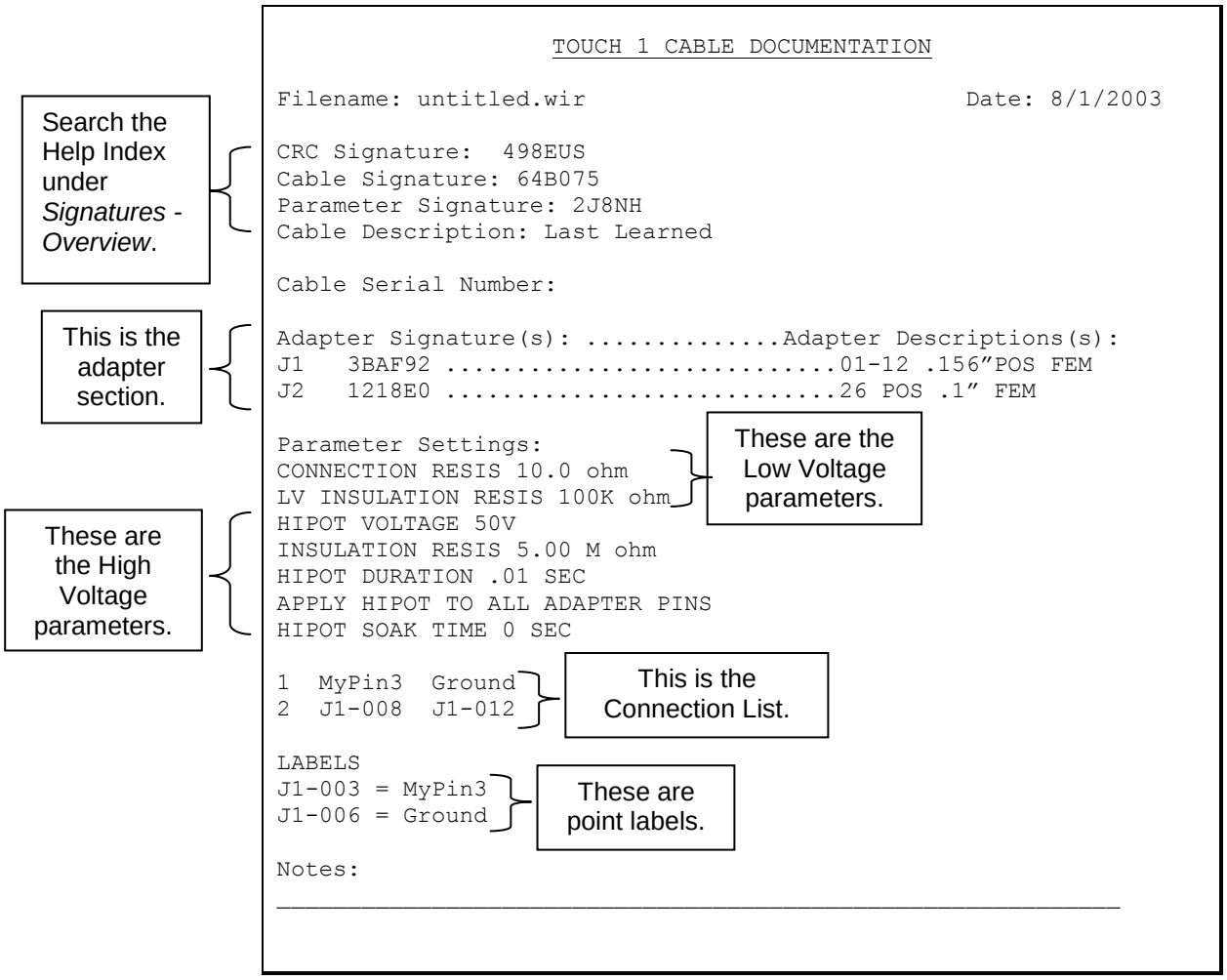
You can **PRINT** the wirelist for manual verification as required.



Use the **CHANGE** button to access the changeable items for the section that is highlighted.

You can use the arrows and slider to view the sections of the wirelist without selecting them.

Sample Wirelist Printout


TOUCH 1 CABLE DOCUMENTATION
Filename: untitled.wir
Date: 8/1/2003
CRC Signature: 498EUS
Cable Signature: 64B075
Parameter Signature: 2J8NH
Cable Description: Last Learned
Cable Serial Number:
Adapter Signature(s): .....Adapter Descriptions(s):
J1 3BAF92 .....01-12 .156”POS FEM
J2 1218E0 .....26 POS .1” FEM
Parameter Settings:
CONNECTION RESIS 10.0 ohm
LV INSULATION RESIS 100K ohm
HIPOT VOLTAGE 50V
INSULATION RESIS 5.00 M ohm
HIPOT DURATION .01 SEC
APPLY HIPOT TO ALL ADAPTER PINS
HIPOT SOAK TIME 0 SEC
1 MyPin3 Ground
2 J1-008 J1-012
LABELS
J1-003 = MyPin3
J1-006 = Ground
Notes:
Search the Help Index under Signatures - Overview.
This is the adapter section.
These are the High Voltage parameters.
These are the Low Voltage parameters.
This is the Connection List.
These are point labels.

Chapter 3: Testing a Device

Installing Adapters for a Test Session

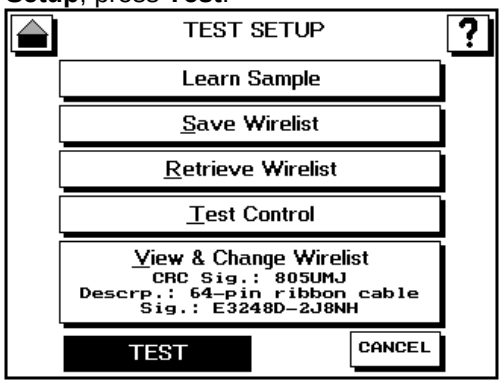
Before you begin a test session or “run”, the correct adapters must be installed in the correct “J” position in the analyzer. If you press TEST without the correct adapters in the correct positions, the Touch 1 will prompt you with the necessary information to configure the adapters in the analyzer.

Starting a Test Run

Testing is performed using the currently loaded wirelist as shown in either the "Test Cable" button in the **Main Menu** or the **View & Change Wirelist** button in the **Test Setup** window. You can use the Last Learned wirelist or you can retrieve a wirelist that you previously created and saved to disk or to the network.

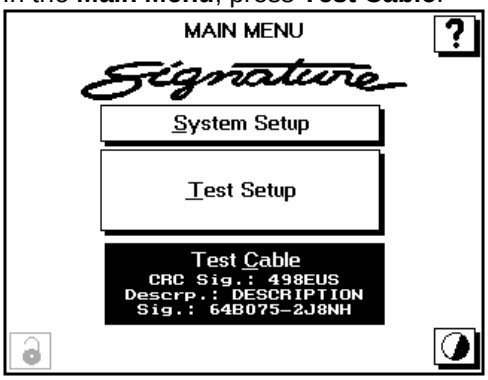
Note: If you turn off the tester, when you turn it back on, the last-learned or last-retrieved wirelist will be ready to use for testing from the Main Menu.

In **Test Setup**, press **Test**.

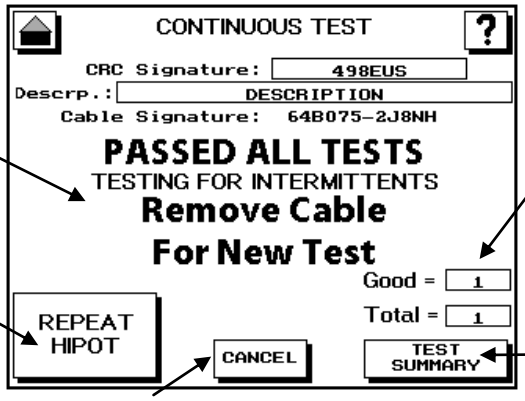


OR

In the **Main Menu**, press **Test Cable**.



The test window opens, giving you status messages and instructions about the testing process.



This area is used for messages regarding the status of the test.

This button is used to start the next test or other functions as they are available.

Use the **Help Index** under **Signatures: Overview** for more information.

These boxes indicate the number GOOD and the number tested.

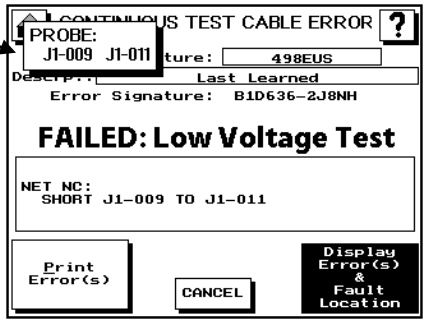
This button shows a printable summary of this run of tests including adapters, parameters, and the number of good tests.

To complete a test run and store SPC data, press the **CANCEL** button. The good and total counters are reset to 0. See **Appendix C: SPC Data Collection** for more information.

Chapter 4: Analyzing Test Errors

There are many features on the Touch 1 to help you find and resolve errors.

Probe the test points of the error with the hand-held probe.



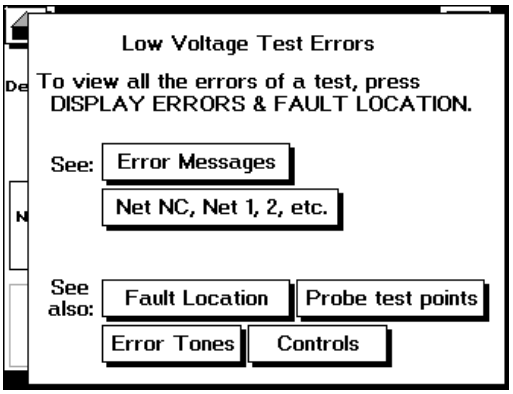
Error tones can be used to identify more common errors.

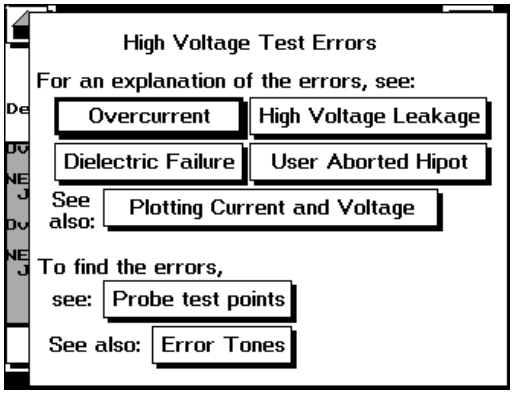
Print a list of the errors to refer to during rework.

Find the location of the error using Which-End Fault Location

Help on Test Errors

To get online help on test errors, press the question mark in the upper right hand corner of the screen. Then press anywhere in the middle of the screen. One of the following help windows will appear.





Low Voltage Test Errors

Low Voltage Test Errors or Continuity Test errors represent the failure of a wire connection to meet the LV parameter settings. Continuity errors report first and must be corrected before component or high voltage tests are performed.

The following is a list of the most common errors that occur during testing and some causes / solutions that may help you correct the problem.

Open

An open indicates either a missing wire connection or the improper setting of test parameters.

Example:

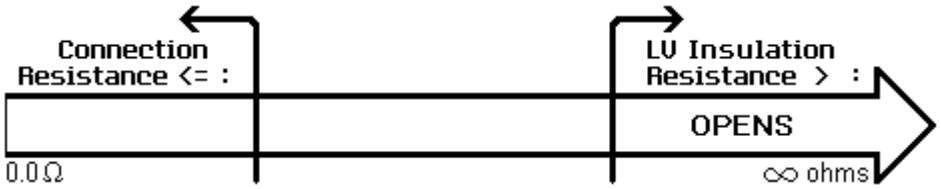
```
Net 1:
   Open J1-001 J1-015
```

Explanation

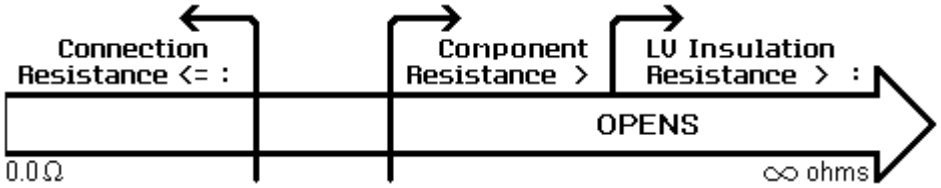
Net <n> refers to a connection of two or more test points of which the test points listed in the error are members. Nets are named by an ascending number from the list of connections in the “Connections” part of the wirelist in the order they are scanned by the hardware.

How test parameter settings define opens

Wires Only



Components



Short

A Short indicates either an unintended wire connections or improper settings of test parameters.

Example:

```
NET 1:
   SHORT J1-001 J1-015 TO
         J2-003 J2-004

NET NC:
   SHORT J1-012 J1-014
```

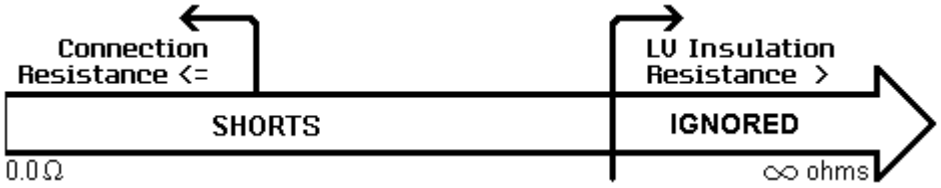
Explanation

NET <n> refers to a connection of two or more test points of which the test points listed in the error are members. Nets are named by a serialized number and list in the “Connections” part of the wirelist in the order they are scanned by the hardware.

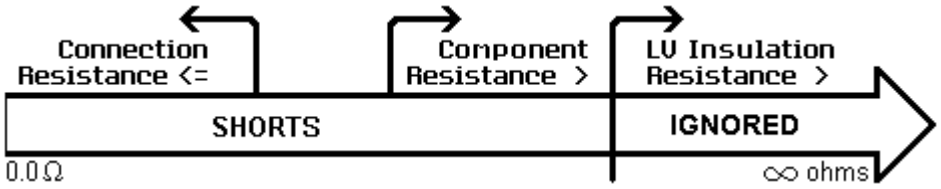
NET NC refers to unused pins in the connector (**N**o **C**onnection)

How test parameter settings define shorts

Wires Only



Components



Miswire

Miswires are a combination of opens and shorts. At least one test point is correct, but others are open from where they should go and shorted to where they should not go.

Example:

```
NET 1:
  OPEN J1-001 TO J2-015
  MISWIRE J1-001 J2-005
```

Explanation

J1-001 should be connected to J2-015, but J1-001 is miswired to J2-005.

High Resistance error

High Resistance errors indicate detected resistance greater than what defines a good connection but less than what is either ignored or considered an open.

Example:

```
High Resistance Errors:
   NET 1: Measured 2.00 K ohm
    Detected at J1-001 J2-001
```

How test parameter settings define high resistance

Intermittents

Intermittents are defined by cables that test good, then bad, then good. The actual errors reported by an intermittent are: Opens, Shorts, Miswires, High Resistance errors, and missing components.

Component Errors

Component errors are both the connection and parameter errors of the various components.

CAPACITOR ERRORS

Capacitor errors indicate faulty components or improper test setup.

Example:

```
Bad Capacitor between
   J1-001 and J2-001
     Expected value: 4.7uF
     Measured value: 10.0uF

Bad Capacitor between
     J1-001 and J2-001
       Capacitor missing??
```

DIODE ERRORS

Diode errors indicate faulty components or improper test setup.

Example:

```
REVERSED diode/LED between
   J1-001 and J2-001

MISSING diode/LED between
     J1-021 and J2-007

LEAKY diode/LED between
     J2-035 and J2-012
```

RESISTOR ERRORS

Resistor errors indicate faulty components or improper test setup.

Example:

```
Bad Resistor between
   J1-001 and J2-001
     Expected value: 47.0 ohm
     Measured value: 49.5 ohm

Bad Resistor between
     J1-001 and J2-001
       Resistor Missing??
```

TWISTED PAIR ERRORS

Twisted Pairs errors indicate faulty wiring or improper test setup.

Example:

```
Pair connected to
   J1-001 and J2-001
    NOT twisted
```

WIRE COMPONENT ERRORS

Wire Component errors indicate bad wiring or improper test setup. Wire Component errors are component test errors and not Continuity Test errors. The Continuity Test reports wiring errors with Opens, Shorts, and Miswires.

Example:

```
Bad Wire between
   J1-001 and J2-001
     Expected value: <5.0 ohm
     Measured value: 9.73 ohm

Bad Wire between
     J1-001 and J2-001
       Wire Missing??
```

High Voltage Errors

High Voltage Test Errors represent the failure of a wire's insulation to meet the HV parameter settings.

The following is a list of the most common errors that occur during testing and some causes / solutions that may help you correct the problem.

Dielectric Failure Error

Dielectric Failure errors are High Voltage Test errors that occur during the Dielectric Strength Test and the part of the Insulation Resistance Test controlled by Soak Time.

Example:

```
Dielectric Failure NET 1:
    J1-013  J1-053

Dielectric Failure NET NC:
    J1-026
```

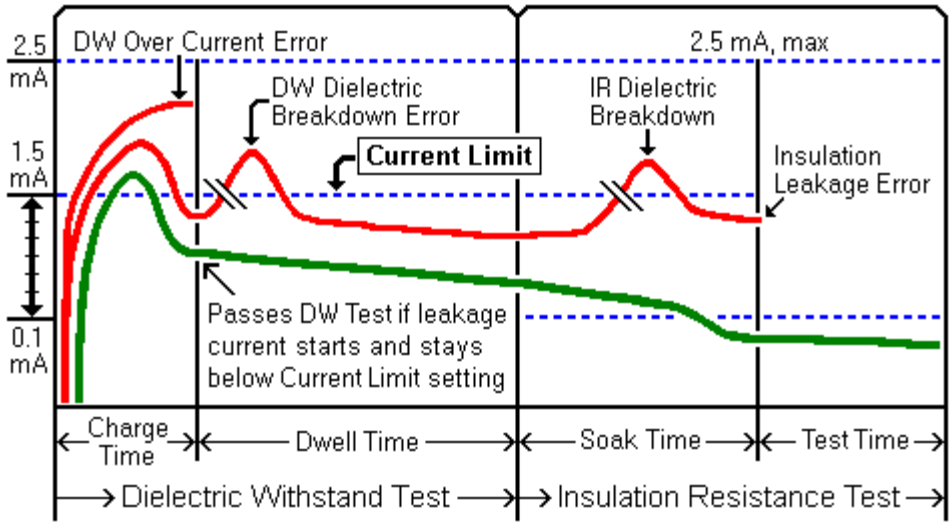
Comments:

NET 1: refers to a connection. Nets are numbered in the order listed under CON in the Editor and under Common Connections in the report *Touch 1 Cable Documentation*

NET NC: refers to test points not in nets such as the unused pins of a connector.

Note. Discharge paths and the number of separate errors are not always obvious:
One error = excessive capacitance·
Two errors = discharge path is between the two errors (but not always).
More than two errors = any combination of discharge paths - one error or several errors.

How test parameter settings define Dielectric Failure errors



High Voltage Leakage Error

High Voltage Leakage errors are High Voltage Test errors that occur during the part of the Insulation Resistance Test controlled by the Soak parameter.

Example:

```
High Voltage Leakage NET 1:
    J1-001  J1-014
     4.34 M ohm
High Voltage Leakage NET NC:
    J1-026
     5.68 M ohm
```

Comments:
NET 1: refers to a connection. Nets are numbered in the order listed under CON in the Editor and under Common Connections in the report *Touch 1 Cable Documentation*
NET NC: refers to test points not in nets such as the unused pins of a connector.

Note. Leakage paths and the number of separate errors are not always obvious:
Two errors = leakage path is between the two errors (but not always).
More than two errors = any combination of discharge paths - one error or several errors.

How test parameter settings define High Voltage Leakage errors

Refer to the diagram for Dielectric Failure errors above for a graphical view of High Voltage Leakage errors.

Good Insulation has less leakage current between unconnected points than the threshold defined by dividing the IR Voltage setting by the IR Resistance setting (I=V/R).

Though leakage current can start higher than the threshold at the beginning of Soak Time, leakage current must fall below the threshold at the end of Soak Time and remain below the threshold for the duration of IR Test Time. Current flow is a function of the applied IR Voltage over the insulation resistance of the device-under-test (Ohm's Law: I=V/R). Therefore, too high an IR Voltage setting coupled with too high an IR Resistance setting can make the allowable current flow too stringent for the test.

Over Current Error

Over Current errors are High Voltage Test errors that occur at the outset of the Dielectric Strength Test.

Example:	**Comments:**

`Overcurrent NET 1:`
`  J1-013  J1-053`
 	
`Overcurrent NET NC:`
`  J1-026`
	NET 1: refers to a connection. Nets are numbered in the order listed under CON in the Editor and under Common Connections in the report *Touch 1 Cable Documentation*
	NET NC: refers to test points not in nets such as the unused pins of a connector.

Note. Discharge paths and the number of separate errors are not always obvious:
One error = excessive capacitance·
Two errors = discharge path is between the two errors (but not always).
More than two errors = any combination of discharge paths - one error or several errors.

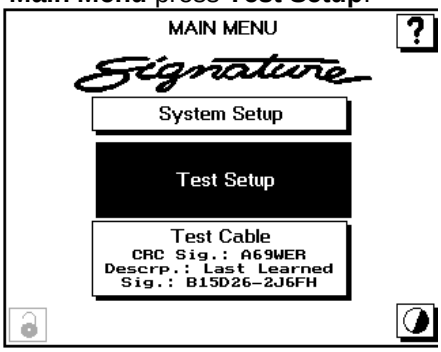
Chapter 5: Editing Wirelists

Using the Wirelist Editor

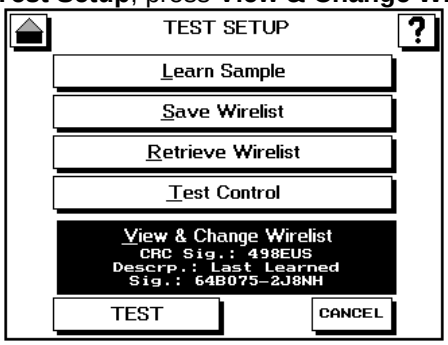
Purpose:

- View or print the wirelist (Touch 1 Cable Documentation)
- Add parts not learned such as components
- Change existing parameter settings
- Create wirelists from templates

In the **Main Menu** press **Test Setup**.



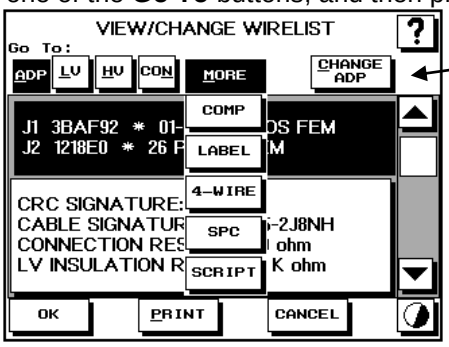
In **Test Setup**, press **View & Change Wirelist**



The wirelist loaded into the Editor is shown by Signature and Cable Description in the View & Change Wirelist button. To edit a different wirelist, press Retrieve Wirelist.

In **View/Change Wirelist**, press one of the **Go To** buttons, and then press **Change**.

These are the **Go To** buttons. Each represents a section of a wirelist. Choosing one of these buttons moves the highlight to that section of the wirelist, allowing you to view or change the settings of that section.

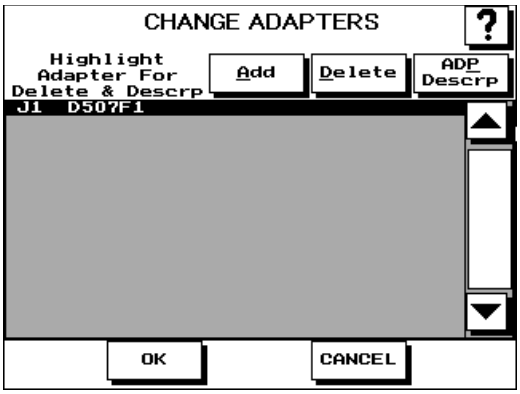


This is the **CHANGE** button. Once the section you want to change is highlighted, this button will allow you to make changes to that section.

ADP - Adapters

The most likely use of this option is to change the description associated with an adapter.

For more information on Adapters, look in the **Help Index** under **Adapters** or refer to **Chapter 1: Setting Up the Touch 1** in the **Using Cirris Adapters** section.



Learning a device is the best way to get adapter information into the wirelist.

LV - Low Voltage (Continuity) Test

For information on editing the Low Voltage parameters, refer to **Chapter 2: Creating a Wirelist** in the **LV- Low Voltage Settings** section or in the **Help Index** search for **Low Voltage parameters**.

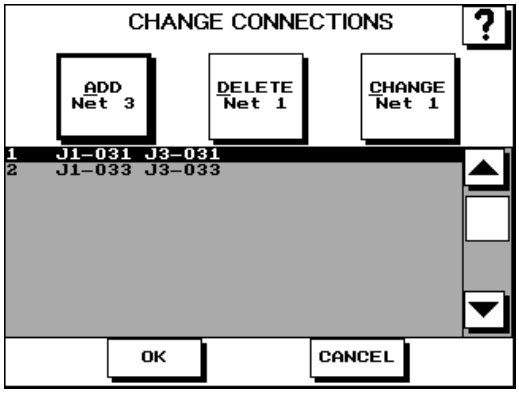
HV - High Voltage Test

For information on editing the High Voltage parameters, refer to **Chapter 2: Creating a Wirelist** in the **HV- High Voltage Settings** section or in the **Help Index** search for **High Voltage parameters**.

CON - Wire Connections (Net List)

Use the CON button to view, add, change, or delete nets in the connections list. The list of available points is based on the adapters that are listed in the ADP section.

Each increasing number indicates a separate net.

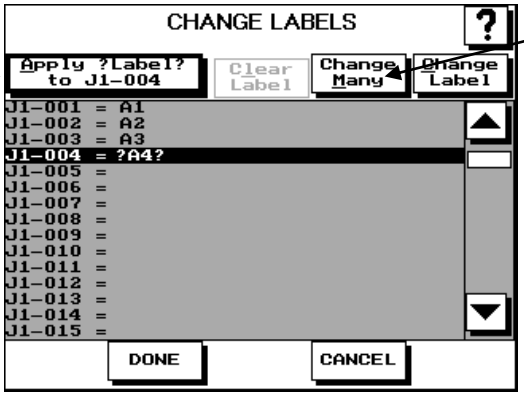


Components like resistors and capacitors are listed in the COMP section.

LABEL - Custom test point labels

The LABEL button allows you to re-name the default test point labels.

If your labels end in a number, the Touch 1 will try to increment the label for you. You can touch here to use the generated label or input your own for each point.



Labels can be loaded from another file and applied to points in this wirelist.

You can use the probe to help speed the labeling process. When you touch a point with the probe, the software highlights that point as the next to be labeled.

COMP - Components (resistors, diodes, capacitors, etc.)

For information on editing Component parameters, refer to **Chapter 2: Creating a Wirelist** in the **COMP-Learning Components** section or in the **Help Index** search for **Components**.

4-WIRE – Four Wire wirelists

Please refer to **Appendix B: Four Wire Testing** for information on four-wire applications.

SPC - Statistical Process Control

Please refer to **Appendix C: SPC Data Collection** for information on statistical process control.

SCRIPT - Test Event and Custom Components

Please refer to **Appendix D: Scripting** for information on scripts and custom components.

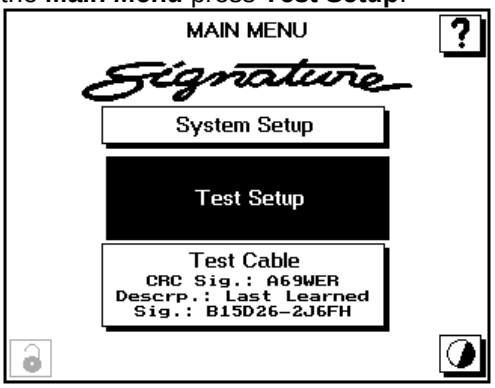
Chapter 6: Saving and Retrieving Wirelists and Scripts

Wirelists and Scripts are files stored on floppy disk, hard drive, or on your network. You can manage them much the same way you manage other kinds of files on your computer, such as Word "docs" or spreadsheet files.

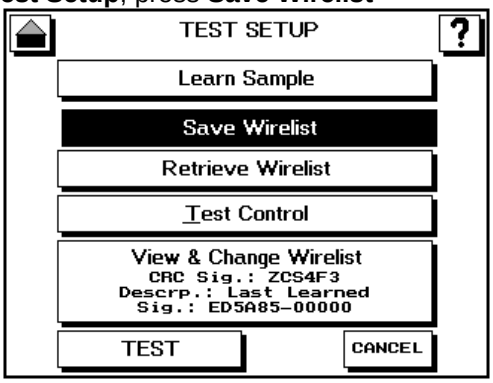
Saving a Wirelist

You can save a wirelist to the Touch 1's internal hard drive, a floppy disk, or to your network.

In the **Main Menu** press **Test Setup**.

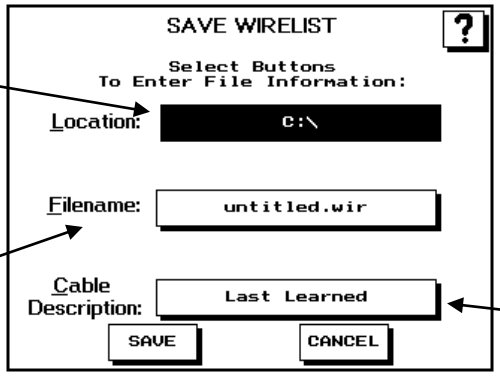


In **Test Setup**, press **Save Wirelist**



Choose a location where you want to save the wirelist. If the location is where you want it, no action is necessary.

You can give the wirelist a unique name of up to 8 digits. The .wir extension is required.



You can add new locations (folders) to further organize your wirelists. Choose Location then Add. The Last Learned wirelist is overwritten anytime a learn is performed or a wirelist is retrieved.

A 32 character description of the wirelist can be added to the wirelist that is displayed in buttons and screens throughout the analyzer.

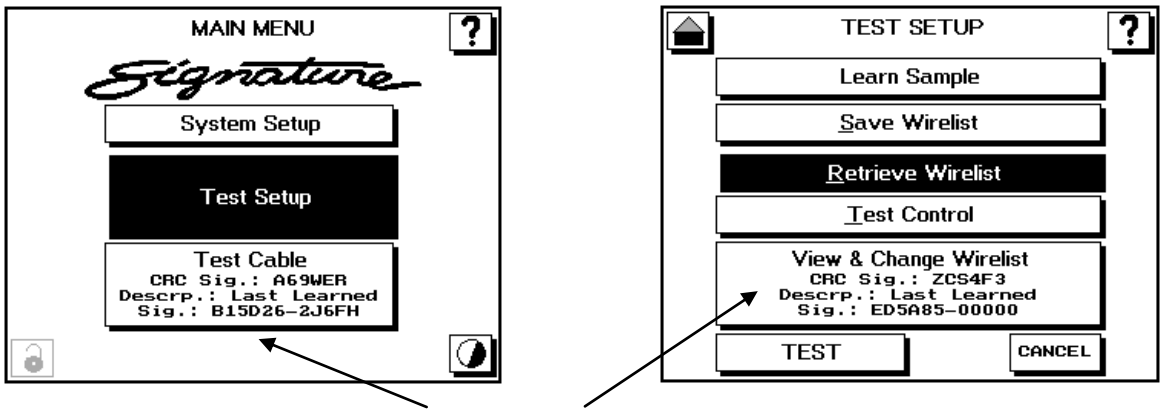
Retrieving a Wirelist

Wirelists are files that are loaded into the tester to create a test setup for a specific cable or harness. They configure everything necessary to test the device except Test Controls and System Options, which are global to all wirelists.

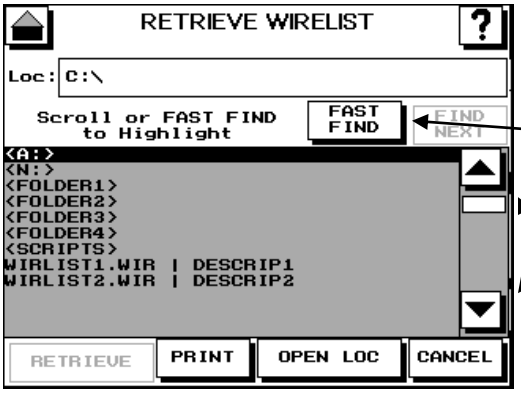
Wirelists can be retrieved from floppy disk, the hard drive in the Touch 1 and from your network. Retrieving a wirelist replaces the Last Learned wirelist. The last retrieved wirelist will remain loaded even if power is interrupted.

In the **Main Menu**, press **Test Setup**.

In **Test Setup** press **Retrieve Wirelist**.



Testing is performed according to the presently loaded wirelist as shown in the **Test Cable** button in the **Main Menu** or in the **View & Change Wirelist** button in the **Test Setup** screen.



Search a long list of wirelists using Fast Find. Fast Find only searches in the current Location.

Choose an available wirelist from the list using the scroll arrows.

When a valid wirelist has been selected with the black cursor bar, the option to **RETRIEVE** will become available.

Change Locations by moving the black cursor line to the new location then press **OPEN LOC**. Network drives will show in the list when they are available.

Note: When a wirelist is retrieved, the Touch 1 will evaluate the wirelist and report any error in syntax as it is loaded. If there are no messages while retrieving a wirelist, the syntax of the wirelist is correct.

Changing Cable Descriptions

Changing Cable Descriptions refers to editing the text description entered on creating and saving a wirelist file. Changing Cable Descriptions consists of retrieving the wirelist and editing the description when saving the wirelist back to disk.

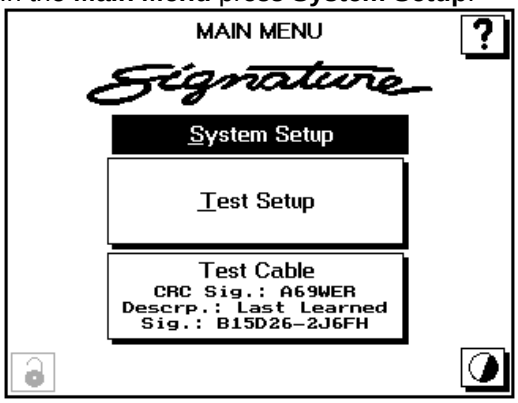
For more information on Cable Descriptions, search the **Help Index** under ***Cable Description***.

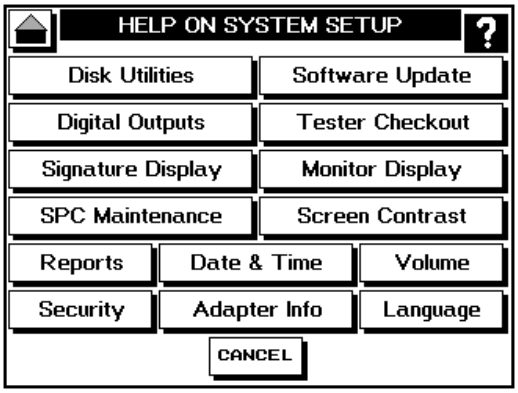
Chapter 7: Setting System Options and Test Controls

Setting up System Options

Because System Options are global, they are set independently of the wirelist options.

In the **Main Menu** press **System Setup**.



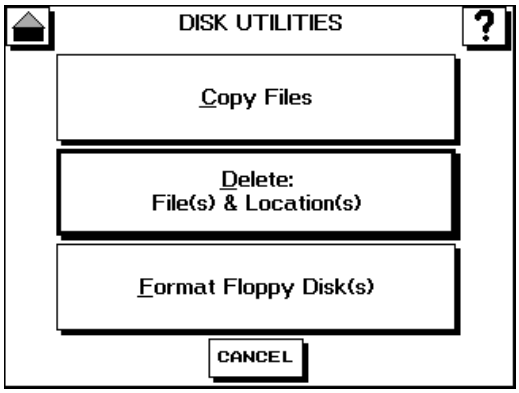


Disk Utilities

Disk Utilities allow you to copy and delete files as well as format floppy disks for use in your Touch 1 analyzer.

Files may be copied or deleted singly or as a group to any location on a floppy disk, the hard drive in the Touch 1 or on your network.

You must have network rights to copy and delete files on your network from the Touch 1.



It is not possible to copy a wirelist to the same location as the original.

Files once deleted are not recoverable.

Formatting a floppy disk erases all of the previous data, if any, on the floppy disk.

Moving Wirelists and Scripts

Moving wirelists or script files refers to changing the “Locations” (folders or drives) where they are stored. Moving consists of: (a) copying wirelists or scripts to a new location, and (b) deleting the original files at the old location.

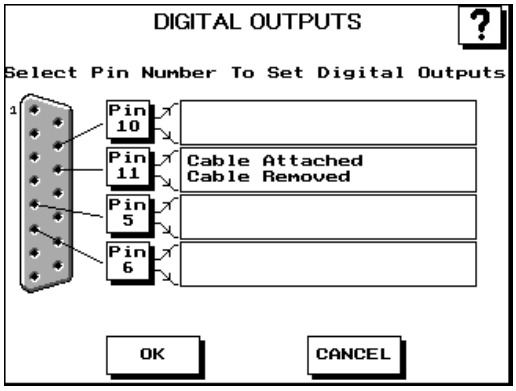
For details, search the **Help Index** under ***Wirelists, File Management - Overview***.

Re-naming Wirelists and Script Files

Re-naming wirelists and script files refers to changing the name of the file. Re-naming consists of: (a) making it the active wirelist (retrieving or just learned, (b) saving it to a new name, and (c) deleting the old one.

Digital Outputs

Digital I/O is based upon events. There are a variety of events that occur as the analyzer operates. You can select which event will cause a transition from a low state to a high state as well as from a high state to a low state for a total of four pins on the I / O connector.



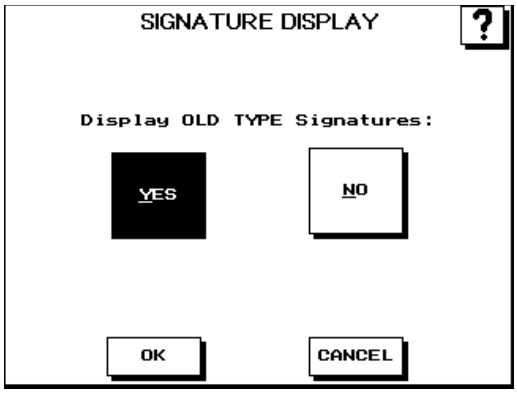
For a detailed example, see **Appendix F: Digital I / O** or the **Help Index** under **Digital I / O**.

The I/O pins are open collector transistor ports that can operate at up to 24 volts and 500 milliamps.

Use of these pins may require a pull up resistor to operate properly.

Signature Display

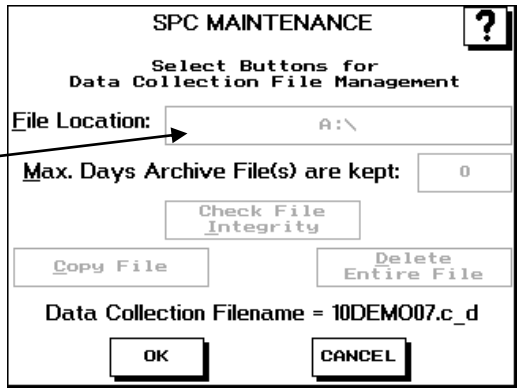
The Touch 1 uses a CRC signature. You can choose to display the "old" style of signature from the Cirris 1000R+ / H+ series in addition to the new CRC signature.



SPC Maintenance

SPC Maintenance helps you manage your collected data.

If your analyzer is connected to a network, the storage location of the SPC data files can be specified.



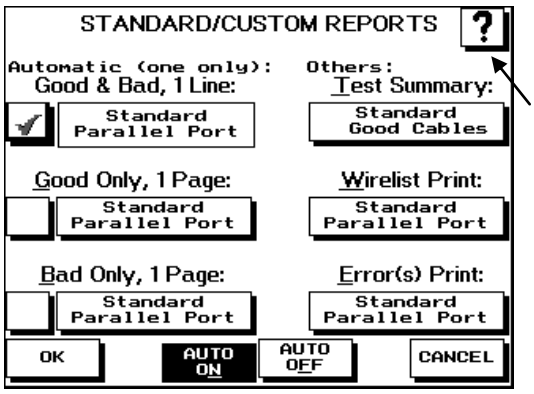
The integrity of an existing data file can be verified.

You can also copy or delete the SPC data file.

See **SPC Data Collection** in the Help Index or **Appendix C: SPC Data Collection** for more information.

Reports

The Touch 1 analyzer can print the test status automatically in several formats.



Use the Help Button for more information.

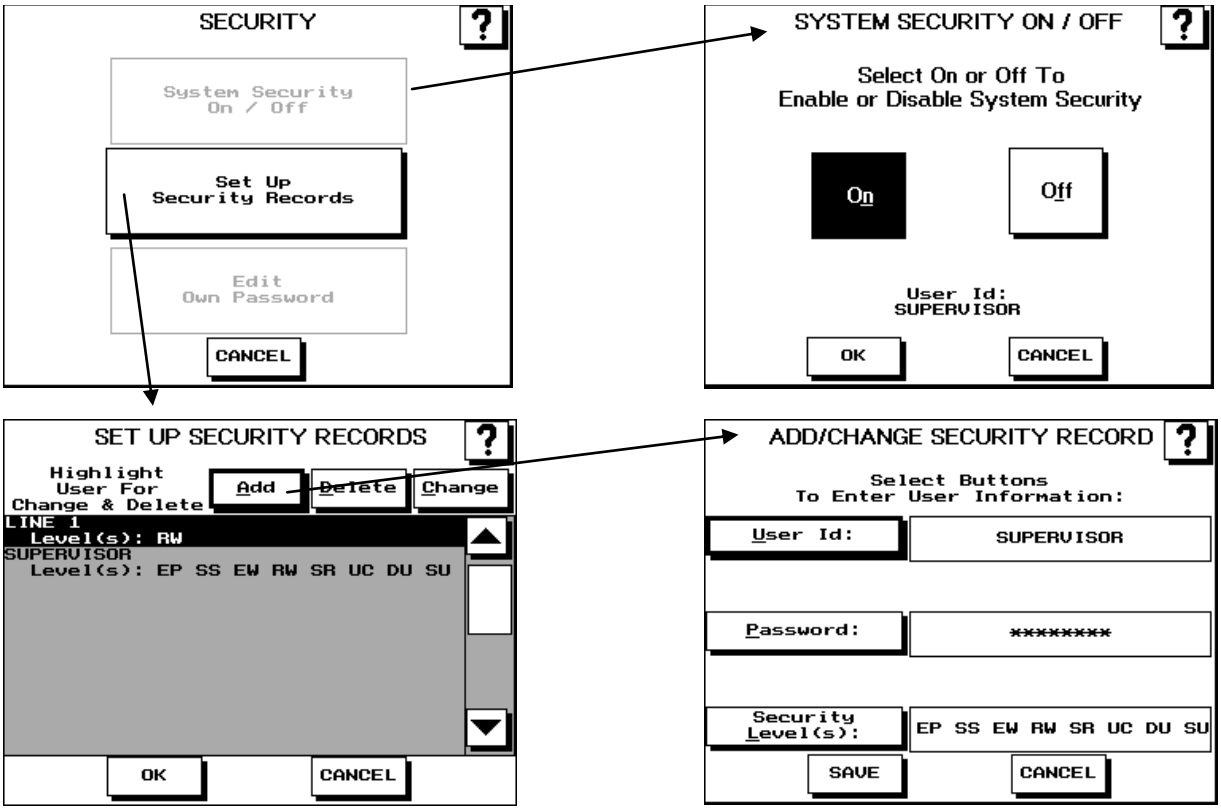
With the scripting option, you can design custom reports that can be used in many different areas in the analyzer.

Security

Security allows you to limit access to certain tester functions via password control. Before you can use security, it is necessary to create Security Records and turn the Security system on. For complete details on Security, search the **Help Index** under ***Security - Overview***.

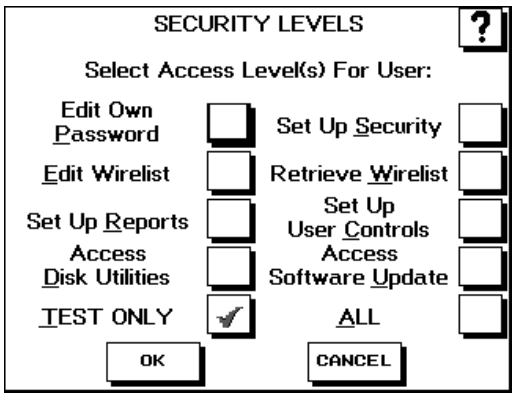
Setting Up Security

Enabling and Disabling Security



The user that is logged in is stored with the SPC data that can be collected during testing.

Each user can be allowed different levels of access by choosing from the list.

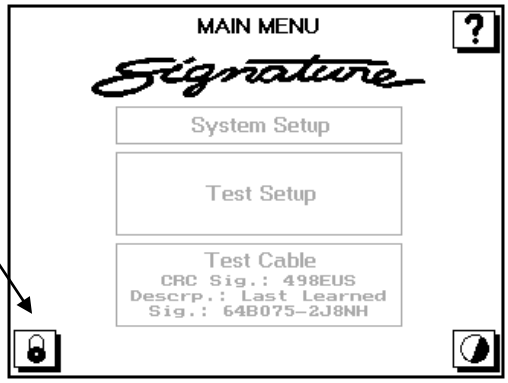


Selecting **ALL** or **Set Up Security** will give access to the security system to that user.

One user must be set up as an administrator with **ALL** security levels enabled.

Logging in (unlocking) with a Security Password

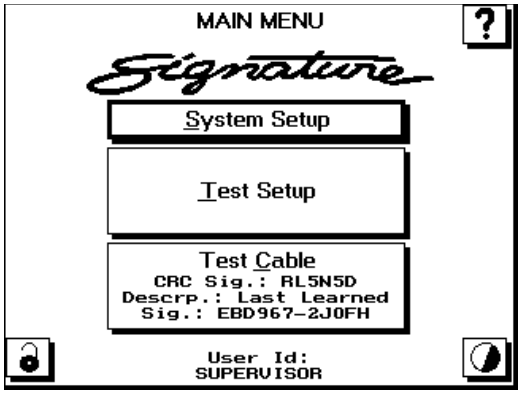
From the **Main Menu**, press the **Lock icon**.



For complete details on Security, search the **Help Index** under ***Security - Overview***.

In **Password Entry**, enter your password.

The analyzer is now unlocked.

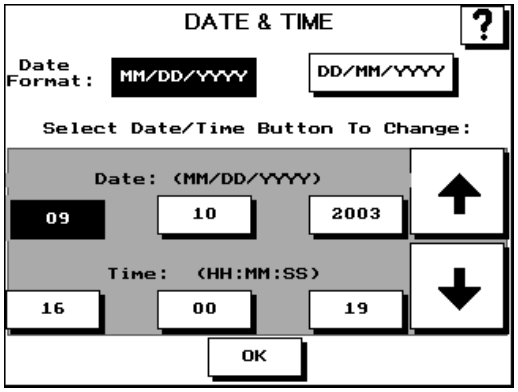


The current user login is displayed on the Main Menu.

Date & Time

Date and Time is used when storing SPC Data as well as when saving files, wirelists, and scripts.

Correct Date and Time can also be used by Custom Scripts for timing.

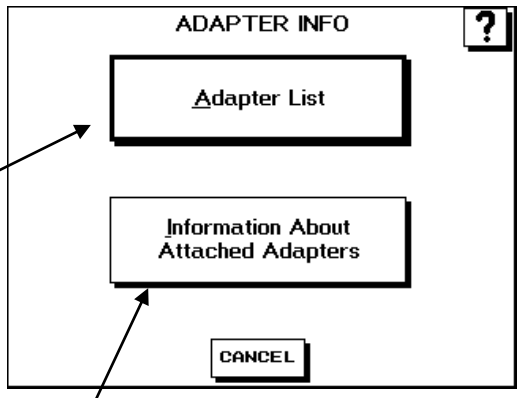


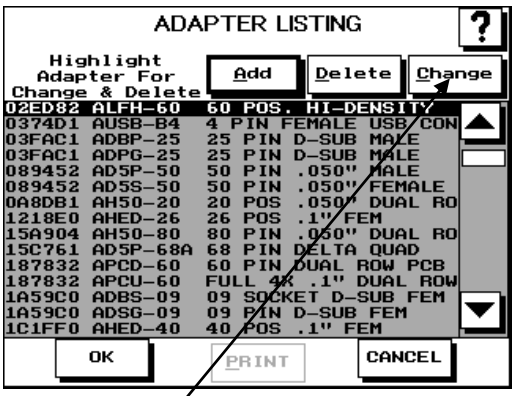
Choose your Date format and set the Date and Time by pressing the appropriate buttons.

Adapter Info

The **Adapter List** keeps track of the adapters that can be used with the analyzer.

If the description of an adapter needs to be changed, choose the **Adapter List** option.





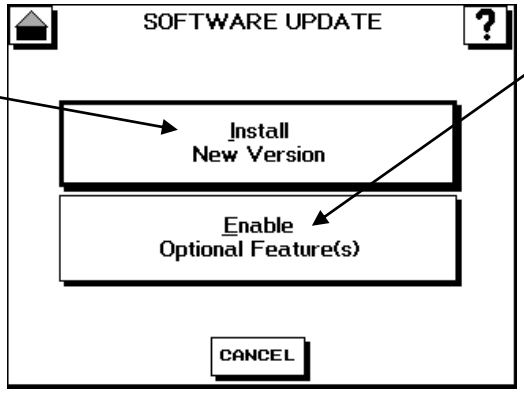
If an adapter installed on the analyzer is unidentified, use the **Information about Attached Adapters** option to identify them.

Select the adapter that needs to be changed from the list and select **CHANGE**.

Software Update

New versions of software can be installed using the Install New Version option.

The process will prompt you for the materials needed to complete the install.



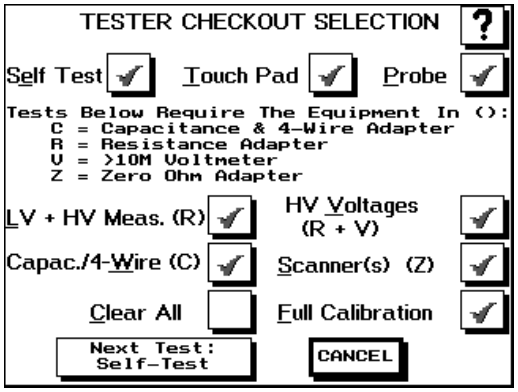
Additional features can be enabled on your analyzer, such as SPC Data Collection and Scripting.

Contact Cirris for a complete list of the available Optional Features.

Tester Checkout

Many facets of the analyzer can be verified by you in the work area.

Utilizing a **Performance Check Kit** and the **Tester Checkout** options, you can verify the calibration of your analyzer.



Simply choose the test that you would like to perform and the analyzer will do the rest.

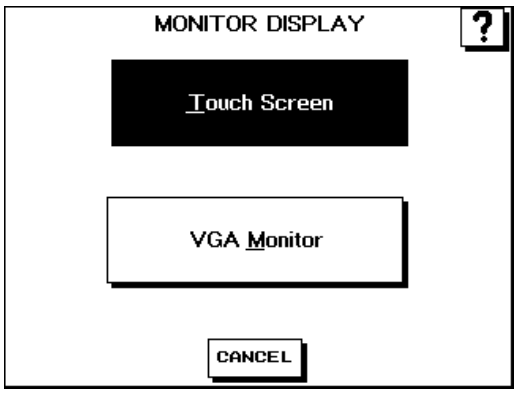
Some of the tests require parts from the **Performance Check Kit.**

If you choose to verify High Voltages, a voltmeter that can withstand high voltages is necessary.

Monitor Display

If you connect an external monitor to your analyzer, you can choose to view the screen contents in a larger format.

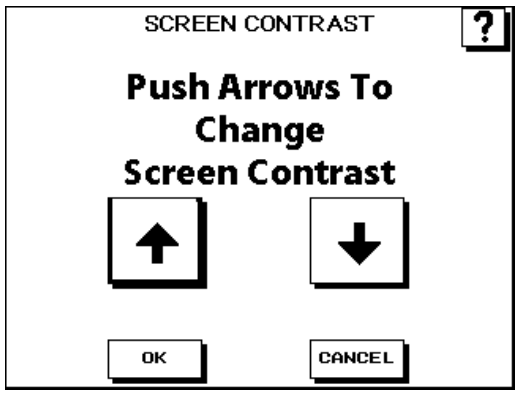
Choosing the VGA Monitor option changes the screen viewing properties for the external monitor.



Using the VGA Monitor option renders the touch screen inoperable.

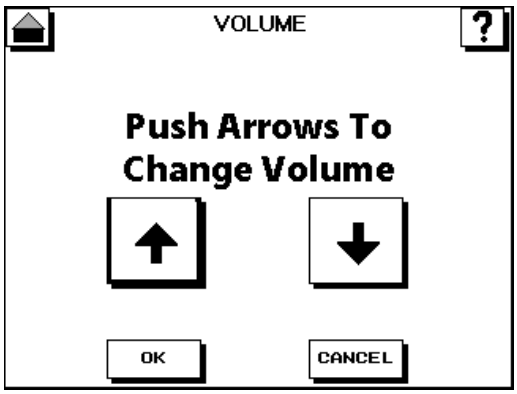
A keyboard must also be attached to the analyzer in order to issue commands to the analyzer while in VGA Monitor mode.

Screen Contrast



Screen contrast allows you to adjust the viewing characteristics of the touch screen based on the viewing angle and available lighting.

Volume



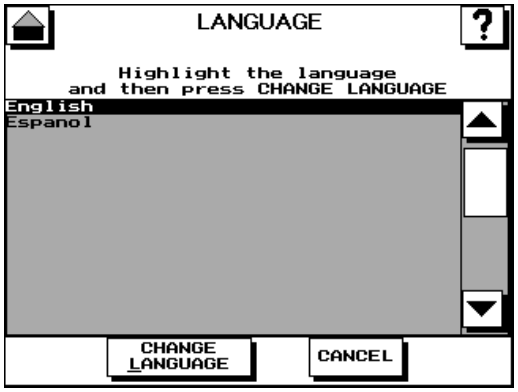
The volume of the tones generated by the analyzer can be adjusted to fit your work environment.

Language

Different languages are available for your analyzer.

Simply choose the language you require from the list and select **CHANGE LANGUAGE**.

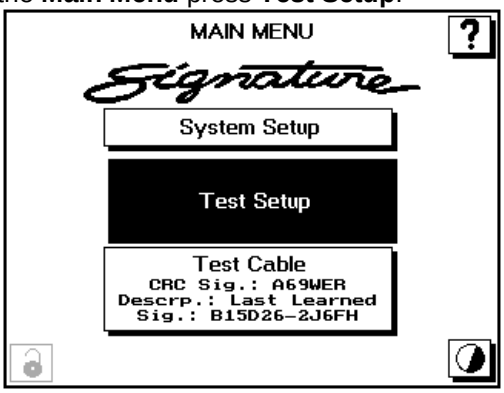
The language will change immediately.



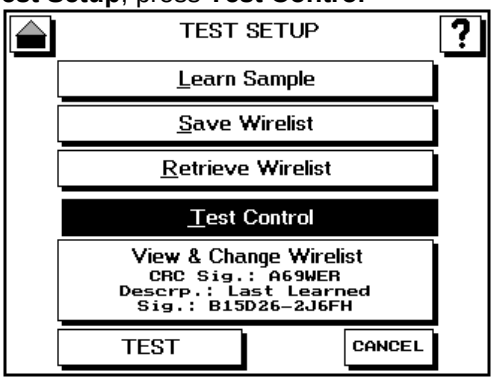
Setting Test Controls

Test Controls such as Single Test / Continuous Test and Automatic / Manual Hipot are global, they are not stored as part of the wirelist. To record the settings, write them on the same wirelist printout you use to document the wirelist filename and required adapters.

In the **Main Menu** press **Test Setup**.

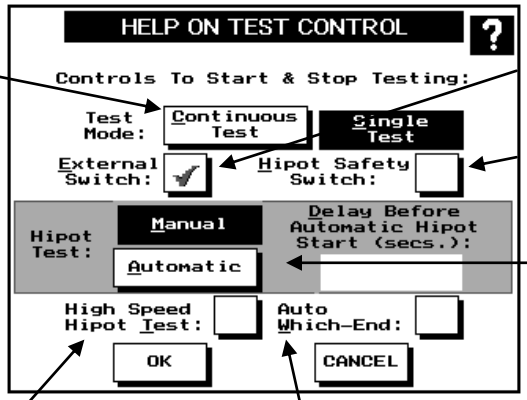


In **Test Setup**, press **Test Control**



In **Test Control**, select the following:

Select Continuous Test to have the test start automatically when an assembly is attached and to scan continuously for intermittents. Select Single Test to perform one test each time you press the TEST button.



An external switch can be attached to the analyzer to start a test.

Hipot Safety Switch requires a switch closure before a hipot test can be performed.

The hipot test can be set to start automatically after the low voltage portion of the test is complete or require a button press to start.

The High Speed Hipot option allows multiple nets to be tested simultaneously, increasing the speed of the test.

The Auto Which End function attempts to determine which end of the cable has an open or a short in the event of these types of errors.

Chapter 8: General Information

Maintenance

Tester Maintenance

The Touch 1 tester requires no maintenance. If desired you may clean the outside surfaces of the Touch 1 tester. Since some cleaning agents leave a conductive residue, take special care to not allow the cleaning agents to come into contact with the test point connectors or the circuitry inside the casework.

Fixture Maintenance

The contacts on adapters and other fixturing that mate to the device under test may wear due to repeated insertion cycles. Contact wear can result in higher connection resistances which in turn will increase the measured resistances for the tested device. For this reason Cirris recommends that customers evaluate the number of mating cycles and the cycle life of fixture contacts to determine maintenance intervals for testing and/or replacing fixturing contacts. A good way to check fixture contact resistance is to construct and use a shorting block. For more information on creating shorting blocks, see http://www.cirris.com/adapters/test-adapt.html.

Service

All Cirris Testers are designed as modules for easy servicing. Should your Cirris tester require service, as directed by Cirris support personnel, you may need to send the affected module or the entire tester back to Cirris for repair. If needed during the repair period, a loaner tester can be sent to you. You should not attempt to service any circuit board at the component level. All component-level service should be performed by Cirris technicians.

Calibration

With your Touch 1 tester you should have received a Certificate of Calibration. Before leaving the factory every Touch 1 tester is calibrated in compliance with ANSI/NCSL Z540-1-1994 and MIL-STD-45662A to standards traceable to the NIST in the United States. The tester should thereafter be calibrated annually.

To verify calibration and functionality, you can purchase the Touch 1 Performance Check Kit. The Touch 1 Performance Check kit has a valid calibration period of 5 years after which it must be replaced. In addition to the performance check kit, you need a calibrated volt meter and high voltage probe capable of measuring the highest high voltage the tester is capable of outputting. Note that in the event a Cirris tester is found to be out of calibration there are no adjustable controls; the tester, or the affected portions of the tester, must be sent back to a Cirris facility for repair.

Conditions for Operation

Your Touch 1 Tester is intended to be used indoors at a temperature of 10 to 40 degrees Celsius. Best performance can be obtained at a relative humidity less than 70%. Insulation Resistance Measurements will degrade over 70% relative humidity. The unit can be mounted in a ventilated compartment. Be sure not to block the vents on the sides and back of the tester.

Never apply live voltages to the test points or probe input of your Cirris tester. You should have received a power cord that is compliant with the country of use. Newer Touch 1 testers will automatically adjust to a line voltage of either 120V 60 Hz or 240ACV 50 Hz. If you use a Cirris product in a manner not specified in this manual and the accompanying help system, the protection provided by the product may be impaired.

Appendix A: Specifications

CAPACITY:	128 to 1024 points in 128-point increments
TEST LEVELS:	Low Voltage Tests: 5 volts @ 6mA max current High Voltage Tests: Standard: 50-1000VDC (in 1 volt steps) ±5% (50-707VAC ±5% optional) Option: 50-2000VDC (in 1 volt steps) ±5% (50-1000VAC ±5% optional)
SENSITIVITY:	Connection Resistance: 0.1 ohm to 100k ohm ± 1% ± 0.1 ohm also: 500k ohm, 1M ohm, 5M ohm ± 10% 4-wire Resistance: 0.001 ohm to 10 ohm ± 2% ± 0.001 ohm 4-wire Current: 1 Amp up to 1 ohm, 0.25 Amp from 1 to 10 ohm, 6mA above 10 ohm High Voltage Insulation Resistance: 5M ohm to 1G ohm ± 10% (optional AC/DC dielectric .1mA to 1.5mA leakage current threshold) High Voltage Dwell (duration): 10 ms to 120 seconds (optional AC 1-7200 cycles)
CAPACITANCE:	5nF to 100µF ± 10% ± .02nF (relative measurements to 10pF)
COMPONENTS TESTED:	Resistors, diodes, capacitors, wires, switches, twisted pairs, and custom components
TEST RATE:	Connection Test: 128 points .25 seconds (typical) Hipot Test: 10ms to 120 seconds dwell per net High speed hipot test user selectable on/off
MAX CAPACITANCE PER NET:	0.2µF @ 300VDC, 80nF @ 500VDC, 30nF @1000VDC, 20nF @ 1500VDC, 15nF @ 2000VDC, 2.5nF @ 1000VAC
HV ENERGY LIMIT:	35mJoules
CONTROLLER:	Built-in Pentium-class PC with 1 floppy and 1 hard drive. Serial, parallel, keyboard, monitor, auxiliary digital I/O ports standard. Ethernet port optional
POINT LABELING:	User-definable labels of up to 30 characters; also custom file descriptions of up to 30 characters
POWER:	105-135VAC 60Hz or 210-260VAC 50Hz – switchable
SIZE:	Main unit: (128 test points) 22"w x 9"h x 6.5"d (56 x 24 x 17 cm) Add-on box: 6.25"w x 9"h x 6.5"d (16 x 24 x 17 cm)
WEIGHT:	Main unit: (128 test points) 25.4 lbs (11.25 kg) Add-on box: (128 test points) 6 lbs (2.7kg)
DISPLAY:	3 1/2" x 4 1/2" Graphical Touch Screen

Warranty

Cirris Systems Corporation warrants the Touch 1 Cable Analyzer to be free of defects in materials and workmanship for a period of one (1) year from the date of delivery to you, as evidenced by receipt of your warranty registration form. In the event a defect develops due to normal use during the warranty period, Cirris Systems will repair or replace the analyzer with a new or reconditioned unit of equal value. For this warranty to be valid you must complete and return the warranty registration card.

In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original analyzer. Replacement units will be returned by the same method shipped; generally within one (1) working day.

If analyzer failure results from accident, abuse, or misapplication, Cirris Systems Corporation shall have no responsibility to replace the analyzer or refund the purchase price. Defects arising from such causes will be considered a breach of this warranty. Cirris Systems Corporation is not responsible for special, incidental, or consequential damages resulting from any breach of warranty, or under any other legal theory, including lost profits, downtime, goodwill, damage to or replacement of equipment and property, and any costs of recovering materials used with the Cirris Touch 1 Analyzer.

ANY IMPLIED WARRANTIES ARISING OUT OF SALES OF THE TOUCH 1 ANALYZER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO THE ABOVE STATED ONE (1) YEAR PERIOD. Cirris Systems SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE, EXPENSES, OR ECONOMIC LOSS.

Some states do not allow limitations on length, or implied warranty, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Cirris Systems Corporation
Salt Lake City, Utah.

PLEASE RECORD PURCHASE DATE AND SERIAL NUMBER BELOW.

DATE:_____
SERIAL NUMBER: _____

Appendix B: Four-wire “Kelvin” Testing

What is 2-wire and 4-wire?

If you've used an ohmmeter to make resistance measurements you've probably heard terms such as "2-wire measurement" and "4-wire Kelvin measurement." This document explains how ohmmeters measure resistance, how 2-wire resistance measurements work, how 4-wire resistance measurements work, and the special considerations for each measurement type.

How do ohmmeters work?

When you use your ohmmeter to measure the resistance of a wire you touch one meter lead to each end of the wire and you get a resistance measurement (Figure 1). How does the meter measure resistance? What resistance is it really measuring? To understand how ohmmeters work, start with Ohm's law; Resistance = Voltage / Current. This equation says "Put a current through the wire, measure the voltage drop along the wire, and you can calculate the resistance of the wire."

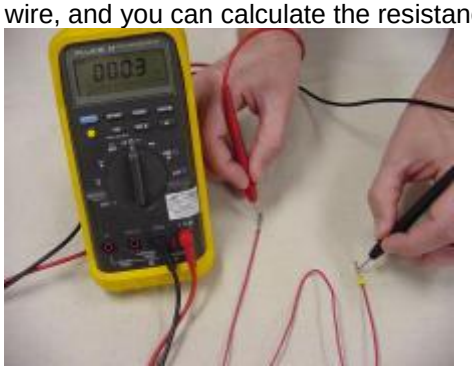


Figure 1. A 2-wire resistance measurement.

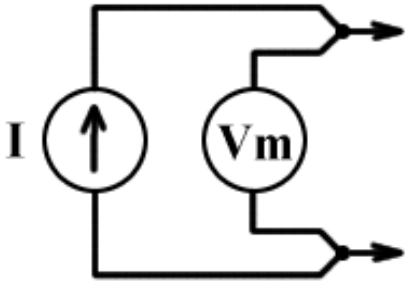


Figure 2. Meters contain a current source (I) and a volt meter (Vm).

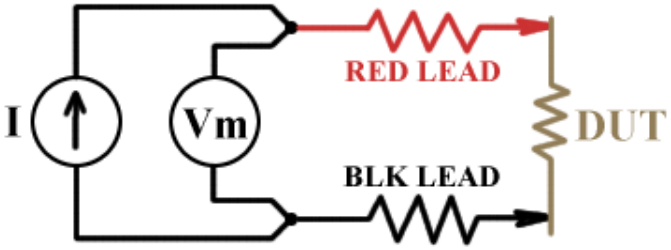
Your ohmmeter forces a current through the wire, measures the voltage that develops, calculates the resistance, and displays the result. To do this your ohmmeter must have a current source and volt meter (see figure 2). What's important is where the current source and volt meter get connected together.

2-wire measurements

When you make a 2-wire resistance measurement your meter uses only two leads to connect to the device under test (DUT). Figure 1 shows a normal 2-wire test set up. This setup has the advantage of using two wires to connect to the DUT; but what is the actual resistance that it's measuring? To measure just the resistance of the DUT you would want to measure just the voltage across the DUT. Figure 3 shows that the voltmeter is really measuring the voltage across the DUT *and* the test leads.

Two-wire measurements actually measure the DUT resistance plus the test lead resistance. What should you do when you really want to measure only the DUT resistance

Figure 3. A 2-wire measurement really measures the DUT resistance plus the meter lead resistance.



4-wire measurements

Some ohmmeters have four connections; two come from the current source (sometimes called the "force" leads), and two come from the voltmeter (usually called the "sense" leads). With an ohmmeter like this you can do a 4-wire measurement as shown in figure 4. With four connections *you* choose where to connect the voltmeter so you are in control over exactly what resistance you want to measure (see figure 5). If you connect the meter directly to your DUT you will measure just the resistance of the DUT.

Figure 4. A 4-wire measurement. Notice the meter has four connections.

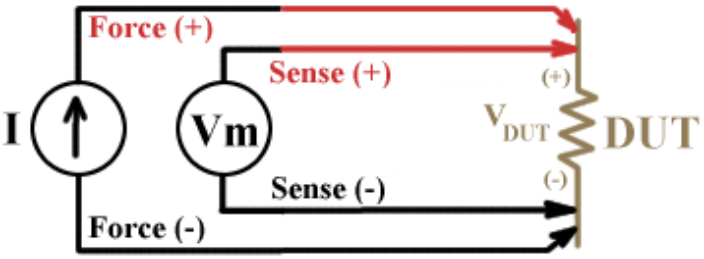


Figure 5. A 4-wire measurement gives you control of where the volt meter connects.

The disadvantage of 4-wire testing is it takes four connections to do the test but it does give you an accurate resistance measurement of the DUT without the resistance of the test leads.

Resistance measurements in your cable tester

Your cable tester basically contains a high-speed ohmmeter, with a current source and a voltmeter. Normally you do 2-wire measurements; you use two test points per measurement. More advanced testers allow you to also make 4-wire measurements; using four test points per measurement. To make a 4-wire measurement on your tester you generally need to create custom 4-wire test fixturing that combines the force and sense lines near your DUT, canceling the fixturing resistance.

You may not need 4-wire with the Touch 1 tester

Many continuity testers require 4-wire testing to accurately measure resistances less than 1 ohm. The Cirris Touch1 tester uses internal four-wire connections to reduce the fixturing (lead) resistance of the tester. All Cirris testers that measure resistance have this feature. Also, adapters that plug directly into Signature series testers eliminate much of the fixturing resistance that often occurs with adapting cables. If you need your resistance measurement to be accurate to only 0.1 ohms you won't need to use 4-wire on your Cirris tester.

Why not just subtract fixturing resistance?

Fixturing resistance is sometimes referred to as a "tare value" that could be removed to meet a specification for maximum resistance in the DUT. While the tare value can be used to adjust your measurements, it’s not as simple as it first appears. First the accuracy of the tester is reduced by the ratio of fixturing to DUT resistance. This means that a .1 ohm DUT measurement with 2 ohm of fixturing and a 2% tester accuracy has (2 + .1) ohm x 2% = 0.042 ohms of variation or 42% measurement error (adjusted measurement error = Tester measurement error X (fixture resistance + DUT actual resistance) / DUT actual resistance). In this example the threshold for a good cable would need to be adjusted to .1 x (100%– 42%) = 0.062 ohms.

There is a more serious danger if you "tare out" the fixture resistance. Try measuring the resistance of a piece of wire with your VOM. You will find that the resistance varies depending on how hard you hold your lest leads to the wire ends. This variation in resistance comes from the point of contact between the DUT and the fixturing. This resistance variation from measurement to measurement can add significantly to a learned resistance and will get worse as the mating connectors wear. The effect of this variation could be that resistance thresholds are set too high and defective cables are allowed to pass.

What does 4-wire testing buy you?

It eliminates the resistance of your interface cabling. If fixturing resistance is a significant part of the total resistance then using 4-wire will greatly improve accuracy.

It allows you to measure lower resistance values than 2-wire testing. On Cirris hipot testers we use a higher current (up to 1Amp) when performing 4-wire Kelvin tests. This allows us to more accurately measure lower resistances, all the way down to 1 mΩ (0.001 ohm). Our low voltage testers that are 4-wire capable (CR, 1100R+) can measure down to 5 mΩ , but can still resolve to 1 mΩ . (You lose mΩ resolution once the DUT resistance is > 10 ohms)

If you make 4-wire connections on the DUT, not just the connector that mates to the DUT, you can eliminate all sources of fixturing resistance. This extra effort however may not be feasible.

What 4-wire testing will cost you

- Complexity in fixturing, more wiring, more work building and maintaining the test fixture
- Twice the number of test points is required in the tester.
- Increased complexity in setting up a test that performs these specific measurements
- Slower testing speed.

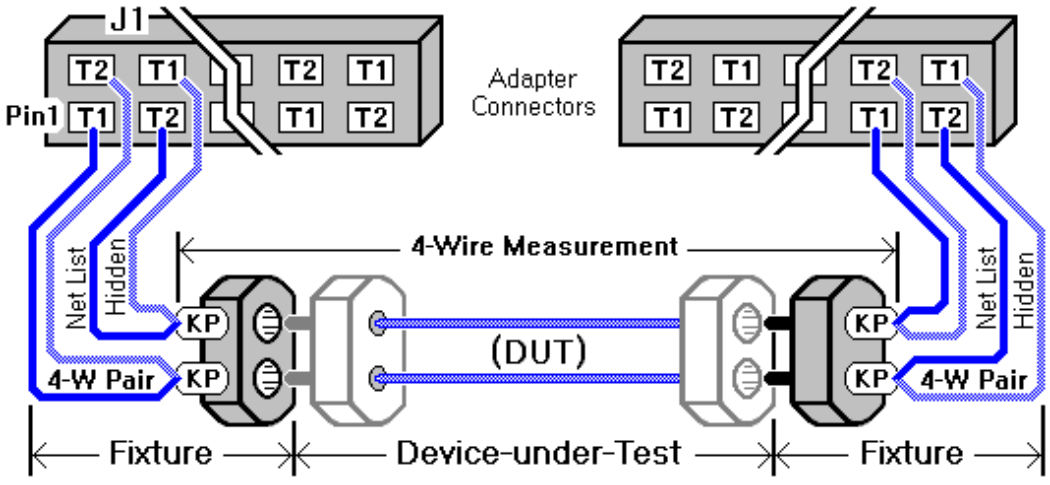
Building 4-Wire Test Fixtures

Using four wires in two pairs per measurement, 4-wire fixtures connect each pair’s T1 and T2 points at the Touch1 to a Kelvin point (KP) as close as possible to the device-under-test. **Note.** You can mix 2-Wire Testing with 4-Wire Testing in any combination.

Important! Before you begin building 4-wire fixtures*, it is necessary to identify which pins of an adapter are T1 and T2 points.* (See page 42). *Every 4-wire pair must have one of each.*

This is an example of a four-wire implementation.

Use the following instructions to build your own system.



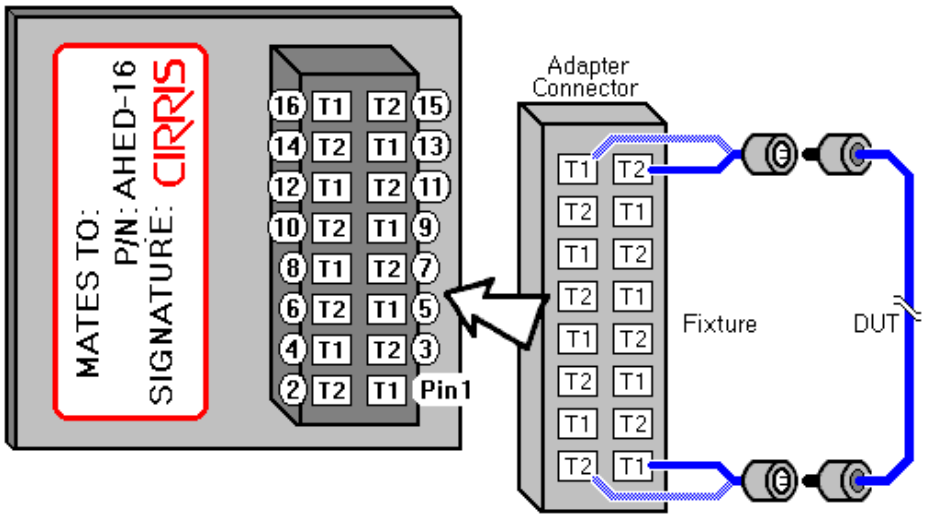
Example of a Fixture and Device-Under-Test

Selecting Adapters to Install in the Touch1

You can use any Cirris Adapter in any combination to connect a fixture to the Touch1.

Recommended: AHED-10 to AHED-64 adapters. Why? AHED adapters map T1 and T2 points in a uniform alternating pattern: pin 1=T1, pin 2=T2, pin 3=T2, pin 4=T1, etc.

Example of an AHED Adapter showing T1 and T2 locations.



Finding T1 and T2 Points Automatically

Why find T1 and T2 points? For a 4-wire measurement, each 4-wire pair must be wired to one Type1 point and one Type2 point. The location of these T1 and T2 points on the adapter pins is determined by internal wiring. The Touch 1 can locate Type 1 and Type 2 pins automatically This is especially useful if the pattern is irregular. To locate the T1 and T2 points, follow these steps:

1. Install the adapters you intend to use for your 4-wire measurement.
2. In **Test Setup**, press **Learn Sample**.
3. In **Learn Setup**, press **Change**.
4. In **View/Change Learn Settings**, press **More, 4-Wire**, and then **Change 4-Wire**.
5. In **Change Learn Four-Wire**, check **Learn Fourwire Fixturing** and then press **OK** twice to get back to the Learn Setup window.
6. In **Learn Setup**, press **Learn**.
7. While in the **Four-Wire Fixture Learn** screen, probe the adapter pins to locate the Type1 and Type2 points.

Selecting a Fixture Wiring Pattern

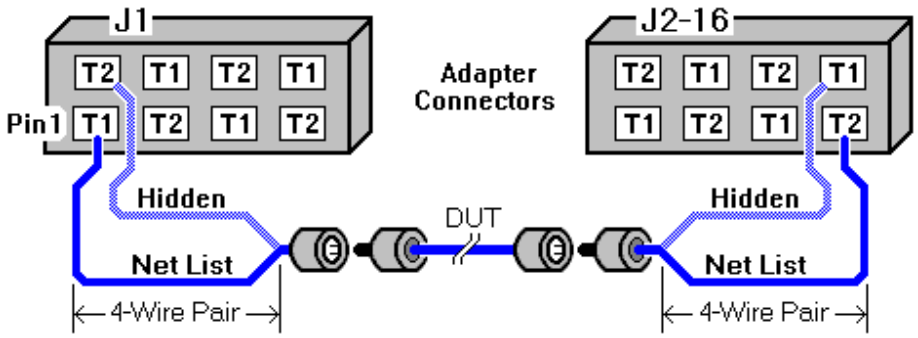
Important! The design of the hardware determines which pins are Type 1 or Type 2 and every 4-wire pair must be wired to one of each.

For each 4-wire pair, one wire goes to the Net List; the other “hides” in the 4-Wire Pairs List. The Net List wire can be either T1 or T2 as long as the Hidden point is the other wire.

When learning, the first-scanned point of each 4-wire pair goes to the Net List. Scanning starts at J1-001 using the counting pattern of the installed adapter(s).

There are two patterns for matching Type 1 and Type 2 points to 4-Wire pairs.

Alternating - Net List and Hidden Points Alternate in the Same Adapter



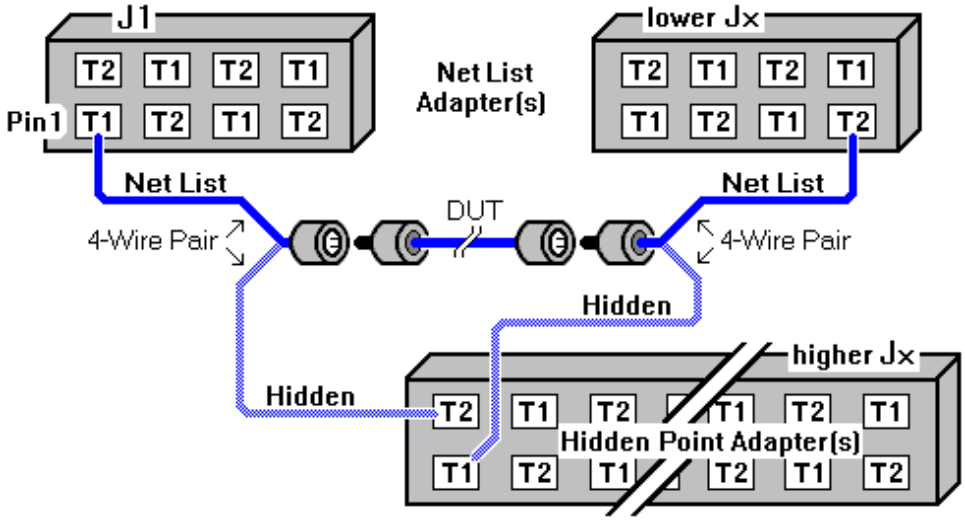
Advantage:

- Ease of use (ribbon cable) - solder adjacent wires to join 4-Wire Pairs.

Disadvantage:

- Wirelist documentation - connector adapter pin numbers won’t match the pin numbers of the Device-under-Test. See ***Re-labeling Test Points*** at the end of this chapter.

Separate - Net List and Hidden Points in Separate Adapter Connectors



Advantages:

- If the fixture uses the same adapter connector(s) as the device-under-test, the Net List will document correctly without using Custom Test Point Labels.
- The original 2-wire Net List is preserved when converting to 4-wire.

Note: Learning scans correctly if Hidden point adapter(s) are in a higher-counting “J” position than Net List adapter(s).

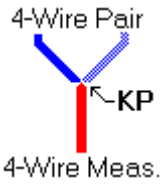
Placing Kelvin Points

The two wires in each 4-wire pair must physically join to one test point of the device-under-test in a manner that creates a Kelvin point (KP).

DEFINITION - KELVIN POINTS (KP)

A Kelvin point is a place that makes a “Y” junction by joining three parts:

- One of the end points of the 4-wire measurement.
- First wire of a 4-wire pair.
- Second wire of a 4-wire pair.

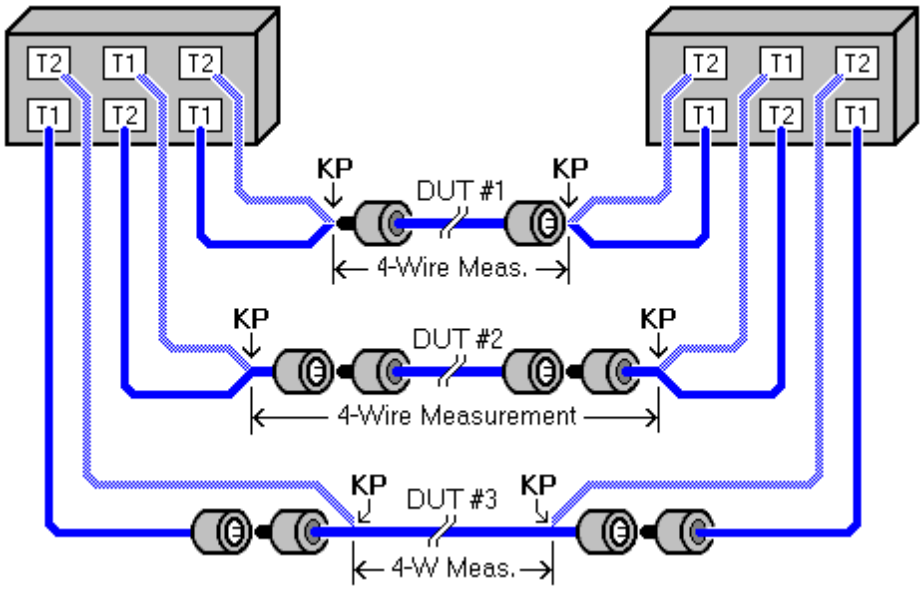


Note: The “Y” junction can be a solder joint or it can be where a paired wire on one side of the measurement is closest to a paired wire on the other side (see below—DUT #3).

REQUIREMENTS - KELVIN POINTS (KP)

Each 4-wire measurement requires two Kelvin points; one at each end. The Kelvin points should be placed as close to the device under test as possible. This is because the 4-Wire Test measures from Kelvin point to Kelvin point, so any contact and lead resistance between the Kelvin points is added to the resistance measurement of the device-under-test (DUT).

How Kelvin Point (KP) Placement affects the 4-Wire Measurement



DUT #1: The measurement is only of the device-under-test. This is the ideal, but in real-world situations it may be nearly impossible.

DUT #2: The measurement includes part of the fixture. ***Warning!*** If a lot of the fixture is between a Kelvin point and the device-under-test, the 4-Wire Test will be considerably compromised.

DUT #3: The measurement tests only part of the device-under-test. For example, by using probe pins, you can eliminate the resistance of a connector from the measurement.

Creating 4-Wire Pair Lists and Net Lists in the Wirelist

A four-wire wirelist requires a list of all 4-wire pairs, a list of the wire connections of the device-under-test, and 4-Wire components. There are two ways to create a 4-Wire pairs list and a Net List.

Method #1: Learn the fixture and sample to automatically detect 4-wire pairs and 4-Wire components. This is the easiest way.

Method #2: Convert an existing 2-wire wirelist by hand-entering 4-wire pairs and adding 4-Wire components.

Method #1: Learning a Fixture & Cable to Create a 4-Wire Test

Method #1 automatically detects 4-wire pairs in the fixture and then learns the interconnections of the device-under-test to create the net list and the 4-wire components. **Note:** During fixture learning, the first-scanned point of each 4-wire pair goes to the net list. Scanning is in the same counting order as an AHED adapter.

ENABLE FIXTURE LEARNING

1. In the **Main Menu**, press **Test Setup**.
2. In **Test Setup**, press **Learn Sample**.
3. In **Learn Setup**, press **Change**.
4. In **View/Change Learn Settings**, press **More, 4-Wire**, then **Change 4-Wire**.
5. In **Change Learn Four-Wire**, put a **check** in the box, then press **OK**.
6. In **View/Change Learn Settings**, set other parameters, if necessary. Then press **OK**.
7. In **Learn Setup**, press **Learn** to learn 4-wire fixturing.

LEARN THE FIXTURE

1. Attach **only** the fixture.
2. In **Four-Wire Fixture Learn**, press **OK**.
3. If there were errors on learning the fixture, skip to ***Troubleshooting*** for Learning Fixtures.
   or
   If the fixture learned correctly, continue…

LEARN THE SAMPLE CABLE OR HARNESS

1. Attach the sample cable assembly to the fixture just learned.
2. In **Start Learn**, press **OK**. OK is disabled until the sample is attached.
3. In **Learn Complete**, press **OK**.

Method #2: Editing a Wirelist to Create a 4-Wire Test

Method #2 is for editing a 4-wire wirelist or converting an existing 2-wire wirelist into a 4-wire wirelist by manually selecting the 4-Wire Pairs List and Net List.

LOAD A 2-WIRE WIRELIST SO IT IS THE ACTIVE TEST SETUP

1. In the **Main Menu**, press **Test Setup**.
2. In **Test Setup**, press **Retrieve Wirelist**.
3. In **Retrieve Wirelist**, select the desired wirelist, then press **Retrieve**.
4. In **Test Setup**, press **View & Change Wirelist**.
5. *Optional:* If you are converting a 2-wire wirelist to 4-wire by adding fixture wires to a new adapter, add the adapter to the wirelist.
   a. In **View/Change Wirelist**, press **ADP**, then **Change**.
   b. In **Change Adapters**, press **Add**.
   c. In **Add Adapter Position**, select (highlight) the position where the Hidden Point adapter is located (J2, J3, etc.). Then press **Add**.
   d. In **Add Adapter**, select (highlight) the new adapter, then press **Add**.
   e. In **Change Adapters**, press **OK**.
6. *Optional:* To help identify test points, see *Re-labeling Test Points*, page 52.

IDENTIFY THE FOUR WIRES OF MATCHING 4-WIRE PAIRS FROM A PRINTOUT

You can assign either wire in a 4-wire pair to the Net List, and consequently, the other wire to the hidden point. It largely depends on how the fixture is built.

1. In **View/Change Wirelist**, press the **Print** button.
2. Locate the Net List (**connections**) in the printout, *Touch1 Cable Documentation*.
   a. Mark from each net the two Net List points of each 4-wire measurement. (applies only to connections below *Connection Resistance*)
   b. Add to each net the two matching Hidden points from the fixture build list.

Example of the original test points of two nets

```
Connections:

1  J1-001  J3-063
2  J1-003  J3-061
     ↑       ↑
  Net List  Net List
```

Example of All Four Wires of Two 4-Wire Measurements:

```
Connections:

1  J1-001 J1-002  J3-063 J3-064
2  J1-003 J1-004  J3-061 J3-062
     ↑      ↑      ↑      ↑
  Net List Hidden Net List Hidden
           4W Pair        4W Pair
```

Note: If the fixture and sample are learned together in a 2-Wire mode, all four wires of the fixture will be in the Net List similar to the second example.

SELECT THE NET LIST TEST POINT

1. In **View/Change Wirelist**, press **More**, **4-Wire**, then **Change**.
2. In **Four-Wire Pairs**, press **Add**.
3. In **Four-Wire Pair**, press **Net List Point**.
4. In **Add/Change Four-Wire Point**, select (highlight) a net list point using:
   • Up/down arrows • Scroll bar (gray between arrows) • Hand-held probe.
5. Then press **OK**.

SELECT THE HIDDEN POINT

1. In **Four-Wire Pair**, press **Hidden Point**.
2. In **Add/Change Four-Wire Point**, select the hidden test point of the *same* 4-wire pair for which you just selected the net list point.

Why are not all test points available for the hidden point?
Each 4-wire pair requires one T1 and one T2 point. Selecting the net list point has used one of the types, so only the unused points of the other type are available for the hidden point.

3. Press **OK** to return to the *Four-Wire Pair* window.
4. In **Four-Wire Pair**, if both points of the pair are displayed, press **OK**.

Example:

Four-Wire Kelvin Pairs Listing

J3-063	J3-064	} *one 4-wire measurement*
J1-001	J1-002	
↑	↑	
Net List	*Hidden*	

COMPLETE THE 4-WIRE PAIRS LIST

1. In **Four-Wire Pairs**, press **Add** to add more 4-wire pairs. Each 4-wire measurement requires two pairs!
2. After adding pairs, press **OK** for one of three possible outcomes:
   - If a **Four-Wire Setup Warning** screen opens to add 4-Wire Components:
     - Press **Ignore** to identify measurement locations (*From & To)*.
       or
     - Press **Add 4-Wire Comp** if you know the *From* & *To* points.
   - If a **Four-Wire Pair Warning** screen opens:
     Press **Add a Pair** to complete 4-Wire Pair selection.
   - If a **Remove Points From Net List** screen opens:
     continue on…

REMOVE HIDDEN POINTS FROM THE NET LIST, IF NECESSARY

1. In **Remove Points From Net List**, press **Delete Points**.
2. Then press **OK**.
3. In **Four-Wire Setup Warning**—to add 4-Wire Components:
   - press **Ignore** to: identify measurement locations or custom-label test points.
   or
   - press **Add 4-Wire Comp** if you know the *From* & *To* points.

WARNING! It is absolutely necessary to add 4-Wire Components.

PURPOSE OF 4-WIRE COMPONENTS

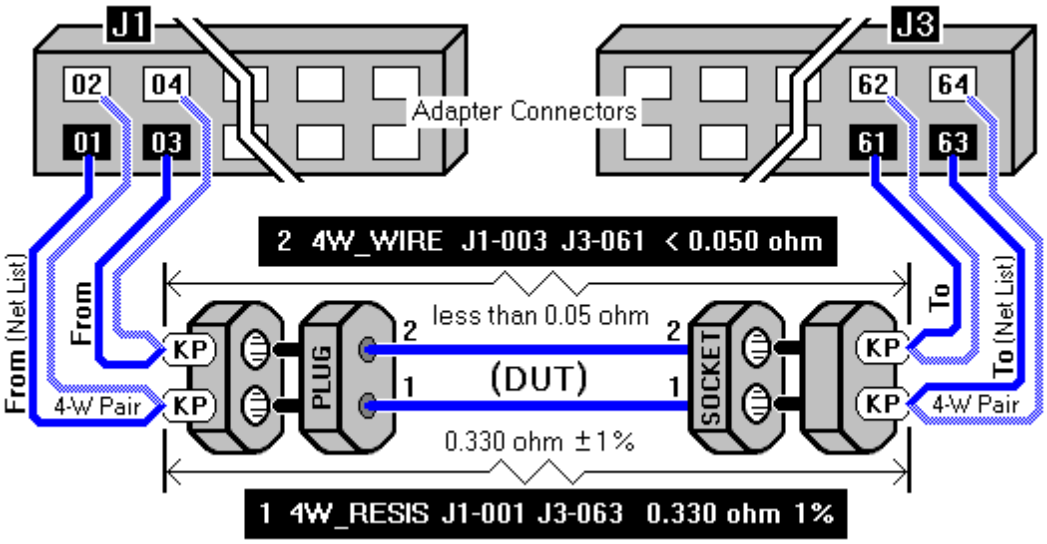
- Defines the resistance parameter of *each* 4-wire measurement.
- Identifies the location of *each* measurement (*From* & *To* test points).

SPECIFICATIONS: TWO KINDS OF 4-WIRE COMPONENTS

4-W WIRE — Sets the maximum allowable resistance a wire segment can have between two Kelvin Points (KP). ***RANGE:*** 0.001Ω to 1.0MΩ ±4% ±0.001Ω
TOLERANCE: Threshold—good if less than.

4-W RESISTOR

Sets the resistance value and tolerance for resistors or wire segments between two Kelvin Points (KP). ***RANGE:*** 0.001Ω to 1.0MΩ ±4% ±0.001Ω
TOLERANCE: 1-99%



Important!

- A 4-Wire Component is required for ***each*** 4-wire measurement.
- Resistance is measured from Kelvin point to Kelvin point (KP).

Identifying From and To Points–the Location of the Measurement

The window used to select *From* & *To* points does not match the points for you. However, by referring to a Net List, you can easily find the *From* & *To* test points for each 4-Wire Component because the two points are always in the same net.

Note: Using the Net List for reference applies only to connections with resistance below *Connection Resistance* at the time of creating the wirelist.

PRINT OUT A NET LIST TO IDENTIFY THE LOCATION OF EACH MEASUREMENT

1. In **View/Change Wirelist**, press the **Print** button.
2. Locate the Net List (**`connections`**) in the printout, *Touch1 Cable Documentation*.
3. Mark test points from one net (example: **`J1-001 J1-063`**) for *From* & *To*.

“FROM” & “TO” USING DEFAULTS:

```
Connections:
1   J1-001   J3-063
2   J1-003   J3-061
```

“FROM” & “TO” USING CUSTOM LABELS:

```
Connections:
1   PLUG_PIN-1   SOCKET_PIN-1
2   PLUG_PIN-2   SOCKET_PIN-2
```

SELECT THE KIND OF 4-WIRE COMPONENT

1. In **View/Change Wirelist**, press **More-Comp**, then **Change**.
2. In **Change Components**, press **Add**.
3. In **Add Components**, select one of the following:
   - **Four-Wire Wire** - test wires to a threshold (good if less than).
   - **Four-Wire Resistor** - test wires or resistors to a value & tolerance.

Note: These buttons disable if there is no 4-Wire pairs list.

ENTER THE LOCATION – FROM & TO – OF THE 4-WIRE MEASUREMENT

1. In **Add/Change 4-Wire Wire** [or] **Resistor**, press the **From** box.
2. In **Add/Change Component**, select (highlight) a test point using:
   • Up/down arrows • Scroll bar (gray between arrows) • Hand-held probe.
   Then press **OK**.
3. Press the **To** box and repeat Step #2.

Note: Only test points in the 4-Wire Pairs List display.

ENTER A 4-WIRE COMPONENT VALUE (AND TOLERANCE)

1. In **Add/Change 4-Wire Wire** [or] **Resistor**, press **Component Value**.
2. In **Enter 4-Wire…Value**, enter the **Component Value** using:
   • Touch screen • User-supplied computer keyboard. Then press **OK**.
3. If for a 4-Wire Resistor, also press **Tolerance Level**, then **OK** when done.
4. Press **OK** to return to the Change Components window.

Note: Delete Resistor Components if 4-W Resistors are replacing them.

VERIFY THE 4-WIRE COMPONENTS BEFORE COMPLETING SETUP

1. In **Change Components**, do one of the following:
   a. Press **Add** to create more 4-Wire Components.
   or -
   b. Press **OK** to save your work. ***Warning,*** pressing Cancel is like “undo.”
2. In **View/Change Wirelist**, **Print** the wirelist:

```
Four-Wire Kelvin Pairs:        Components:
   J3-061   J3-062             1 4W_RESIS J1-001 J3-063 0.33 ohm 1%
   J1-003   J1-004             2 4W_WIRE  J1-003 J3-061 < 0.05 ohm
   J3-063   J3-064                          ↑       ↑
   J1-001   J1-002                       From     To
      ↑
   From & To
```

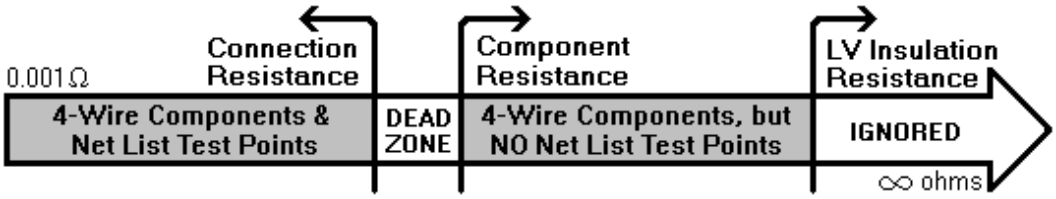
3. Verify the test points in the left column of **Four-Wire Kelvin Pairs** are used as intended for the *From* & *To* points in the **Components** list.
   - If not, press **More-Comp**, then **Change** to complete 4-W Components.
     or
   - If 4-Wire Components are complete, verify the wirelist before testing.

Verifying Setup and Troubleshooting

An otherwise good 4-Wire Test setup can cause LV Continuity Errors if:

- *Connection Resistance* is set too low or *Component Resistance* is set too high.
- Net List test points are missing for components set below the *Connection Resistance* or are unnecessarily present for components set above the *Component Resistance*.

Relationship of LV Continuity Settings to 4-Wire Component Values



Connection Resistance should be at least 20% higher than the resistance value of any 4-Wire Components used in this region. *From* & *To* test points of 4-Wire Components in this region should also be in the Net List.

Component Resistance should be at least 20% lower than the resistance value of any 4-Wire Components used in this region. *From* & *To* test points of 4-Wire Components in this region should NOT be in the Net List.

Adjust Continuity (Low Voltage) Settings, if Necessary

1. Open the **Change Low Voltage**:
   - In **View/Change Wirelist**, press **LV**, then **Change**.

2. In **Change Low Voltage**, press either or both:
   - **Connection Resistance** - to set at least 20% higher than any 4-Wire Components intended below this setting.
   - **Component Resistance** - to set at least 20% lower than any 4-Wire Components intended above this setting.
3. Press **OK** when done.

Edit the Net List, if Necessary

1. In **View/Change Wirelist**, press **Con.** Then press **Change**.
2. In **Change Connections**, press either or both:
   - **Add** - to add test points identical to the *From* & *To* points of 4-Wire Components set lower than *Connection Resistance*.
   - **Delete** - to remove test points identical to the *From* & *To* points of 4-Wire Components set higher than *Component Resistance*.
3. Press **OK** when done.

Save the Wirelist To Disk

1. In **View/Change Wirelist**, press **OK**. (pressing Cancel is like “Undo”)
2. In Test Setup, press Save Wirelist.

Test a Sample Cable To Verify The Setup

1. Install a cable you have reason to believe is good.
2. In the **Main Menu**, press **Test Cable** or in **Test Setup**, press **Test**.
3. If the cable tested correctly—test setup is complete.
   or
   If there were errors during the test—continue to *Troubleshooting*.

Troubleshooting: Learning 4-Wire Fixture Errors

ERROR MESSAGE:

```
Invalid 4-Wire Kelvin Pair:
  More than two points connected
  J1-001  J1-002  J3-063  J3-064
```

Possible Causes:

- The sample cable was not removed before learning the fixture.
- A 4-wire pair is shorted to other pairs or have more than two wires.

Solutions:

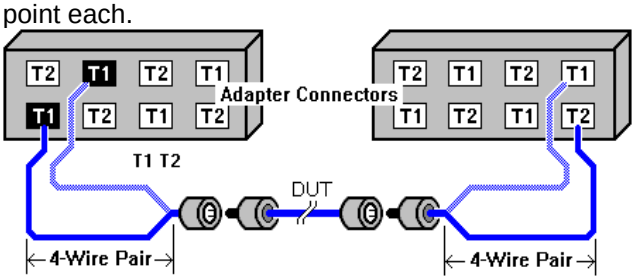
1. Do one of the following:
   - Remove the sample from the fixture.
     or
   - **Print** the error for reference, then remove and re-wire the fixture.
2. In **Four-Wire Fixture Error(s)**, press **Cancel**.
3. In **Learn Setup**, press **Learn** to start over, or **Cancel** to quit the learn.

ERROR MESSAGE:

```
Invalid 4-Wire Kelvin Pair:
  Both points J1-001 and J1-004
  are Type 1 [or 2] points.
```

Possible Causes:

A Four-wire pair lacks one Type 1 and one Type 2 point each.



The 4-wire pair on the left duplicates T1; the pair on the right is correct.

Solutions:

1. In **Four-Wire Fixture Error(s)**, **Print** the error for reference.
   Then press **Cancel**.
2. Remove the fixture.
3. Re-wire the fixture at the adapter connector so each 4-wire pair has
   one T1 and one T2 point. (See page 42).
4. In **Learn Setup**, press **Learn** to start over, or **Cancel** to quit the learn.

Troubleshooting: Continuity Test Errors

ERROR MESSAGE:

```
High Resistance Errors:
NET 1: Measured 2.9 ohm
  Detected at J1-001 and J1-063
```

Possible Causes:

- Setup Error: *Connection Resistance* is set lower than the detected resistance of a good connection.
- Defective Cable: Detected resistance is higher than *Connection Resistance*.

Solutions:

- Raise *Connection Resistance* so it is 20% higher than the 4-Wire Component value describing the connection causing the error.
- Repair or test another cable.

ERROR MESSAGE:

```
NET 1:
  OPEN J1-001 and J1-063
```

Possible Causes:

- Setup Errors: *Component Resistance* is set lower than the detected resistance of a good connection intended to be in the Net List.
- Unnecessary test points are in the Net List corresponding to 4-Wire Components set higher than *Component Resistance.*
- Defective Cable: Intended connection is missing.

Solutions:

- Raise both *Connection Resistance* & *Component Resistance* for wires to be tested by 4-Wire Components set below *Connection Resistance*.
- Delete from the Net List corresponding test points of 4-Wire Components set above *Component Resistance*.
- Repair or test another cable.

ERROR MESSAGE:

```
NET 1:
  SHORT J1-001 and J1-063
```

Possible Causes:

- Setup Errors: Test points are missing from the Net List for 4-Wire Components set below *Connection Resistance*.
- *Component Resistance* is set too high for a 4-Wire Component set above *Connection Resistance*.
- Defective Cable: Unintended connection. Resistor - detected resistance is less than *Component Resistance*.

Solutions:

- Add to the Net List corresponding test points of 4-Wire Components set below *Connection Resistance*.
- Lower *Component Resistance*—to 20% less than the Component Value.
- Repair or test another cable.

Troubleshooting: 4-Wire Test Errors

ERROR MESSAGE:

```
4-Wire Kelvin Pair Error
  J1-002 and J3-064
    not connected
```

Possible Causes:

- Hidden Point wires are not connected at the Touch1.
- Defective fixture—opens.
- Incorrect 4-Wire Pairs List.

Solutions:

- Re-connect or repair the fixture.
- Test with the correct 4-wire fixture.
- Edit Hidden points.

ERROR MESSAGE:

```
Bad 4-W Resistor between:
  J1-001 and J3-063
   [also: Resistor Missing]
  Expected value 1.00 ohm 1%
  Measured value: 1.30 ohm
```

Possible Causes:

- Setup Errors: Incorrect or unrealistic settings: Component Value or Tolerance. Incorrect “From” & “To” points. (reports “Resistor Missing”)
- Fixture not built correctly.
- Defective Cable: Missing wire or resistor. Detected resistance out of range (Value or Tolerance or both).

Solutions:

- Edit the 4-Wire Resistor reporting the error.
- Reduce unwanted lead resistance.
- Repair or test another cable.

ERROR MESSAGE:

```
Bad 4-W Wire between:
  J1-003 and J3-061
   [also: Wire Missing]
  Expected value < 0.05 ohm
  Measured value: 1.22 ohm
```

Possible Causes:

- Setup Errors: Incorrect or unrealistic setting: Component Value. Incorrect “From” & “To” points. (reports “Wire Missing”)
- Fixture not built correctly
- Defective Cable: Missing wire. Detected resistance over threshold (Component Value).

Solutions:

- Edit the 4-Wire Wire reporting the error.
- Reduce unwanted lead resistance.
- Repair or test another cable.

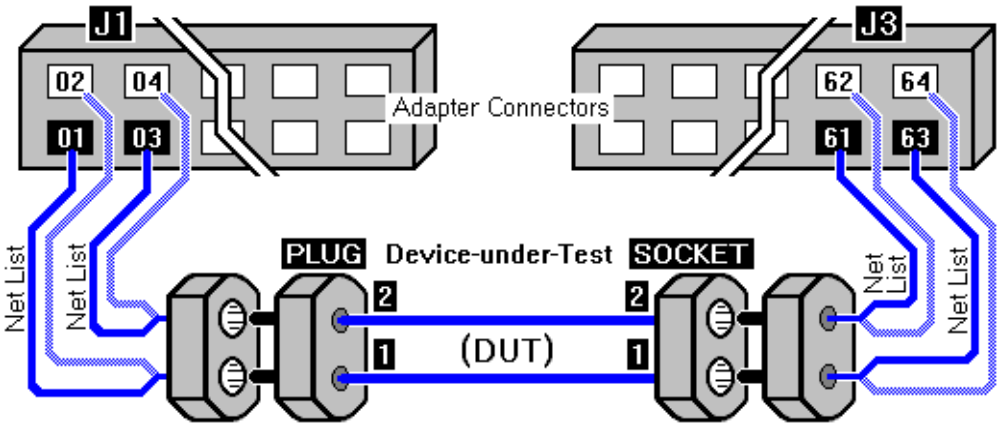
Optional: Re-Labeling Test Points

By default, the Touch1 labels test points in a Net List (**`Connections`**) according to the fixture adapter connector(s). It uses the location of the adapters (J1, J2, etc.) and the adapter’s connector pin names (001, 002, etc.). Custom labeling allows you to re-label the Net List and Components List to match the device-under-test.

Benefits of Custom Labels

- Wirelist documentation and error reporting will match the connector and pin names of connectors on the device-under-test (DUT).
- When creating 4-Wire Components, it will be easier to identify the *From* and *To* points required to identify the location of the 4-wire measurement.
- When creating the 4-Wire Pairs List using *Method #2* (page 45) it will be easier to identify the Net List and Hidden points of each 4-wire pair.

Test Point Identification – Fixture Adapters vs. Device Under Test



FIXTURE	DUT		DUT	FIXTURE
J1-001	= Plug, pin 1	<= *connected* =>	Socket, pin 1 =	J3-063
J1-003	= Plug, pin 2	<= *connected* =>	Socket, pin 2 =	J3-061

NET LIST USING DEFAULT TEST POINTS:

(documents Fixture Adapter connectors)

```
Connections:
1   J1-001   J3-063
2   J1-003   J3-061
```

SAME NET LIST USING CUSTOM LABELS:

(documents the Device-under-Test)

```
Connections:
1   PLUG_PIN-1   SOCKET_PIN-1
2   PLUG_PIN-2   SOCKET_PIN-2
```

Re-Label Default Test Points To Match The Device under Test (DUT)

1. In **View/Change Wirelist**, press the **Print** button.
2. Locate the Net List (**`Connections`**) in *Touch1 Cable Documentation*.
3. From the Net List, match the fixture (default) test points to the DUT.
4. In **View/Change Wirelist**, press **More-Label**, then **Change**.
5. In **Change Labels**, select (highlight) a Net List test point using:
   • Up/down arrows • Scroll bar (gray between arrows) • Hand-held probe. Then press **Change Label**.
6. Enter a label from the touch screen or a user-supplied computer keyboard.

Format: 30 characters, maximum.
First character: A to Z and underscore.
All others: A to Z, 0 to 9, dash, #, underscore.

Note: Lower case is available by using a computer keyboard.

Appendix C: SPC Data Collection

SPC Data Collection allows you to store information specific to a test or a run of tests and retrieve that information later for analysis. With very little effort, a wide range of statistics is available to you. With a little more effort, you can store custom information specific to your applications.

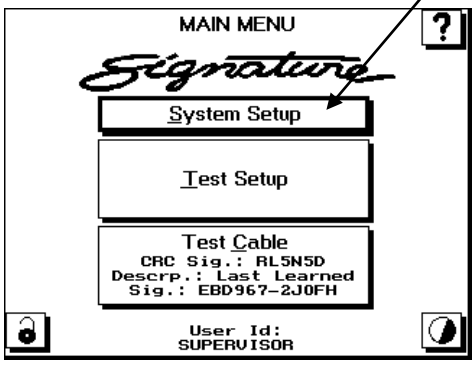
In order to use SPC Data Collection, follow these steps:

1. Activate SPC Data Collection on your analyzer.
2. Add SPC Data Collection to a wirelist.
3. Store SPC Data by performing tests.
4. Retrieve SPC Data for future analysis.
5. Analyze SPC Data.

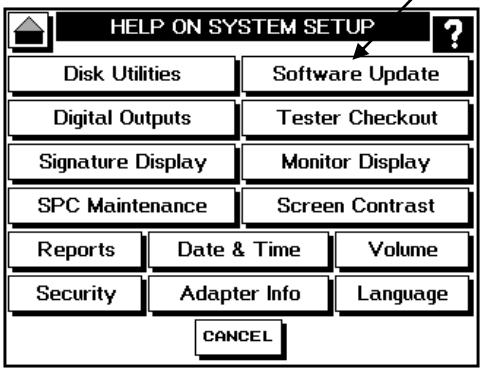
Activate SPC Data Collection on your Analyzer

Note: SPC Data Collection is sold as an option on the Touch 1.

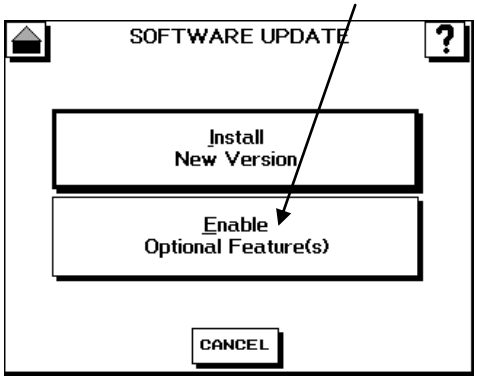
From the **Main Menu**, select **System Setup**.



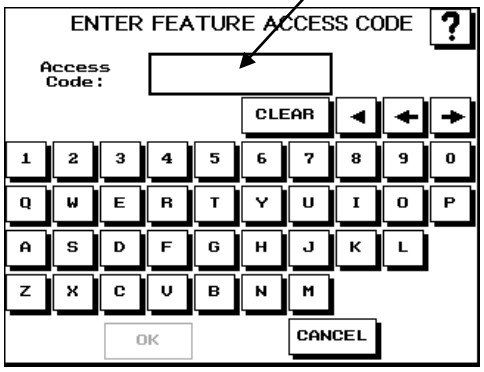
From the **Setup Menu**, select **Software Update**.



From the **Software Update Menu**, select **Enable Optional Feature(s)**.



Enter the **Feature Access Code**, obtained from Cirris and press **OK**.

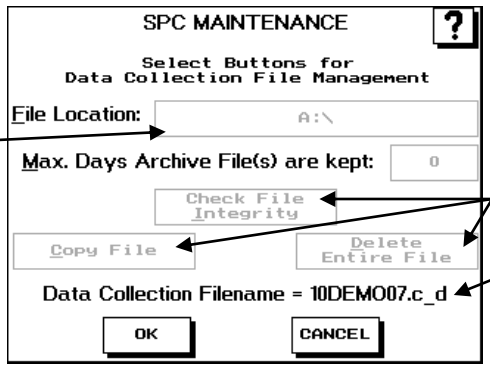


SPC Data Collection is now available on this analyzer.

You may also select where the data collection files are to be stored if the analyzer is connected to a network. To see where your data collection files are being stored, select **SPC Maintenance** from the **System Setup Menu**.

The **File Location** shows where the SPC Data Collection files are being stored. This can only be changed if the tester is connected to a network.

You must have Create and Modify rights on the network drive for SPC Data to be stored.



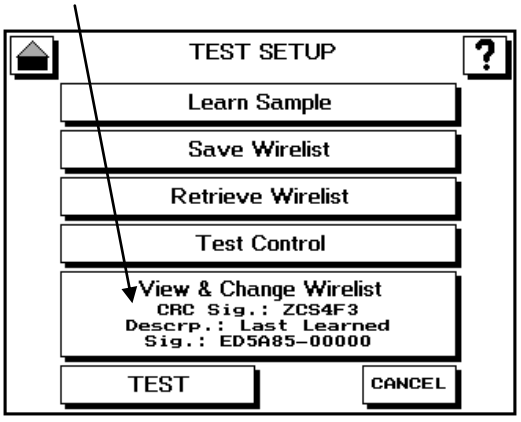
Once a data file has been created, you can verify the integrity of the file, copy the file, or delete the file.

The **Data Collection Filename** is determined based on the serial number of the analyzer.

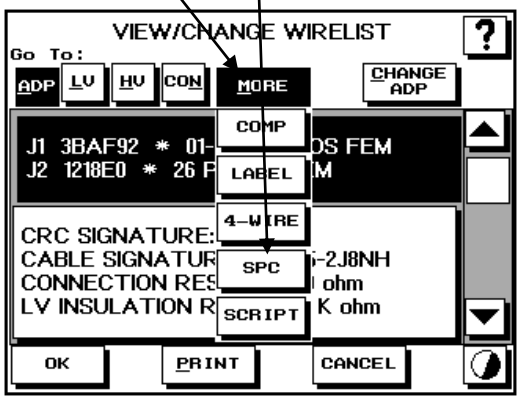
Add SPC Data Collection to a Wirelist

Each wirelist can store SPC Data differently. Therefore, SPC Data Collection must be defined for each wirelist independently.

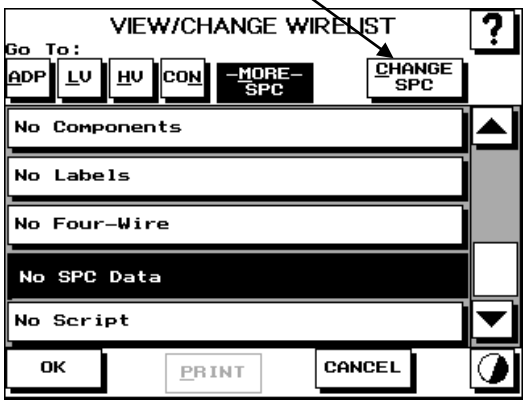
Modify a current wirelist by selecting **View & Change Wirelist** from the **Test Setup Menu.**



Select **More**, then **SPC**.

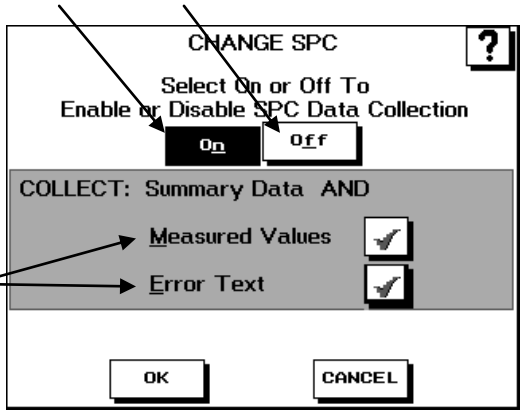


Select **Change SPC.**

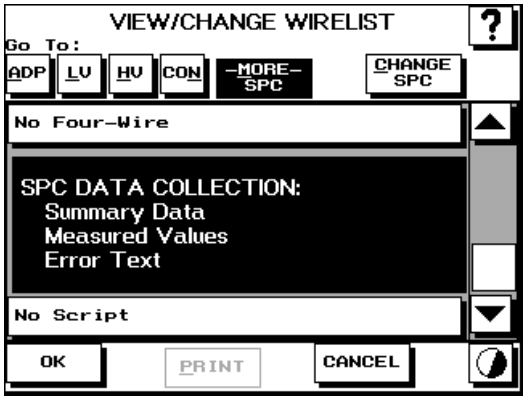


Enable or **Disable** SPC Data Collection.

You can also select the extent of the data to be collected.



The wirelist will then reflect the changed SPC Data Collection options.



Storing SPC Data

SPC Data is stored in a temporary archive as each test is performed on the analyzer. The SPC Data is stored in the **File Location** when the run is complete, indicated by returning to the **Main Menu**. Do **NOT** remove the floppy disk until the drive light goes off. Large amounts of SPC Data may take up to a minute to send to the floppy disk.

Subsequent runs of SPC Data do not overwrite the older data. Newer SPC Data is appended to the end of the data file.

These data elements are always stored as part of **SPC Data Collection**

- Run Number
- Analyzer Serial number
- Cable Description (if defined)
- Cable File Name
- Operator Name (if defined)
- Date and Time tested
- Signature
-

These data elements are stored as part of **Summary** data.

- Total Tested
- Total Good
- Total Bad
- Error Types Summary
- Custom, per group (if stored in Scripting)
- Custom, per Cable (if stored in Scripting)

These data elements are stored if **Measured Values** is selected.

- Net or Instruction Label
- Net or Instruction Measurement

These data elements are stored if **Error Text** is selected.

- Error Number
- Error Code
- Error Type
- Error Text

Additional data elements may be stored using **Scripting** in conjunction with **SPC Data Collection**.

Retrieving and Analyzing SPC Data

Cirris SPC Data can be read and stored by SPCLink, software that comes with your SPC Data Collection package. Your data can then be exported in a delimited format for use with spreadsheet or data analysis software packages. Instructions for use are included with the PC software.

SPC Made Easy not only reads and stores SPC Data like SPCLink but it graphs and charts your data for you as well, making analysis quick and easy. A demonstration of SPC Made Easy can be obtained from Cirris by calling 1-800-441-9910.

Appendix D: Scripting

Scripting is sold as an option on the Touch 1.

Activate Scripting on your Analyzer

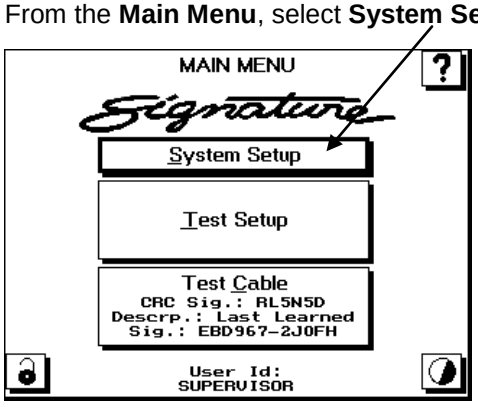
Scripting allows you to implement a wide variety of custom functionality to your analyzer. Think of Scripting as having a multi-point Volt ohmmeter where you can specify what measurements you want to make, where to put the leads, and what to do with the results, all controlled automatically.

Scripting can be used to:

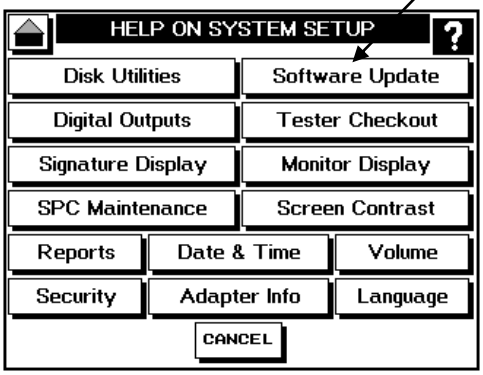
- Store Custom SPC Data
- Override the tester's standard testing mode to suit your own special applications
- Create custom labels/reports/graphics for printers
- Communicate with other devices
- Create "custom components" that can be imbedded into a standard test program
- Embed the Touch 1 into automated machine applications
- Test multiple parts at the same time and discriminate which one is bad
- Use serial numbers and bar code scanners
- Put Operator Comments into the test program
- Whatever you can imagine (call us, we'll help you imagine it)

To add the scripting option to your analyzer, start at the **Main Menu**.

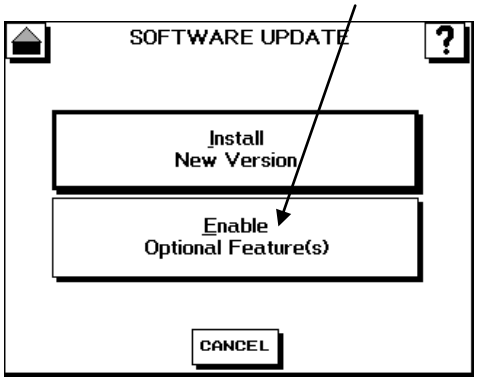
From the **Main Menu**, select **System Setup**.



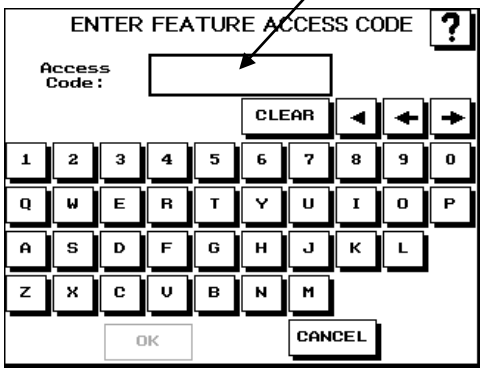
From the **Setup Menu**, select **Software Update**.



From the **Software Update Menu**, select **Enable Optional Feature(s)**.



Enter the **Feature Access Code**, obtained from Cirris and press **OK**.

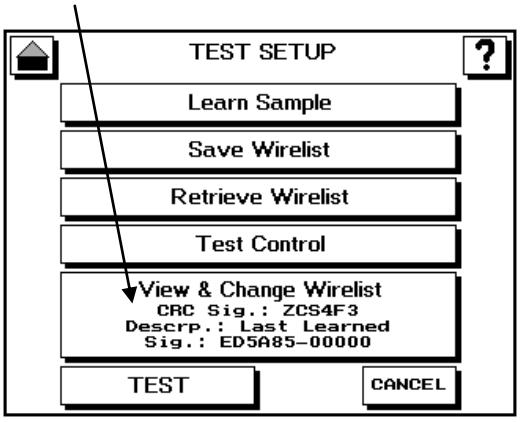


The Scripting option is now available on your analyzer.

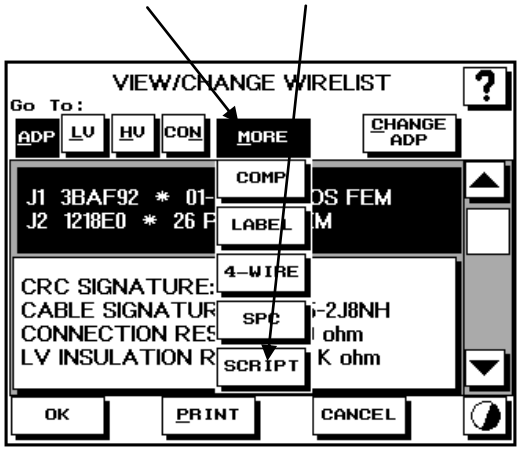
Attach a Script to a Wirelist

Each wirelist can utilize scripts differently. Therefore, Scripting must be defined for each wirelist independently.

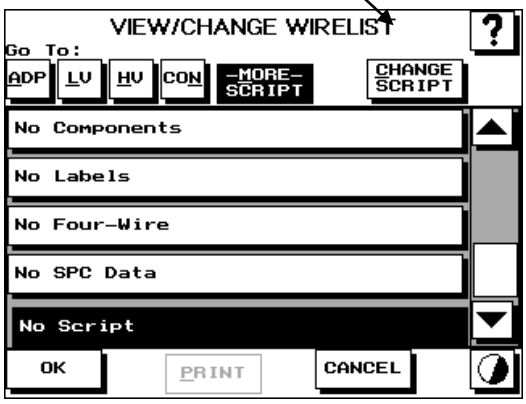
Modify a current wirelist by selecting **View & Change Wirelist** from the **Test Setup Menu.**



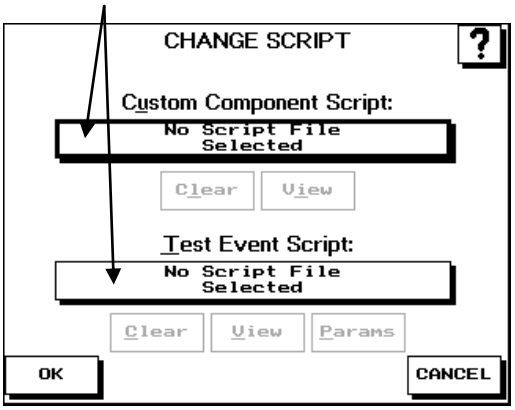
Select **More**, then **SCRIPT**.



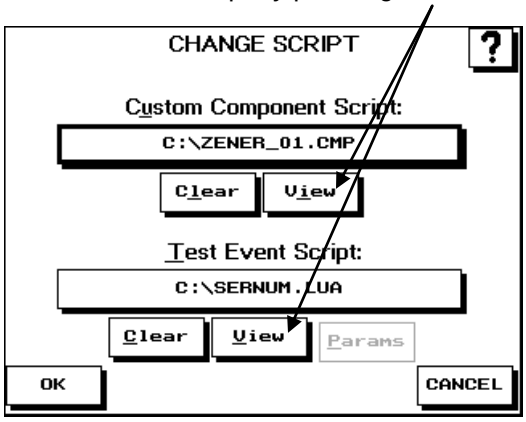
Select **Change SCRIPT.**



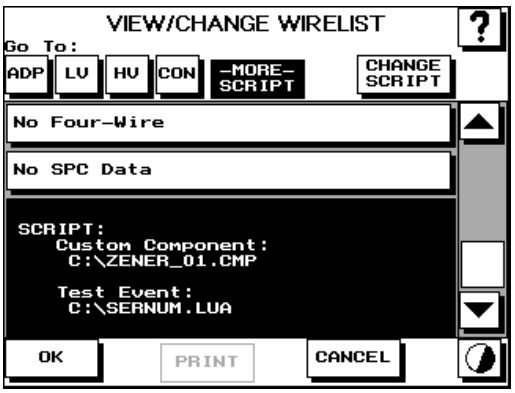
Add or Remove scripts by pressing the bar under the type of script you want to add.



Once a script is added you can see the contents of the script by pressing **View.**



The wirelist will then reflect the changed **Scripting** options.



Custom Components (.cmp)

Custom Components are a type of script that allows special measurements and types of testing to be performed. Once a custom component is created and attached to a wirelist, any number of them can be added to the wirelist. For example, if you had a custom component that would test a Zener diode, you could add any number of Zener diode tests to the wirelist, each with its own set of parameters.

More information on Scripting can be found in the **Help System** under **Scripting – Overview**.

Cirris can write your Custom Component for you. Call us at 1-800-441-9910 for a quote.

Event Scripts (.evt)

An event script differs from a custom component in that there is only one event script for each wirelist. Event scripts perform command functions that alter the way that testing is performed.

Event scripts can allow you to store custom SPC Data like unique cable serial numbers or pop up screens for users to read and respond to during a test. With an event script nearly any implementation is possible.

Some users have integrated with PLCs to control external devices. Others do mathematical calculations as part of their scripts.

Scripts can range from simple to complex. Let us help you with your scripting. Call us at 1-800-441-9910 for a quote. We can write your script for you or point you in the right direction.

More information on Scripting can be found in the **Help System** under **Scripting – Overview**.

Not all problems require scripting for a solution. Take the following example.

Selectively Apply Hipot Voltage

How you would like to selectively apply hipot voltage would indicate which solution is best for you.

To selectively apply High Voltage	**Use this**
Hipot all interconnections but no unused points	Hipot Parameter: Connections only
Hipot only selected test points to different sets of test parameters (voltages)	Script components: cmpHipotNets, cmpAdvACHipotNets, cmpAdvDCHipotNets
Hipot only selected test points to the same standard or advanced Hipot test	Script component: cmpHVMaskIn
Exclude selected test points from the same Std. or Adv Hipot Test	Script component: cmpHVMaskOut
Test at different voltages in the same test	Script components: cmpHipotNets, cmpAdvACHipotNets, cmpAdvDCHipotNets
Test groups of nets at the same time	Link Component
Allow one net (usually highly capacitive) to fail, but consider the test good if all others pass	High Cap. Shield Allowed
Allow multiple nets (usually highly capacitive) to fail, but consider the test good if all others pass	Combination of using Link Components with the option High Cap. Shield Allowed.

Appendix E: Parent / Child Wirelists

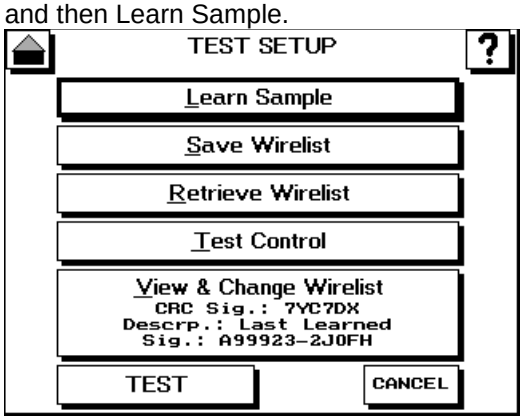
What are Parent / Child Wirelists?

Parent / Child Wirelists are separate tests that are strung together so that all of the individual tests run but only one final result is returned at the end of all of the tests, either Pass or Fail. The Parent test is the starting point or entry into a set of tests. Child tests are the individual pieces that can be arranged and if used with the Scripting option, rearranged to provide enormous flexibility.

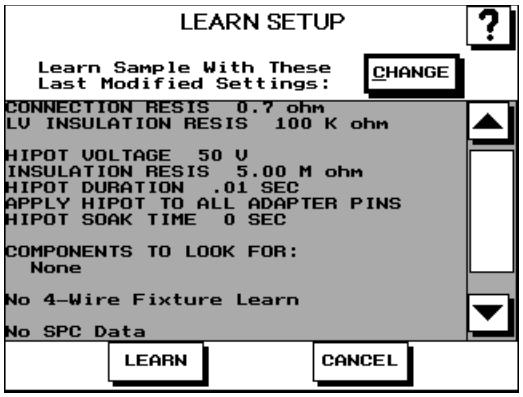
The starting point for using Parent / Child Wirelists is the Learn.

Learn a Parent / Child Wirelist(s)

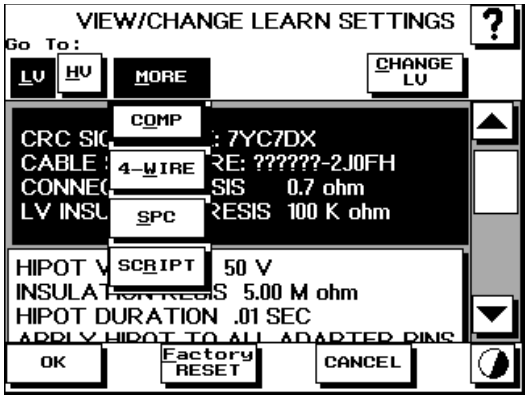
From the Main Menu select Test Setup, and then Learn Sample.



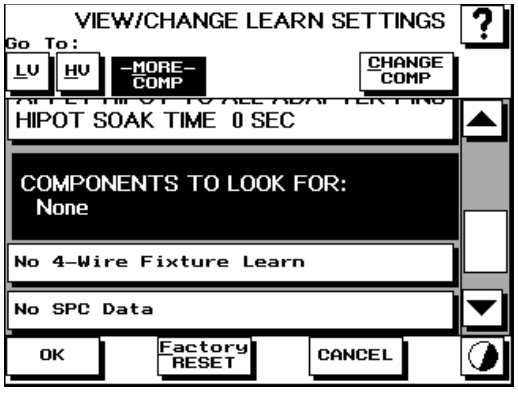
In Learn Setup select CHANGE.



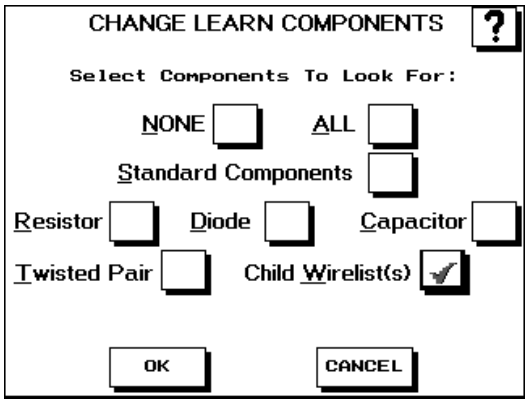
In View/Change Learn Settings select MORE then COMP.



In View/Change Learn Settings select CHANGE COMP.



In Change Learn Components select Child Wirelist(s).



Now select OK.

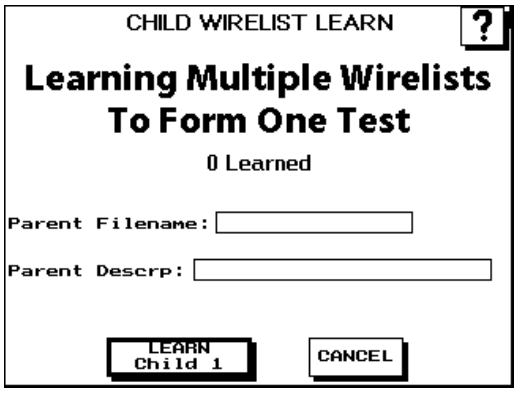
You will return to the View/Change Learn Settings screen.

Select OK again.

You will now return to the Learn Setup screen.

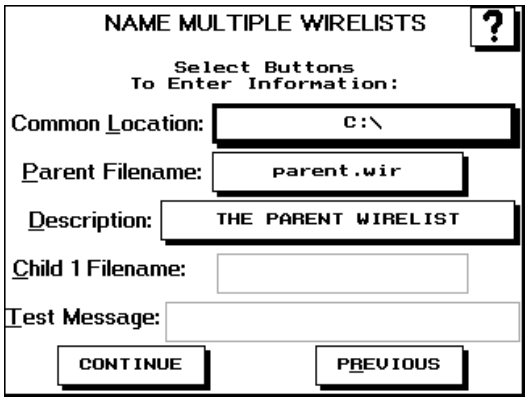
Select LEARN.

In Child Wirelist Learn select **LEARN Child 1**.

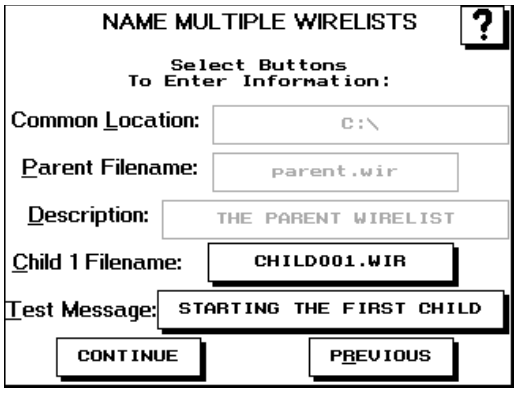


The parent filename and description will show in the test window at the start and end of all tests.

In Name Multiple Wirelists fill in the boxes and select CONTINUE.



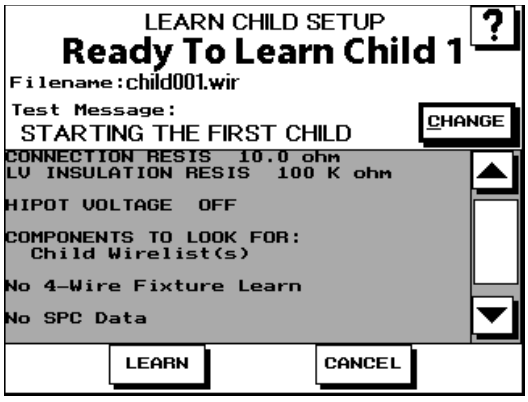
Now fill in the boxes for the first Child wirelist and select CONTINUE.



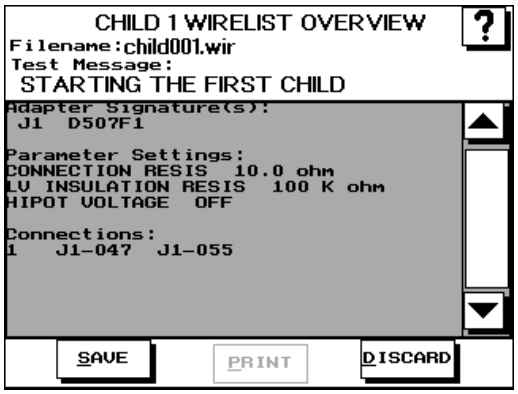
The child Filename and description will show in the test window as the test begins and executes.

Learn parameters can be changed for each child wirelist.

In Learn Child Setup attach the part of the device to be tested then select LEARN.

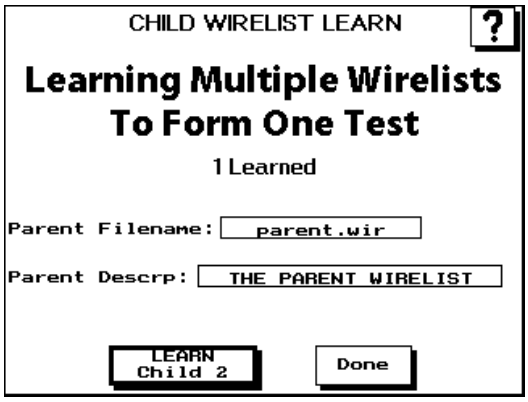


After learning, in the Child Wirelist Overview, select SAVE.

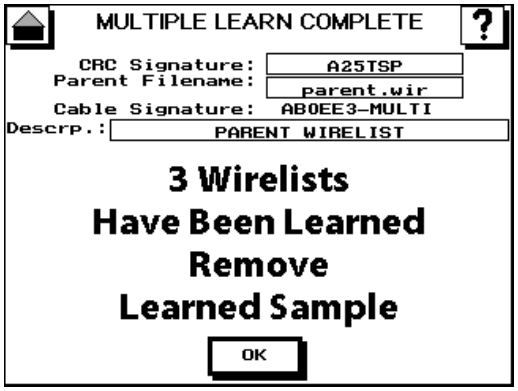


You can discard the learn and try again if the results were not as expected.

In Child Wirelist Learn, either LEARN the next Child or select DONE.



Selecting DONE will show how many wirelist were learned. Select OK.



To execute the test, load the Parent Wirelist and select TEST.

All learned child wirelists will execute in the order that they were learned.

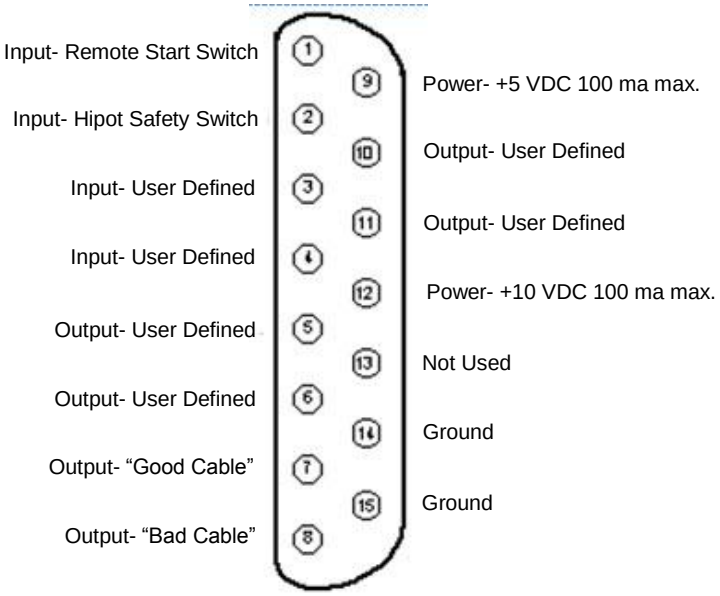
Appendix F: Digital I/O

What is Digital I/O?

The Touch 1 can send and receive triggered events through the 15 pin Digital I/O port on the back of the analyzer. External devices like stampers, markers, and locking devices can be activated and deactivated as necessary to enhance your testing requirements.

The 15 pin Digital I/O port has the following:

- A Remote Start Switch Input
- A Hipot Safety Switch Input
- Two User Defined Inputs
- A “Good Cable” Output
- A “Bad Cable” Output
- Four User Defined Outputs
- 5V and 10V power
- Two Grounds



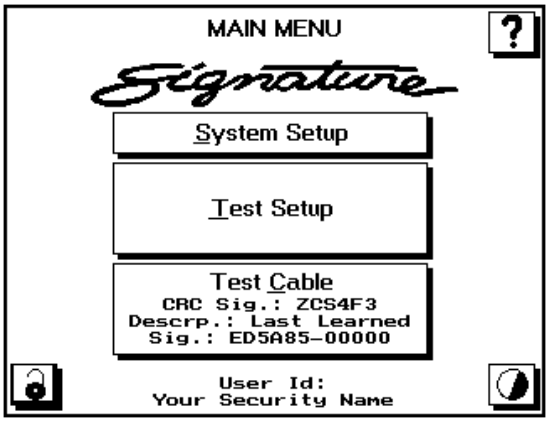
Using your own power source with Inputs

The tester’s outputs are “sink” outputs meaning that when activated they will connect (or sink) a voltage to ground in effect turning ON the output circuit. The outputs are capable of sinking up to a nominal 24 volts and 500 milliamps. To limit the output current always ensure adequate resistance between a power supply and the output. When switching a voltage between 12 and 24 volts, the output will allow a slight current flow (about 1mA at 24 volts) when the output is off.

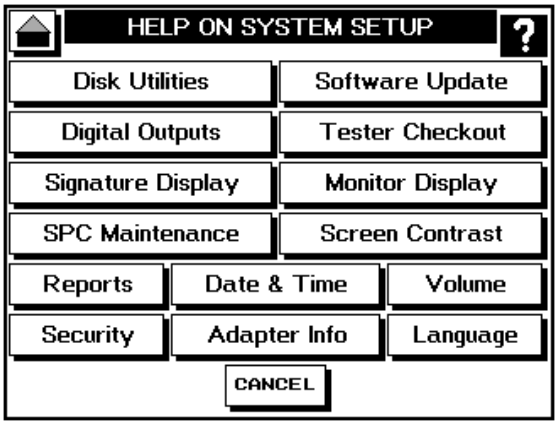
Setting up Digital I/O

The two defined inputs, External Switch and Hipot Safety Switch, are enabled in the **Test Controls** area. See **Chapter 7: Setting Test Controls** for more information. User Defined Inputs are accessed through Scripting.
The four User Defined outputs are configured from the System Setup Menu.

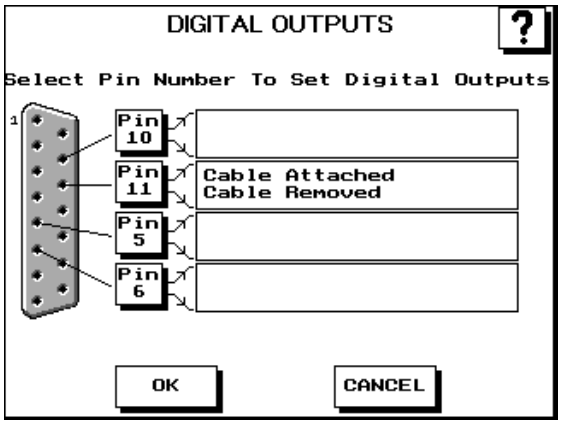
From the **Main Menu**, select **System Setup**.



From **System Setup**, select **Digital Outputs**.



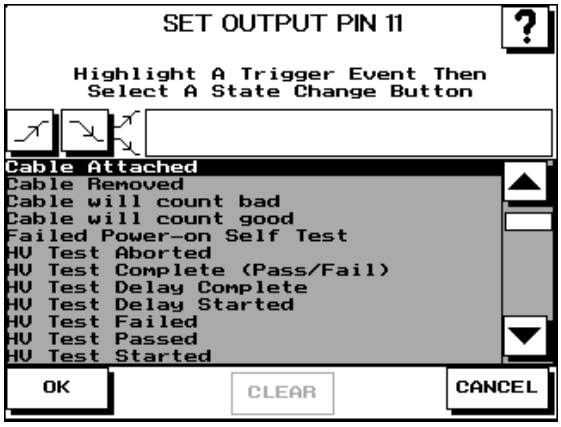
Select the output pin to attach events.

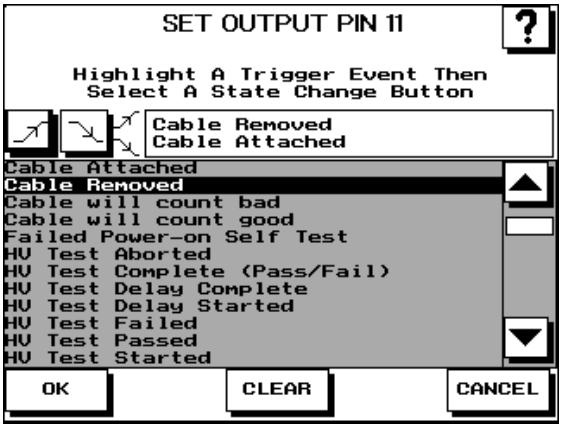


The I/O pins are open collector transistor ports that can operate at up to 24 volts and 300 milliamps.

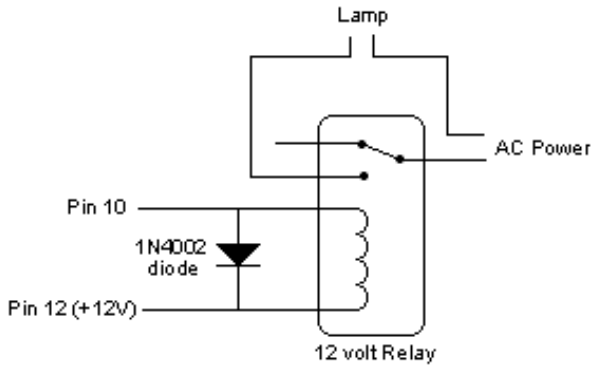
Use of these pins may require a pull up resistor to operate properly.

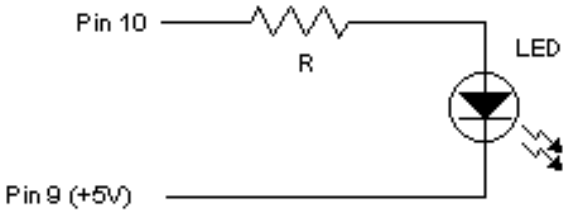
Select trigger events for the RISING and FALLING positions. FALLING events turn a device on and RISING events turn a device off. Both events must be defined and they must be different events.





The following schematics are examples of how to connect external devices to the Touch 1 using the Digital I/O function.





The value of R is determined based on the characteristics of the LED. A 20 milliamp LED would use a 150 Ohm resistor as R = 3V / 0.020a.

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W