Signature 1000HX Cable Analyzer User's Guide

Version 2008.4.0
May 27, 2010

CIRRIS

An ISO 9001 Certified Company

Signature 1000HX Cable Analyzer User's Guide
Version 4.0
May 27, 2010

Table of Contents

Introduction

The Cirris 1000HX cable analyzer allows you to test cables quickly and easily.

You Should Have Received

- 1000HX main unit, including a wall transformer with power cord.

- Hand-held test probe.

- The connector adapters you have ordered (usually shipped in a 3x5-inch card file). You may also have ordered an optional tilt stand, or an optional frame stand. If so, these should be included.

- An expansion box if you ordered one.

The 1000HX User Process

1. Install any expansion boxes you may want to use (see pages 6). Once you have installed the boxes the first time, you probably will not have to repeat this step again.

2. Install the connector adapters to match the cables you want to test (see pages 4).

3. Check the test option settings; reset the options if you need to (see page 11).

4. Either:
   - Learn a Sample Cable (a cable you know is built correctly) of the kind you want to test (see page 16), or...

   - Retrieve the wirelist data for the kind of cable you want to test from the analyzer's memory (see page 21).

This completes programming the analyzer for testing cables. If you have connected a Sample Cable to learn it, disconnect it now.

5. Connect the first cable you want to test.

6. Test the cable (see page 18).

7. Record and/or or print the test results.

We will show you how to do each of these steps in this manual.

Cirris Customer Support

If you need assistance with your 1000HX tester, a customer support representative is ready to assist you. In the USA, call Cirris customer service toll-free at 1-800-441-9910. Outside the USA, enter the URL www.cirris.com/contact.html to find the Cirris Sales Office nearest you.

Warning!

Possible electric shock!   ◄────── **Please Note**

Cirris hipot testers are designed to be safe for operators. Injuries from hipot test equipment are rare. Still, not every hipot test situation is safe. Hipot testing does not present a danger to healthy individuals; however, occasional mild electric shock may be experienced. Small shocks only occur during a hipot test when the operator touches an energized connection point. Any shock from the tester may result in a hipot test failure.

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

Improving Hipot Safety:

- **Set Auto Hipot to off**

  Set the AUTO HIPOT option to OFF (see page 15). When this option is set to OFF, 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 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

Set Up

Connector Adapters
Interchangeable adapter cards that match the connectors on your cable are used to connect your cables to the analyzer.

Connector Adapter Sizes
There are three sizes of Cirris Adapters: Single-High, Double-High, and Quad-High.

Single-high adapters are used for connectors up to 28 test points.

Double-high adapters are used for connectors up to 64 test points.

Quad-high adapters are used for connectors up to 120 test points. To use more than one of these at one time, an expansion box is required.
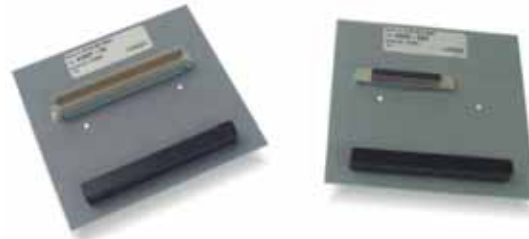
Connector Adapter Positions
The tester recognizes positions for each adapter and refers to test points based on these positions.

The 1000HX analyzer's scanner assembly has four connector adapter positions: J1, J2, J3, and J4.

Note: Each expansion box has four adapter positions that will be referred to as J5, J6, J7, and J8. There are white boxes provided next to each corner where you can write in the positions.
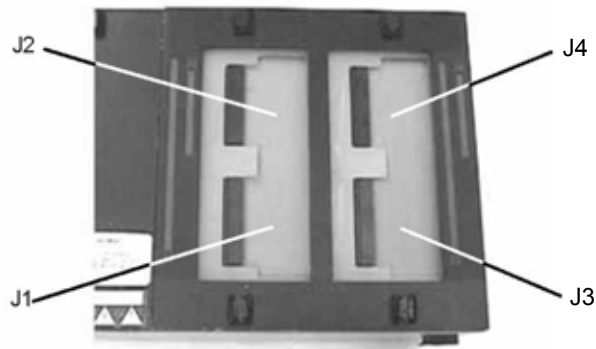
The adapter position is determined by the lowest number that the adapter occupies. For example:

This single-high adapter occupies the J1 position (in this case J1 is the only number that the adapter occupies).
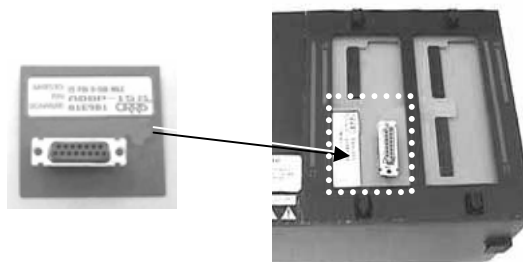
This double-high adapter occupies the J1 position.
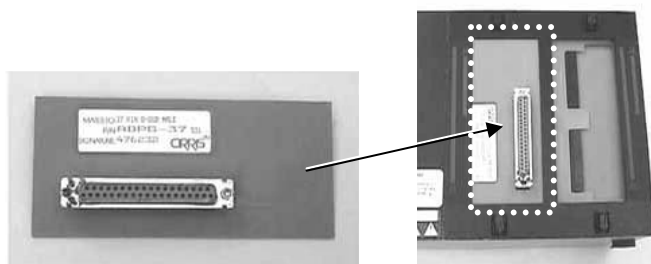
This quad-high adapter occupies the J1 position.
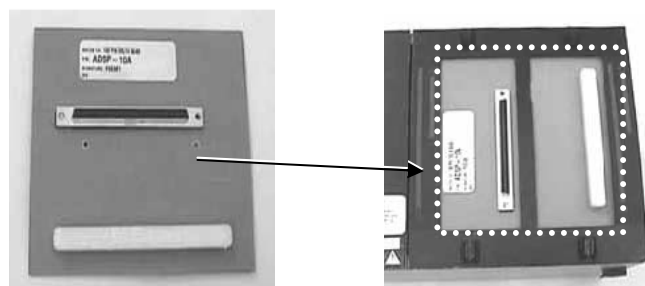
Installing Connector Adapters

When you are installing connector adapters, make sure you install the lowest "J" position number first and then move up (position J1 being the lowest and J4 being the highest). If adapters are installed in the wrong order (especially if you are installing more than one type of adapter), you may find that the adapters will not fit in the scanner assembly correctly. For example:

If you intend to use adapter positions J1 and J4, you would first install an adapter at position J1 and then install the other adapter at position J4.
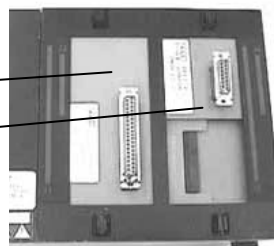
In this example, the cable documentation will show interconnections for J1 and J4 but not J2 or J3.

4

To install connector adapters:

1. Use a coin or screw driver to turn the four fasteners on the adapter cover plate to the unlock position, and remove the cover plate.

Fastener in the locked position

Fastener in the unlocked position
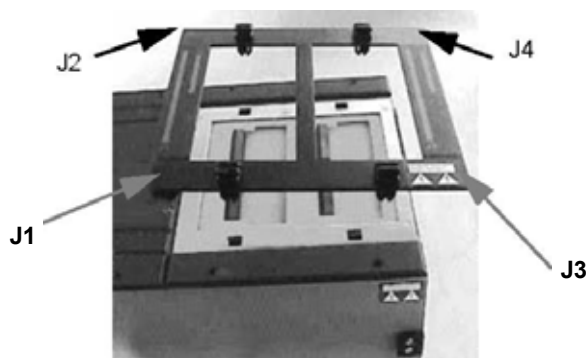
Removing the cover plate

Warning! Make sure the adapter is against the edge of the metal frame as you slide it in. The adapter must be properly lined up before sliding it in or the pins will bend!

2. Slide in each adapter until it is fully seated.
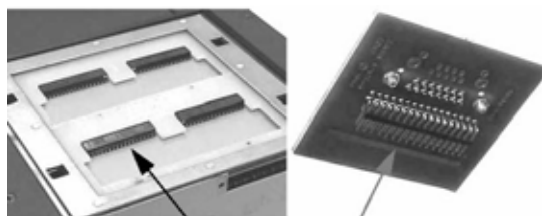
These horizontal pin sockets…mate with the connector pins on the bottom of each adapter.

3. Replace the cover plate.

   Make sure the small alignment pins on the underside of the cover plate fit into the corresponding holes on the tester's upper surface.

4. Turn the fasteners to the vertical position to lock the cover plate in place.
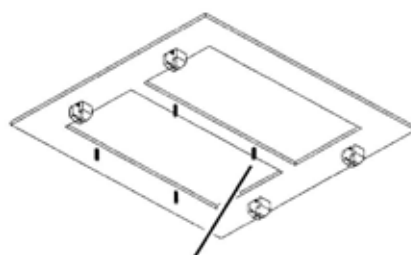
Each cover plate alignment pin...

...fits into a hole in the scanner's upper surface.
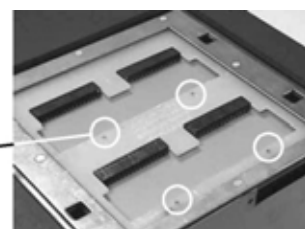
Installing an Expansion Box

One expansion box can be installed on your 1000HX to increase the number of test points available. You can set up your system to have as many as 256 test points.

To install an expansion box:

1. Turn the fasteners on the analyzer's spacer plate and cover plate to the unlock position.

2. Remove the spacer plate and the cover plate.

3. Lift the scanner assemblies out of both the main unit and the expansion box.

Scanner assembly

Spacer Plate

Cover plate
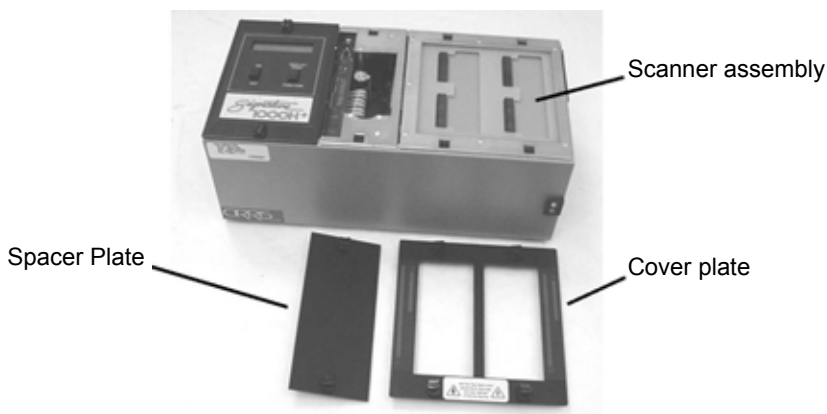
Note: Your expansion box may have a black plastic plate covering the opening where you will be routing the scanner cable. Once the scanner has been removed, push the plastic rivets out from the inside of the chassis, and remove the plastic plate.

In this photo you can view the connector that plugs into the scanner assembly in the main unit, the connector that plugs into the scanner assembly in the expansion box, and the plastic plate in the main unit. Make sure both scanners are secure.

This connector goes to the main scanner

This connector goes to the expansion box scanner

Completely remove this plate
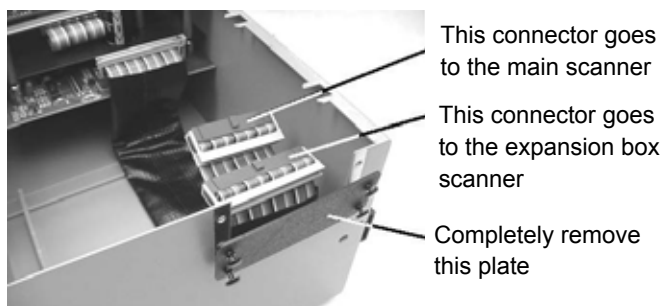
4. Connect the cable in the main unit to the expansion box cable.

This photo shows the cables that connect the main unit to the expansion box as they should appear before you connect them. Be sure the connectors are well-seated and that the connection is secure.

6
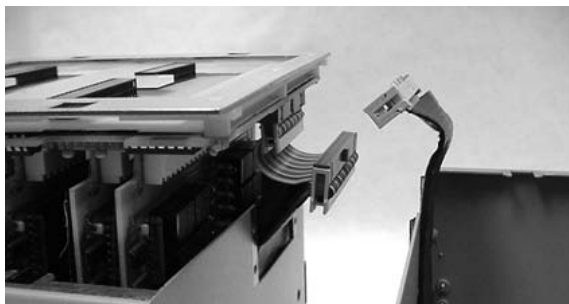
5. Gently lower both scanners into their boxes, routing the connecting cables through the openings in the side of each box.

6. Slide the two metal boxes together. The alignment pins in the side of one box will fit into the round openings in the side of the next box.

This alignment…

…fits into this
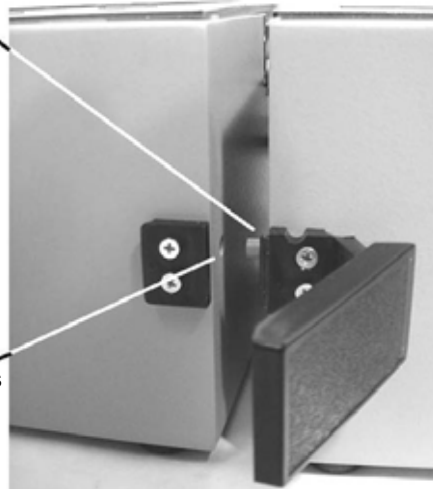
7. Once the two boxes are in position, hook the draw latches on one box over the keepers on the other box, then close the draw latches to lock the boxes securely together.
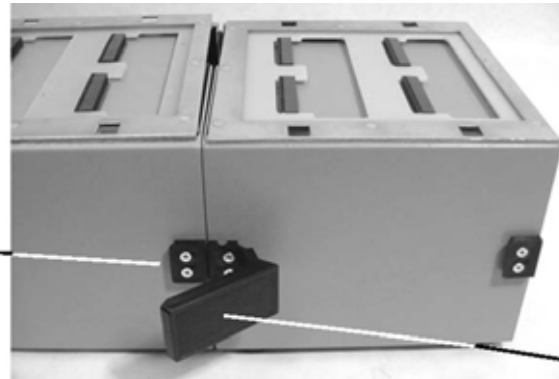
8. Replace the cover plates.

Keeper

Draw latch

This is how your 1000HX should look with one expansion box installed and the spacer plate and cover plates in place.
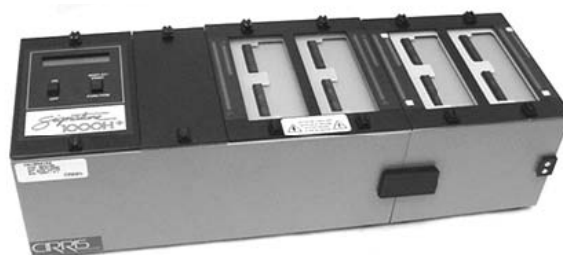
Changing the EPROM

You may need to change the EPROM on the microprocessor assembly.

To change the EPROM:

1. Disconnect the wall transformer from the wall outlet, and disconnect the power cable from the socket on the back of the analyzer.

Disconnect the power cable
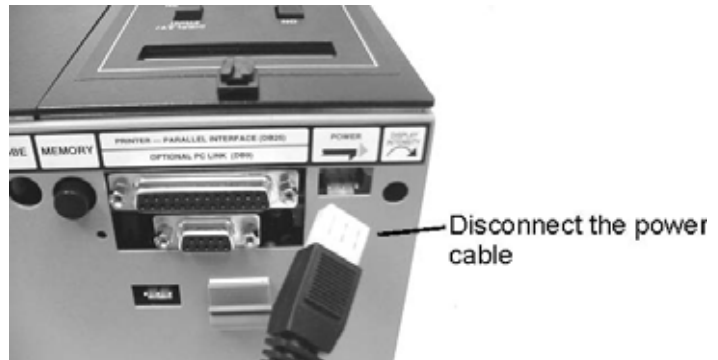
2. Unlock the twistlock fasteners, remove the spacer plate, and gently raise the microprocessor assembly out of the box.

3. Carefully turn over the microprocessor assembly. You will now be able to see the EPROM you are about to change.

EPROM   **Speaker Wires**
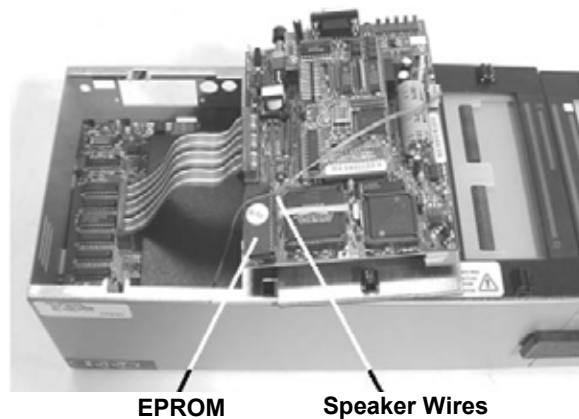
4. Using a small, flat-bladed screwdriver, gently pry the EPROM out of its socket and remove it.

Notch
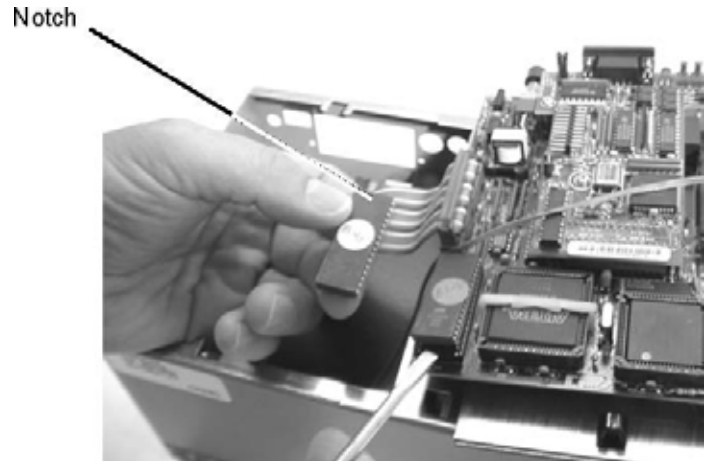
5. Gently align the pins on the new EPROM with the holes in the sockets. Be careful not to bend the pins!
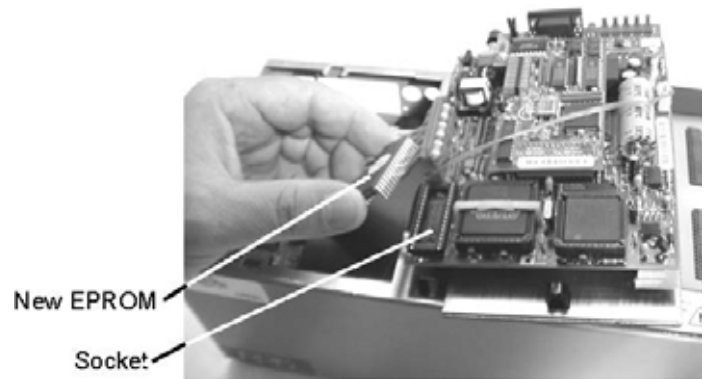
New EPROM

Socket

6. Carefully push the new EPROM down into the socket using even pressure.
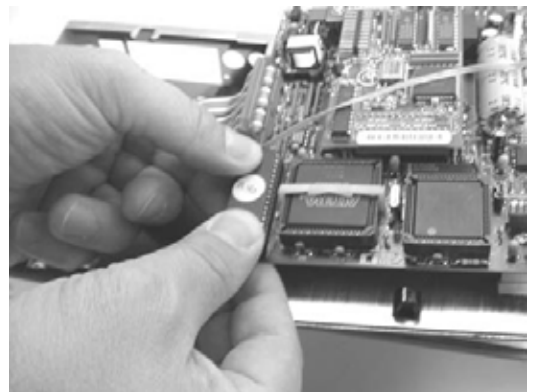
7. Gently lower the microprocessor assembly back into the box. Replace the spacer plate, and lock the twistlock fasteners. **Your unit is now reassembled!**

Adding a Printer

The 1000HX works with almost any printer that has an Epson/Centronics parallel interface.

Warning! Connecting the analyzer to a printer with an RS-232 serial interface will cause serious damage to the analyzer and is not covered by your factory warranty.

To add a printer:

1. Use a standard Epson/Centronics parallel interface cable readily available from almost any PC dealer. Plug one end of the cable into the printer, and plug the other end into the parallel printer socket on your analyzer.

Plug the printer in here

How do I know if I have a parallel printer?

To see if you have a parallel printer, look for the parallel connector on the printer. Printers usually have a parallel interface located in back. Many printers have both a serial and a parallel connector. To work with the 1000HX, your printer must have a 36-position connector similar to the one shown here.
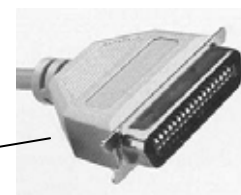
Can I use one printer with more than one analyzer?

Yes you can. To use your printer with more than one analyzer, use a switchbox. To change which analyzer the printer is receiving information from, simply change the switch setting on the box.

How do I use a printer without an on-line/off-line switch?

If your printer does not happen to have an on-line/off-line switch, you can use one of two solutions:

- Add a switch by placing a switch in the wire to pin 11 of the Epson/Centronics printer cable. When pin 11 on either side of the cable is open, the analyzer will see the printer as being off-line, and will display information rather than send it to the printer. When you close the switch so that pin 11 is closed, information will be sent to the printer.

- If you have a switch box available, you can connect the cable to the switchbox and use its switch as the on-line/off-line switch.

Option Settings

Checking the Option Settings

The Cirris 1000HX has twelve test options. Before you learn a Sample Cable, you will want to make sure that all settings are set how you want them.

To set the option settings:

1. Press in and hold the DISPLAY/PRINT switch as you turn on the analyzer. Continue to hold DISPLAY/PRINT.
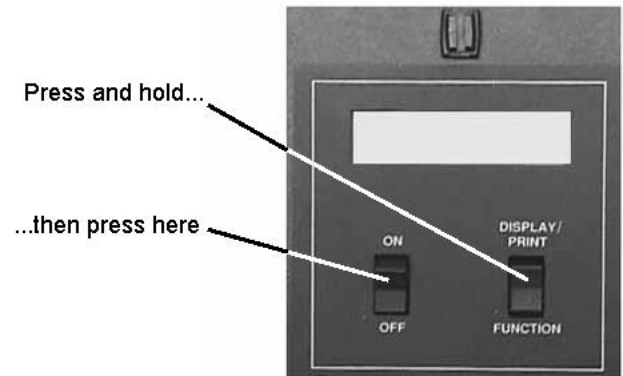
2. When READY TO SET UP OPTIONS appears in the display, release DISPLAY/PRINT.

3. Press DISPLAY/PRINT to step through the options.

To change the option settings:

1. Press the FUNCTION switch to change the setting whithin each option.
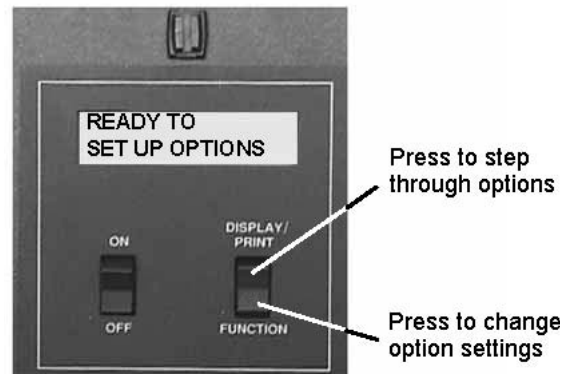
Following is a table that shows the default settings of each option as shipped by the factory.

Factory Default Option Settings	
Option	**Setting**
Create Test From	SAMPLE CABLE
Connection Resistance	AUTO
Hipot Voltage	300 V
Insulation Resistance	10 MΩ
Hipot Duration	100mS
Apply Hipot to	ALL ADAPTER PINS
Single Net Error	FAILS HIPOT
Auto Hipot	OFF
Error Tones are	LOW
Sorted Wire List is	OFF
Count All Cables is	OFF
Auto Print is	OFF

What if you go past the desired value?
In "Option/Setting" mode, the memory button acts as REVERSE. Hold the memory button in while setting options or values, and you can go backwards.

Memory button
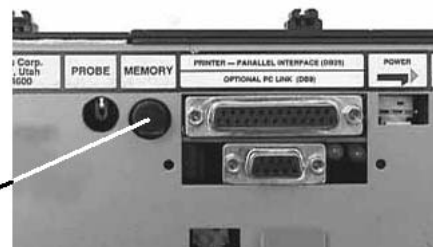
Note: All options or settings will roll over to the beginning whether you are going forward or backward.

When option settings are saved
Your settings automatically save when the value you select displays on the screen. If you turn off the analyzer, your new settings will still be set when you power up the analyzer.

Option Setting Descriptions

Overview
The Cirris 1000HX has twelve test option settings which you set to meet your testing requirements. In this section, we will tell you what each setting means.

Create Test From
The CREATE TEST FROM setting gives you the option to create a new test setup from a Sample Cable, your last test setup, or by learning a complex cable that contains resistors and /or diodes in addition to wire connections.

Sample Cable
Use the SAMPLE CABLE setting to learn standard sample cables (wires and connectors only).

Last Test Setup
When the LAST TEST SETUP is used, the 1000HX will NOT learn a sample cable. Instead it will automatically program itself with the last test program that was used. This setting is useful when testing large batches of the same type of cable. This setting will help protect your test setup in case of a power failure or in case you accidentally turn on the analyzer with an untested cable connected.

Complex Assembly
Use the COMPLEX ASSEMBLY setting to learn a cable that contains resistors, diodes, or divider networks in addition to wires and connectors. When this setting is used, the Connection Resistance refers to the resistance level that separates wires from resistors. The analyzer sets this to 5Ω. You may change the setting to meet your needs. Using the CONNECTION RESISTANCE CALC mode may help you determine a good setting (see below). If there are wires in our cable with > 5 ohms of resistance, you will need to set the Connection Resistance setting higher so they are not learned as resistors.

Connection Resistance
The CONNECTION RESISTANCE setting specifies the *maximum* resistance a connection can have and still be considered good. For example, if you set the Connection Resistance to 10Ω, the analyzer will consider all connections with resistances less than 10Ω as good, and those with resistances greater than 10Ω as bad. **Range:** 0.1 to 100Ω, 500Ω, 1MΩ, 5 MΩ, AUTO, CALC.

Auto Mode: When you set the Connection Resistance to AUTO, the 1000HX measures the resistance of each connection in the Sample Cable, and then automatically sets the Connection Resistance threshold to a value 20% higher than the largest resistance measured in the Sample Cable. The 20% margin of error is increased for resistances less than 1Ω. **Caution:** Using Auto Mode could cause you to have a Connection Resistance setting higher than you want.

Calc Mode Setting the Connection Resistance to CALC causes the 1000HX to measure the resistance of the connections in the Sample Cable in the same way you would measure them with an ohmmeter. In this mode, the analyzer can only measure resistances up to 10KΩ. After the analyzer calculates the resistance of the Sample Cable, it prompts RESISTANCE READY. Press the DISPLAY/PRINT switch to display all resistances measured below 10KΩ. **Note:** Calc Mode should only be used for measuring resistances. It should NOT be used for general cable testing

Hipot Voltage

HIPOT VOLTAGE specifies the voltage that will be applied during hipot testing between pins that should not be connected. This determines how effective the insulation on a cable is during a test. The higher the voltage you set, the higher the insulation resistance the analyzer can detect. Voltage settings will affect the range of insulation resistance settings available to you.

Insulation Resistance

By setting the INSULATION RESISTANCE threshold, you select the *highest* resistance that the analyzer will detect during a test (with hipot turned off). For example, setting the Insulation Resistance at 50KΩ means the analyzer will detect connections with resistances up to 50KΩ. Any connections with resistances higher than 50KΩ will be ignored. **Important!** The Insulation Resistance setting *must* be equal to or greater than the Connection Resistance setting. When you select a hipot voltage, the Insulation Resistance is the level at which a hipot failure will be detected.

The table below shows how the Hipot Voltage setting limits what Insulation Resistance settings are available.

Hipot Voltage vs. Insulation Resistance Settings	
Hipot Voltage	**Available Range of Insulation Resistance Settings**
OFF	From the Connection Resistance value you set to 100KΩ, then 500 KΩ, 1 MΩ, and 5MΩ.
50 V	5MΩ, 10MΩ, 20MΩ.
100 V	5MΩ, 10MΩ, 20MΩ, 50MΩ.
200 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ.
300 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ.
400 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ.
500 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ, 500MΩ.
630 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ, 500MΩ.
800 V	10MΩ, 20MΩ, 50MΩ, 100MΩ (200MΩ, 500 MΩ with special adapters).
1000V	10MΩ, 20MΩ, 50MΩ, 100MΩ (200MΩ, 500 MΩ with special adapters). **Note**: If you plug in an adapter not specially designed for 800 V or 1000 V, the analyzer will reset the Insulation Resistance value to 100MΩ.

Hipot Duration
The HIPOT DURATION setting determines the length of time voltage will be applied to each net during hipot testing. **Important!** The system will not perform a hipot test until a cable has passed the low voltage test. If leakage above the set threshold is detected, the high voltage is immediately switched off (within 10ms).

Apply Hipot To
The APPLY HIPOT TO setting determines whether the hipot voltage will be applied to all adapter pins (whether they have connections or not), or only to those adapter pins that are connected to other pins in the cable's wirelist. The available settings are ALL ADAPTER PINS or CONNECTIONS ONLY. The CONNECTIONS ONLY setting should only be used when you don't want to test unused pins for leakage or arcing.

Single Net Error
The range of settings for this option is IS IGNORED or FAILS HIPOT. This option allows cables with *one* oversized net, or a net with excessive capacitance (that would normally fail) to pass a hipot test. Most of the time, a cable that has insulation resistance problems will show two or more net failures since they will be leaking to each other. **Caution!**

 Auto Hipot
This option lets you choose between automatic and manual hipot testing. When this option is ON, the analyzer will automatically begin a hipot test on a cable as soon as that cable passes the low voltage test. You can repeat the hipot test by pressing the FUNCTION switch. When this option is OFF, a cable will not be hipot tested (after passing the low voltage test) until you press the Function switch. The Function switch becomes a "push-to-test" switch on the hipot test.

Error Tones
When the analyzer detects errors, it emits a series of sharp beeps. This setting allows you to set the volume of these beeps. The available settings are OFF, LOW, and HIGH.

Sorted Wire List
When this option is ON, it changes the order that nets appear in the wirelist. When this option is OFF, the order that nets appear in the wirelist is determined by the scanning order of the analyzer. When this option is ON, the sequencing pattern of the lowest connector determines the order that nets appear in the wirelist.

Count All Cables
Once the analyzer is programmed, and you've begun testing cables, the analyzer begins to count the cables you test. When this option is ON, the printout from your tests shows the total number of cables tested, as well as the number of cables which tested as good. When this option is OFF, the printout will show only the number of cables that tested as good.

Auto Print
When a printer is connected and this option is ON, the system will print a one-line report when each cable being tested is disconnected, indicating whether that cable is good, bad, or intermittent. When this option is OFF, the system will not print each result automatically.

Learn and Store a Sample Cable

Overview
In this chapter, we will show you how to learn a Sample Cable, and then store the wirelist from that cable in one of the permanent memory locations in the analyzer.

Memory in the 1000HX
The Signature 1000HX has 50 memory locations you can store wirelists in. Large wirelists take up more memory than small ones. You can store wirelists in these locations, retrieve wirelists from them, and delete wirelists from them. There is also one temporary memory location called "Last Learned."

Last Learned
When the analyzer learns a new Sample Cable, the wirelist data from that cable is stored in the temporary "Last Learned" memory location. It stays there until you overwrite it by learning another Sample Cable, or calling up a saved test program from memory.

Learn a Sample Cable
Before you can learn a Sample Cable, you must install the right cable adapters on your 1000HX (see page 3).

To learn the Sample Cable:

1. Connect the Sample Cable you want to learn to the connector adapters already installed on the 1000HX. Turn on the analyzer by pressing the ON switch. The analyzer will learn the cable, and then prompt PLEASE VERIFY.

2. Verify that the Sample Cable has been learned correctly. To verify the sample cable, press DISPLAY/PRINT.

   - **If you <u>have</u> a printer connected to the analyzer,** when you press DISPLAY/ PRINT, the analyzer will print out the cable's wirelist information. The printout is your cable documentation. Compare the printed information to the Sample Cable's specification sheet or build list to ensure the cable is good.

   - I**f you do <u>not</u> have a printer connected to the analyzer,** pressing DISPLAY/ PRINT causes the analyzer to prompt wirelist information in its display. Repeatedly press DISPLAY/PRINT to step through the wirelist, transcribing the information to a blank documentation form (see page 60) as you go. Compare the transcribed information to the Sample Cable's specification sheet or build list to ensure the cable is good.

3. Disconnect the Sample Cable from the analyzer.

Store the Sample Cable in Memory

Now that you have learned the Sample Cable, and verified that the wirelist data is correct, you may store the cable in the analyzer's memory.

To store the cable:

1. Press and hold in the MEMORY button (located on the back of the analyzer as shown below).

Press and hold

2. When you press the MEMORY button, the analyzer will prompt READY TO SAVE LEARNED CABLE. Continue to hold in the Memory button.

3. While holding in the MEMORY button, press DISPLAY/PRINT to select a memory location. Each time you press DISPLAY/PRINT the analyzer prompts the next unused memory location. For example, if location #1 is empty, the display will prompt MEMORY LOCATION 1 IS NOW UNUSED. Keep pressing DISPLAY/PRINT until you find the memory location you want.

Hold in the MEMORY button while pressing here.

Note: If the display prompts NO MEMORY AVAILABLE, all of the analyzer's memory locations are full. You will have to delete a wirelist to make room available (see page 22).

4. When you have found an available memory location, continue holding in the MEMORY button, and press FUNCTION to save the newly-learned wirelist to that memory location. The display will prompt MEMORIZING LAST LEARNED CABLE.

5. Release the MEMORY button. The display will prompt LAST LEANRED NOW IN LOCATION X. The wirelist is now stored in the analyzer's memory.

Hold the MEMORY button in while you press here

Error Messages

If an error message appears, such as LEARNED CABLE RESIS ERROR or INSULATION RESIS<AUTO.XXXX while you are trying to learn a Sample Cable, check the following:
If the error message is LEARNED CABLE RESIS ERROR, the cable may have resistances that fall between the Connection Resistance and Insulation Resistance settings.
- Press DISPLAY/PRINT to locate points with resistance errors, and document them. If the cable is correctly built, change the resistance settings to accommodate the cable (see page 13).
- If the cable is not built correctly, use another Sample Cable that does not contain the errors, and repeat the learning process.

Now that you have installed any expansion boxes you will be using, have installed your connector adapters, have checked the option settings, and have programmed the analyzer by learning a Sample Cable (see page 16), or by retrieving a cable from the analyzer's memory (see page 21), you are ready to test your first cable.

To test your first cable:

1. Disconnect and remove the Sample Cable from the analyzer.

2. Connect the cable you want to test to the analyzer.

   - Once you have connected the cable, the analyzer will automatically begin the test. **Note**: If you have set the AUTO HIPOT option to OFF, the analyzer will stop after the continuity and conductance tests, prompt READY TO HIPOT, and wait for you to press FUNCTION to begin the hipot test.

   - **WARNING!!** Be sure not to connect a powered "live" cable to the analyzer! This will seriously damage your analyzer and will immediately void any stated or implied warranty.

Check the Display and Interpret the Sounds

As the analyzer tests a cable, it will display results on its LCD display and emit sounds. Here is how to interpret what you see and hear:

If a cable is good:
The display prompts the same alphanumeric signature as the Sample Cable. The display will show GOOD R<X.XΩ and the analyzer will emit a steady clicking sound.
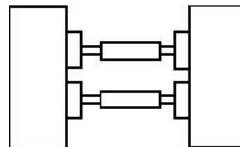
SIG:XXXXXX-XXXX
GOOD R<XXXΩ

Click. Click. Click. Click…

If a connection is missing:
The display prompts OPEN DETECTED, and the analyzer emits a series of single beeps.
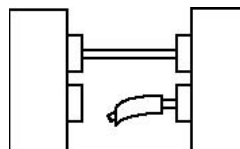
OPEN DETECTED

Beep. Beep. Beep. Beep…

If the analyzer detects a short:
The display prompts SHORT DETECTED, and the analyzer emits a series of double beeps.
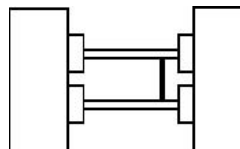
SHORT DETECTED

Beep Beep. Beep Beep...

If a miswire (both opens and shorts) is detected:
The display prompts ERRORS DETECTED, and the analyzer emits a series of triple beeps.
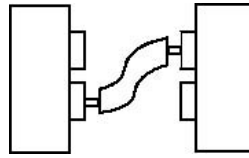
ERRORS DETECTED

Beep Beep Beep. Beep Beep Beep…

If an insulation short is detected:
The display prompts either BAD R> XΩS or INSULATION SHORT. Both prompts indicate that the measured resistance is higher than the Connection Resistance setting, and lower than the Insulation Resistance setting. The analyzer will emit a series of double beeps.

BAD R> .xΩ **or** INSULATION SHORT

Beep Beep. Beep Beep. Beep Beep. Beep Beep...

Interpreting Hipot Test Results

If you have set the AUTO HIPOT option to ON, the analyzer will automatically hipot test each cable after the cable passes the resistance tests. If this option has been set to OFF, the analyzer will prompt READY TO HIPOT, and you will need to press FUNCTION to begin the hipot test.

Note: During the Hipot test, if you happen to touch any un-insulated part of the cable under test, you may experience a mild but annoying electrical shock, and cause the hipot test to fail.

Failed Hipot Test

If the hipot test detects errors, the analyzer prompts FAILED HIPOT TEST. Press DISPLAY/PRINT to step through the errors detected. The display will prompt the problem nets as HAS LEAKAGE, OVER CURRENT, or DIALECTRIC FAILURE.

FAILED
HIPOT TEST
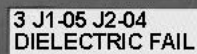
3 J1-05 J2-04
HAS LEAKAGE

3 J1-05 J2-04
OVER CURRENT

Has Leakage indicates that there is weak insulation between pins or bare wires that nearly touch. These defects have the potential to become short circuits. At the most sensitive settings, contamination from fingerprints or body oils deposited while handling connectors may cause a cable to fail.

Over Current indicates that the cable either has excessive capacitance for the selected hipot voltage setting, or the resistance of the leak is sufficiently low (approximately 500KΩ). If the cable has too much capacitance, try using a lower hipot voltage.

Dielectric Fail indicates that the analyzer detected electrical arcing between nets during the hipot test. If the analyzer can isolate the nets that are arcing during the test, it will prompt them in the display. If it cannot isolate the specific nets that are arcing, it will prompt UNDETERMINED NET.
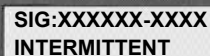
```
3 J1-05 J2-04
DIELECTRIC FAIL
```

```
UNDETERMINED NET
DIELECTRIC FAIL
```

An **Intermittent** error will display if a cable develops shorts or opens after it first tests "good." The analyzer emits a steady series of clicks as though the cable were good.

```
SIG:XXXXXX-XXXX
INTERMITTENT
```
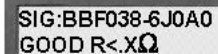
- Press DISPLAY/PRINT to show the error condition that existed when the intermittent occurred.

- Clear the intermittent by pressing the MEMORY button on the back of the analyzer.

Passed Hipot Test
If the hipot test is successful, the analyzer briefly prompts PASSED HIPOT TEST, then cycles to a continuous resistance test and prompts GOOD R<.XΩ. The analyzer emits a steady clicking sound after each newly-completed continuity/conductance test. To repeat the hipot test, press FUNCTION again. The conductance test always follows a successful hipot test, and continues until you remove the cable.

```
PASSED HIPOT TEST
```

```
SIG:BBF038-6J0A0
GOOD R<.XΩ
```

Print or Transcribe an Error List
If the analyzer detects errors in a cable, it will display where the errors are located. To do this, press DISPLAY/PRINT while the cable is still connected to the analyzer. If you have a printer connected to your analyzer, it will automatically print out an error list. If you do not have a printer, keep pressing DISPLAY/PRINT to step through the errors as you transcribe them to a cable documentation form (see page 60).

Retrieve a Cable from Memory

Before the 1000HX can test cables, it has to be programmed with wirelist data for the cables you intend to test. You can avoid having to re-learn a Sample Cable each time you want to test by storing the learned information in the analyzer's memory (see page 17). Once the information is stored, all you have to do is install the correct cable adapters on the analyzer, and retrieve the cable data from memory in order to program the analyzer.

To retrieve a test from memory:

1. Install the connector adapters that mate with the cables you want to test (see page 3).

2. Hold in the MEMORY button as you turn on the analyzer. Continue holding in MEMORY as you complete the next step. The analyzer will prompt READY TO ACCESS MEMORY LOCATIONS.

Press and hold...   ...as you turn the analyzer on

3. Continue holding in MEMORY while you press DISPLAY/PRINT to step through the Sample Cables stored in the analyzer's memory. The first time you press the switch, the display prompts the signature of the cable in the "Last Learned" memory location.

Continue to hold...   ...while you step through the cable signature

4. Press DISPLAY/PRINT again. The analyzer prompts the signature for the cable that is stored in memory location number one (there can be as many as fifty memory locations).

5. Continue holding MEMORY and pressing DISPLAY/PRINT until you get to the memory location you want.

6. When you reach the desired memory location, release the MEMORY button.

   - If the display prompts READY TO TEST, the analyzer has retrieved the Sample Cable data, the correct adapters are in place, and you are ready to test cables.

   - If the display prompts JX ADAPTER SIG: SHOULD BE, the adapters you installed do not go with the retrieved Sample Cable. Read the display to get the correct adapters and their positions, and install them.

When the cable is retrieved and adapters are correct, you are ready to test.

If installed adapters are not correct, the display will prompt you to install correct adapters. Once installed, the display will prompt READY TO TEST.

Note: You can install adapters without turning off the analyzer when it is in this mode. Once you have installed the correct adapters, the display will prompt READY TO TEST.

Delete a Cable from Memory

The Cirris 1000HX has a maximum of fifty memory locations for storing cable information. How many locations are actually available depends on the size of the wirelists being stored. Small wirelists take up less space than large ones. You may need to delete cables to make room for new wirelists, or discard wirelists you no longer use for testing.

To delete a cable:

1. Hold in MEMORY as you turn on the analyzer, and continue to hold it in. The analyzer will prompt READY TO ACCESS MEMORY LOCATIONS.

Press and hold...   ...as you turn the analyzer on

READY TO ACCESS MEMORY LOCATIONS
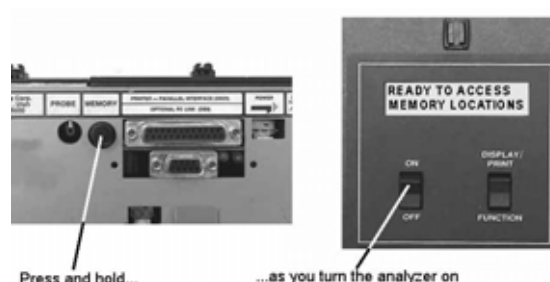
2. Continue holding in MEMORY while you press DISPLAY/PRINT to step through the Sample Cables stored in the analyzer's memory until you come to the signature of the cable you want to delete (the first cable displayed will be the cable in the "Last Learned" memory location; this cable cannot be deleted). When you come to the cable you want to delete, the display should prompt MEM. LOCATION X SIG: XXXXXX-XXXX, indicating the memory location and signature of the cable.

Continue to hold...

MEM LOCATION X
SIG:XXXXXX-XXXX

3. Continue holding in MEMORY while you press FUNCTION to select the cable to delete. Continue to hold down FUNCTION as you complete the next step.

Continue to hold...

MEM LOCATION X
IS TO BE DELETED

...while you press here to select the cable for deletion

4. Delete the Sample Cable you selected by first releasing MEMORY and then releasing FUNCTION. When you release MEMORY, the prompt will change to MEM LOCATION X IS TO BE DELETED. When you release FUNCTION, the prompt will change to IS NOW UNUSED. The memory location is now empty.

First release this button...

MEM LOCATION X
IS NOW UNUSED

...and then release this button

Print a Directory of Stored Cables

If you have a printer connected to your 1000HX, you can print a directory that shows all the Sample Cables stored in the analyzer's memory. The directory will show the memory location number, and the signature of the Sample Cable stored in each memory location.

Important Note: For photographic clarity, we have removed the printer cable in photos. For your printer to work, it *must* be connected to the analyzer.

To print a directory:

1. Make sure the printer is properly connected to the analyzer, and is turned on.

2. Press and hold in the MEMORY button as you turn on the analyzer. Continue to hold in the MEMORY button as you do the next step.

Press and hold this button...
(Note: Printer cable is not shown)

...as you turn the analyzer on

3. As you continue to hold in the MEMORY button, press DISPLAY/PRINT once. The display will prompt PRESS FUNCTION TO PRINT DIR.

Continue to hold this button in...
(**Note:** Printer cable is not shown)

...as you press here

4. When the display prompts PRESS FUNCTION TO PRINT DIR, press the FUNCTION switch. If your printer is properly connected to the analyzer, turned on, and online (selected), it will print a directory showing the signatures of all the cables stored in memory and their corresponding location numbers.

Press here to print a directory

5. Release the MEMORY button.

Cable Documentation

Cable Documentation is a printed record of a Sample Cable's unique signature, adapters, and test parameters. It also contains a complete list of the interconnections in the cable and any notes necessary to help you build the cable.

Prepare Cable Documentation

When you prepare complete documentation, you prepare a standard set of information from which future cables will be built. The 1000HX can help you prepare documentation by learning a Sample Cable. Once the cable has been learned, you can either transcribe it by hand onto documentation form (see page 60), or print it out if you have a printer connected to your analyzer. Once the cable has been completely documented and stored in memory, you won't need to keep an array of "known good" cables handy for comparison. If the signature prompted by the analyzer after learning a sample is the same as the signature in the cable's documentation, you can be sure the cable is correctly built according to your specifications.

You can store Sample Cable information in the analyzer's memory. When you retrieve that information from memory, you program the analyzer just as if you'd learned a real Sample Cable. The analyzer will prompt the Sample Cable's alphanumeric signature, and which connector adapters to install. See page 17 for information on how to store a Sample Cable in memory, and page 21 for information on how to retrieve a cable from memory.

Interpret Cable Documentation

The documentation your 1000HX produces contains all the information you will need to precisely duplicate test setups. This example shows a typical wirelist with the cable signature, parameter signature, adapter signatures, and resistance settings.

B.40----------(M)

SIGNATURE 1000HX CABLE DOCUMENTATION

(C) (A)— CABLE SIGNATURE: BBFO38
(D)— PARAMETER SIGNATURE: KX8NJ
J1 ADAPTER SIGNATURE: 03FAC1
J2 ADAPTER SIGNATURE: F5B4E0
(F)— CABLE DESCRIPTION: _ _ _ _ _ _ _

(B)
CABLE PART NO: _ _ _ _ _ _ _ _ _ _ _ _ (E)

CONNECTOR DESCRIPTION: _ _ _ _ _ _
CONNECTOR DESCRIPTION: _ _ _ _ _ _

(G)
PARAMETER SETTINGS:
CONNECTION RESISTANCE
HIPOT VOLTAGE
INSULATION RESISTANCE
DURATION PER NET
APPLY HIPOT TO

WIRE LIST:
NO. COMMON CONNECTIONS
(H)— 1 J1-01 J2-01
(I)— 2 J1-02 J2-03
3 J1-03 J2-02
4 J1-04 J2-04 J2-20

(J)— TOTAL CABLES TESTED: 50
INTERMITTENT CABLES TESTED: 6
GOOD CABLES TESTED: 40

(K)
DATE: _ _ _ _ _ _ _ _ _ _ _ _ _ _

(L)
NOTES: _ (See Next Page for Explanations)

A. This example shows a cable with the cable signature BBF038. Both this signature and the five-digit parameter signature (see item C below) must match those prompted in the display when you are preparing to test a cable.

B. This space is for writing in the part number of the cable.

C. This is the five-digit parameter signature that represents the voltage and resistance settings you have selected for testing the cable. This signature must match the one shown in the analyzer's display for the resistance and voltage levels to be the same.

D. This is the connector adapter signatures. In this example, the signature for the adapter in position J1 should be 03FAC1. The signature for the adapter in position J2 should be F5B4E0.

E. This space is for writing in a brief description of the connector adapters.

F. This space is for writing in the cable description.

G. This section shows the test parameter options in the tester.

H. Each net (group of interconnected pins) is identified by a *net number*. The net numbers appear directly under the number heading NO, and are immediately followed by the connected pints that comprise that net.

I. The interconnections that comprise each net appear after each net number, and are shown directly under the heading COMMON CONNECTIONS. The numbers J1, J2, J3, and J4 indicate the adapter postion. The number after the hyphen is the specific pin to which a connection is made.

J. This example shows that a total of 50 cables have been tested. Forty of these tested as good. Six cables tested as having intermittent errors and four tested as bad. This breakdown of good and bad cables appears on the documentation because the analyzer's COUNT ALL CABLES option was set to ON. When this option is set to OFF, the printout shows only the number of cables which tested as good.

K. This space is for writing in the date of the test.

L. This space is for writing in any additional notes. You may wish to incude a drawing of the cable here.

M. This shows the EPROM revision number your analyzer is equipped with.

Signatures

Signatures are the working basis of the 1000HX system. When the 1000HX learns a Sample Cable (a cable that you know is good), it computes and displays a cable signature for that Sample Cable. This signature becomes part of your cable documentation.

- When the signature shown in the analyzer matches the signature in your cable documentation, you know that your test setup is correct.

Types of Signatures

The 1000HX uses three types of signatures: the Cable Signature, the Parameter Signature, and the Connector Adapter Signature(s).

- **Cable Signatures**

  The first six characters in a signature (as displayed in the 1000HX) make up the Cable Signature. The Cable Signature represents a summary of the interconnections of the cable and the connector adapters being used.

- **Parameter Signatures**

  The 1000HX first displays the six-digit Cable Signature followed by a hyphen. The five-digit alphanumeric number that follows the hyphen is called the Parameter Signature. It represents the voltage and resistance settings you have selected. If you select the same voltage and resistance settings for two different kinds of cables, both kinds will have the *same* parameter signature, but *different* cable signatures.

- **Adapter Signatures**

  The adapters you use to connect your cables to the 1000HX each have a unique, six-character signature called an Adapter Signature. Adapter Signatures help you verify that your tests are setup correctly. These signatures appear on the labels attached to the adapters and on your cable documentation. When the adapter signatures match those found on your cable documentation, you have installed the correct adapters.

26

Select a Test Procedure

Testing Options
There are three different types of testing: Simple testing, Complex assembly, and Hipot testing.

Simple Testing
Simple tests are used for testing cables made up of only wires and connectors. These cables have no resistors, capacitors, diodes, or active circuitry. With a simple test, set the Connection Resistance to a low number (typically less than 10Ω), and, depending on the capacitance of the cable, set the Insulation Resistance to a higher setting.

Complex Assembly
Complex tests are for cable assemblies that contain components such as resistors, diodes, or capacitors.

Determine Connection Resistance
When you set the option CREATE TEST FROM to COMPLEX ASSEMBLY, set the Connection Resistance to a value that is greater than the highest wire resistance and less than the lowest component resistance. The 1000HX automatically sets the Connection Resistance to a default value of 5Ω. You can change this value to suit your needs.

Note: If you are not sure what Connection Resistance setting is appropriate for the cable(s) you are going to test, you can determine a good value by using the CALC feature (see page 13).

To determine the Connection Resistance setting for a cable:

1. Set the CREATE TEST FROM option to SAMPLE CABLE.

2. Set the CONNECTION RESISTANCE setting to CALC.

3. Turn on the analyzer, and learn the cable.

4. When the display prompts PLEASE VERIFY, press the MEMORY button on the back of the analyzer and the prompt will change to RESISTANCE READY.

5. Press DISPLAY/PRINT, and a list of the measured resistances in the cable will print.

6. From your printout, locate the following resistances:

    *   The **highest** measured resistance for nets that contain wires only.

    *   The **lowest** resistance for nets that contain components which exhibit resistance.

You can now choose a mid-range setting from the high and low resistances. For example, the printout below shows that net 4 contains a resistor, and has a resistance of 20 ohms. Net 1, which is only a wire connection, has a resistance of .1 ohm. All other nets have a zero resistance. Therefore, when you set Connection Resistance for testing a complex assembly, you could select any value from .1 ohm to 20 ohms. As you can see, the automatic default setting of 5 ohms falls well within this range.

```
CABLE SIGNATURE 6CEEOD

1 J1-001 J2-001
RESISTANCE .1 ohm  ◄──────────── Highest wire resistance .1 ohm

2 J1-002 J3-002
RESISTANCE .0 ohm

3 J1-003 J3-003
RESISTANCE .0 ohm

4 J1-004 J3-004
RESISTANCE 20 ohm  ◄──────────── Lowest component resistance 20 ohm

5 J1-005 J3-005
 RESISTANCE .0 ohm

6 J1-006 J3-006
RESISTANCE .0 ohm

7 J1-007 J3-007
RESISTANCE .0 ohm

8 J1-008 J3-008
RESISTANCE .0 ohm

9 J1-009 J3-009
RESISTANCE .0 ohm
```

7. Set the Connection Resistance to a value **greater** than the highest wire resistance, and **less** than the lowest component resistance.

Learn a Complex Assembly

1. Install the correct cable adapters, and connect the cable that you want to learn to the analyzer.

2. Turn on the analyzer to learn the cable assembly.

The analyzer will display LEARNING CABLE as it learns all the interconnections in the cable, which have resistances up to the Connection Resistance setting you selected.

The display changes to LEARNING COMPLEX as the analyzer learns the pattern of wires, which have resistances less than the Insulation Resistance Setting.

Lastly the prompt will change to CREATING CHECKS as the analyzer learns the resistors and diodes in the cable. The analyzer sets the accuracy of the resistor check to a default value of 10%. You can change this value using the optional CTLWin software from Cirris Systems.

Important! If you change this value, the analyzer's accuracy (4%) should always be added to the expected accuracy of the resistance.

Document a Complex Assembly

When the analyzer has finished learning a complex assembly, it prompts SIG:XXXXXX-MULTI PLEASE VERIFY. Either press DISPLAY/PRINT to print the documentation or transcribe the document by hand.

Documentation from a complex cable assembly differs from that of a simple assembly in some ways. See the below example of a printout in detail.

```
-------------------------------------------
SIGNATURE 1000HX CABLE DOCUMENTATION                  (A)
_____

CABLE SIGNATURE: CDE01A        CABLE PART NO:_____     (B)
PARAMETER SIGNATURE:  MULTI
J1 ADAPTER SIGNATURE: ACEFA1   CONNECTOR DESCRIPTION:  _____
J2 ADAPTER SIGNATURE ACEFA1    CONNECTOR DESCRIPTION:  _____
CABLE DESCRIPTION: _____
                                                              (C)
INSULATION TEST PARAMETER SIGNATURE    4X6FJ
HIPOT VOLTAGE                          100Ms
INSOLATION RESISTANCE                  >50M ohm
DURATION PER NET                       100 mS
APPLY HIPOT TO                         ALL ADAPTER PINS
SINGLE NET ERROR                       FAILS HIPOT
                                                              (D)
WIRE LIST SIGNATURE           56FE0C-8Z040
WIRE RESISTANCE                 <.2 ohm                       (E)
COMPONENT RESISTANCE            >15.0 ohm
SORTED WIRE LIST                                              (F)
NO. COMMON CONNECTIONS
1 J1-001 J3-001
2 J1-002 J3-002
3 J1-003 J3-002
4 J1-006 J3-006
5 J1-007 J3-007
6 J1-008 J3-008
7 J1-009 J3-009


                                                              (G)
CHECK COMPONENTS:  NO.
DESCRIPTION                                                   (H)
1 RESIS: J1-004 J3-004 20 ohm 10%
2 DIODE:  J3-005 J1-005                                       (I)
3 LINK:  J1-010 J3-010
NOTES:                                                        (J)
```

A. This cable signature represents the wirelist combined with a signature for the components.

B. A MULTI parameter signature indicates that this documentation was created with the CREATE TEST FROM option set to COMPLEX ASSEMBLY.

C. The Insulation Test Parameter signature represents the setting used for the insulation test.

D. The Wire List Signature represents the connections and settings for the wire test, followed by a list of all wire interconnections.

E. The Wire Resistance is the _highest_ allowable point-to point resistance.

F. The Component Resistance displays a value that is 20% lower than the lowest resistance in the learned cable.

G. With Check Components, each line that follows is an independent test for specified points. They can be resistors, diodes, or links.

H. The RESIS line indicates that a resistor is present in the cable between J1-003 and J1-004.

I. The DIODE line indicates that a diode is present in the cable and that it is connected between J3-005 and J1-005.

J. The LINK line shows two points that were linked in the learned Sample Cable, but a specific test was not created for them. This occurs when the analyzer cannot determine exactly what component is present.

To test a complex cable assembly:

1. Set the test options (see page 11), and connect a Sample Cable to the analyzer.

2. Learn and document the sample cable.

3. Disconnect the sample cable, and connect the cable that you want to test.

First Pass of a Complex Test

Insulation Test
First, the analyzer performs a low voltage insulation test to verify that points which are not supposed to be connected are in fact, not connected.

- If you _have_ set a hipot voltage, this test is supplementary to the hipot test that will be conducted later on. It is used to find gross errors.

- If you _have not_ set a hipot voltage, this test is the insulation portion of the complex test, and the analyzer will use the insulation test parameters you have set.

Wires Test

Second, the analyzer does a wires test (checking connections without resistors) using the wirelist test parameters. If it detects an error, the analyzer loops on this test.

Check Components Test

Third, the analyzer tests individual components. If an error is detected, the analyzer loops on that specific check.

Important! If an error is detected during any of these three tests, press DISPLAY/PRINT to print out an error list. If the analyzer does not detect errors, it will continuously loop on the first three tests until you disconnect the cable.

Complex Assembly Limitations

When you test complex assemblies, remember the following:

- Any connections which have resistances between the Wire Resistance and the Component Resistance are seen by the analyzer as errors. The resistances are too low to be seen as components, and too high to be seen as wires.

- All points in a cable assembly that are not connected by either components or wires must be insulated from each other by resistances which are greater than the Insulation Resistance setting.

- All connections which have resistances that fall between the Component Resistance setting and the Insulation Resistance setting are seen by the analyzer as components. They must have a corresponding Component Check, and must pass the test for that check.

Hipot Test

If you have set a hipot voltage, and the analyzer does not detect any errors during the previous tests, the screen will prompt READY TO HIPOT.

- If the AUTO HIPOT option is set to ON, the analyzer will automatically perform a hipot test after the cable has passed all other tests.

- If the AUTO HIPOT option is set to OFF, the analyzer will prompt READY TO HIPOT. You must press FUNCTION to begin a hipot test.

Hipot Testing

The purpose of hipot testing is to test the effectiveness of the insulation on a cable assembly. When you hipot test, you are making sure that there is extremely high electrical resistance between points that should not be connected in the cable or harness.

Important note! Before the analyzer performs a hipot test, it performs a connection resistance test (sometimes called a continuity test) to make sure that all connections in the cable are correct. If the analyzer finds any open or shorted connections during the continuity test, it will not perform the hipot test.
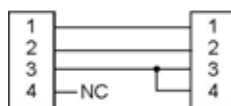
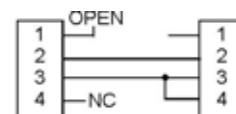This is a known-good cable with all connections intact.

This cable contains an OPEN. The hipot test cannot be done on this cable.

Once a cable passes the continuity test, the analyzer can begin a hipot test. The analyzer applies high voltage to a group of connected pins ("nets"). The remaining pins are tied together. In the example below, we see net number 1 being hipot tested.
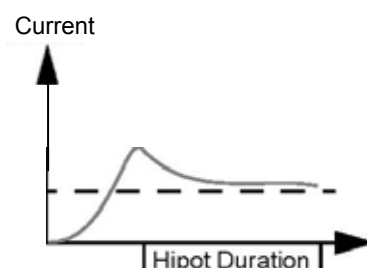
Hipot Voltage

Current

Meter
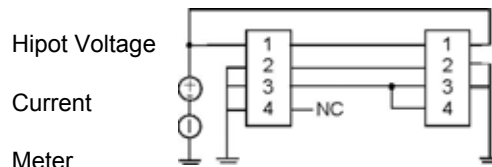
Remember that each net the analyzer tests has capacitance to every other net. That means there is a current surge as this capacitance is charged. The analyzer carefully monitors this current surge. The amount of current tells the analyzer how much energy is being delivered to the cable. If the current delivered is excessive, the amount of energy delivered might be dangerous; therefore, the analyzer shuts off the high voltage and fails that net, labeling it "Over Current."

Maximum allowable current

Hipot Duration

Overcurrent error
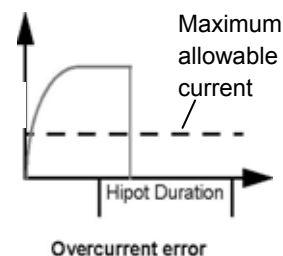
If the current surge subsides to an acceptable level, the hipot test continues. The analyzer has already calculated the maximum amount of current it will allow based on the Hipot Voltage and Insulation Resistance option settings you have chosen (see page 13). The current flow is monitored during the hipot duration you have set, to make sure it does not exceed the maximum allowed current. If the current flow stays below the maximum allowed current for the hipot duration, the net passes the test. If it does not stay below the maximum allowed current, the net fails the hipot test, and the analyzer labels it "Has Leakage." **Note**: The analyzer does *not* check where the current flows; it only knows that too much current is leaving the high voltage power supply.

Current

Hipot Duration

"Has Leakage" error

If the current flow spikes above the maximum allowable current during the hipot duration, the analyzer shuts off the high voltage, and labels the cable as having a dielectric failure.

Current

Time

Hipot Duration

Dielectric Failure
Maximum allowable current

32
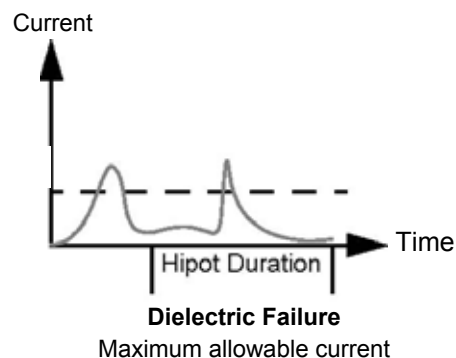
Tips on Selecting Hipot Voltage Settings

Remember, when you select a hipot voltage, you are setting the amount of voltage to be applied between pins that are *not* connected. When you select hipot voltage settings:

- The more voltage you use, the more likely the analyzer is to detect contamination between pins or frayed wires that almost create a short circuit. However, higher test voltages only work well on cables with little pin-to-pin capacitance.

- Higher voltage settings require greater pin-to-pin spacing on cable connectors.

- The hipot test applies high voltage to a net (a group of connected pins) and measures the current that flows <u>from</u> the net. The analyzer does <u>not</u> determine which net or pin the current is flowing to. This means that if several nets have leakage, you cannot tell which nets leak to each other.

Hipot Voltage and Capacitance Problems

Excessive capacitance in a cable assembly is a major consideration when you are deciding on what Hipot Voltage, Hipot Duration, and Insulation Resistance settings to use. If a cable has shielding or a grounded net, capacitance problems are more likely to occur. Here are some tips to remember:

- In general, the higher the capacitance a cable has, the lower a hipot voltage setting you will be able to use. See page 19 for further information.

- If you find that a cable has excessive capacitance, first try lowering the HIPOT VOLTAGE setting. You may also set the SINGLE NET ERROR option to Is Ignored. This will cause the analyzer to ignore a single-net hipot failure (a single-net hipot failure is an indication of the presence of a net with high capacitance, a net with too many points, or a net that tests as borderline). Normally, hipot failures show up with at least two failed nets.

- If you have set the APPLY HIPOT TO option to CONNECTIONS ONLY, the analyzer will not detect leakage of a single net to any unconnected pins.

Tips on Selecting Insulation Resistance Settings

Remember, when you select an Insulation Resistance setting, you are specifying the <u>minimum</u> resistance allowed between unconnected points. See page 13 for more information on Hipot Voltage versus Insulation Resistance settings. Here are some helpful tips:

- Using the highest setting may increase your chances of finding certain errors. You might not want to use an extremely high setting. Oil, solder flux, or fingerprints left over from the manufacturing process can become conductive in high relative humidity conditions.

- If you are testing in relative humidity conditions above 75%, you may have more failures when you test at 500 Meg ohms, or even 200 Meg ohms.

- In general, select an Insulation Resistance setting that is lower than the resistance of normal contamination on the cable.

The table below outlines general guidelines for setting up tests. You can adjust the settings to meet your specific needs.

General Guidelines For Testing					
Test Type	Conn. Resis.	Ins. Resis.	Hipot Voltage	Hipot Duration	Comments
Calculating resistances only	CALC	N/A	OFF	N/A	Use CALC to help you determine where to set your Conn. Resis. threshold. CALC several cables, then set your own threshold. Make sure you d**o not** use CALC for testing!
Automatic test	AUTO	100KΩ	OFF	N/A	AUTO selects a Conn. Resis. threshold for you. AUTO takes the highest resistance measured between any two points and adds 20%. **Warning!** If you get a Sample Cable with a high resistance when learning in AUTO, you may be testing at a much higher threshold than you want. Use CALC to determine a proper connection threshold, and then set it yourself.
Fast test	1KΩ	1KΩ	OFF	N/A	The fastest possible test. This setting effectively makes the analyzer act like a continuity tester.
Long cable test	10Ω	5.0MΩ	100V	100mS	These settings are for low Connection Resistance, mild hipot testing. They allow you to test cables that are long, or that have high capacitances.
Typical test	0.5Ω	100MΩ	300V	100mS	Use these settings when low connection resistance is important, and the cable has little capacitance. Low connection resistance may require careful adapter maintenance. The hipot test will not work on extremely long cables.
Stringent test	0.5Ω	100MΩ	300V	100mS	Use these settings for slow, stringent testing when you need low connection resistance and extremely good insulation resistance. Maintain connector adapters carefully! Works only with clean adapters in low relative humidity.
Complex test	5Ω	100KΩ or more	Optional	Optional	Set the CREAT TEST FROM option to COMPLEX ASSEMBLY to learn an assembly that contains resistors, diodes, or divider networks.

The Hand-Held Test Probe

You can connect a hand-held test probe (provided with your analyzer) to your 1000HX. It will help you quickly identify test points as you rework or assemble cables.

Note: the probe works only when the analyzer is in test mode. It will not function when the analyzer prompts PLEASE VERIFY.

Installing the probe

Plug the probe into the connector labeled, PROBE, on the back of the analyzer.
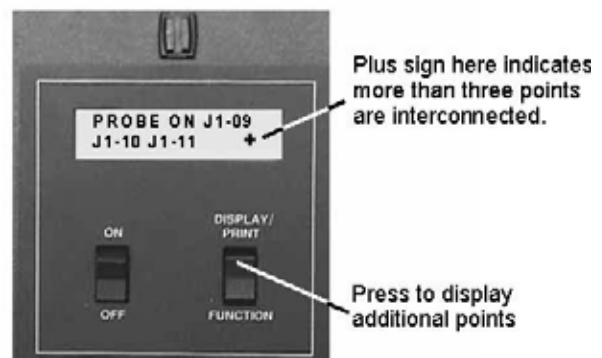

Plug the probe in here

Identifying test points using the probe

While the analyzer is in the test mode, touch the tip of the probe to the connector pin or wire you want to identify. For example, if you touch the probe tip to position J1, pin 11, the analyzer will prompt PROBE ON J1-11.

PROBE ON J1-11

Displaying multiple interconnected pins

Up to three different pins can be displayed at the same time. If more than three pins are interconnected, a plus sign (+) will appear in the lower right-hand corner of the display. To view any additional interconnections, press DISPLAY/PRINT.

PROBE ON J1-09
J1-10 J1-11   +

Plus sign here indicates more than three points are interconnected.

Press to display additional points

Using the probe to identify an open circuit and correcting an open

Using the probe, the analyzer can detect which end of an interconnection has an open. When the analyzer prompts, OPEN, use the sharp tip of the probe to pierce the insulation of the wire that should connect between two pins. The pin shown in the display is the pin that has a good connection to the wire. The pin that is *not* displayed is the open.
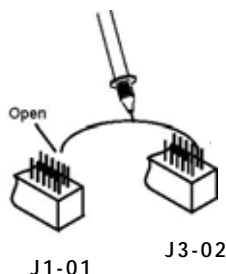
Rework Instructions

Before you begin reworking a cable assembly, remember that:

- If you have a printer connected to your analyzer, either turn it off or disconnect it.

- When the analyzer displays errors, pressing DISPLAY/PRINT *once* will put the analyzer into rework mode. If you press DISPLAY/PRINT twice, the analyzer will prompt all the errors it detects.

Removing shorts within a net

If the analyzer detects shorts:

BREAK JX-XXX

1. Press DISPLAY/PRINT *once* to put the analyzer into rework mode. The analyzer will prompt BREAK JX-XX, where X indicates the adapter position and the pin number. Break all connections indicated in the display.

2. When you break a connection, the analyzer will prompt the next short. When all the shorts have been broken, the analyzer will prompt the net and point to which you should connect JX-XX. Connect JX-XX to the point indicated in the display.
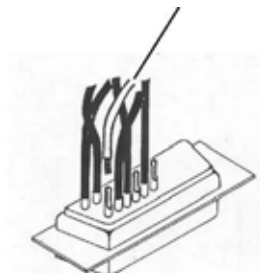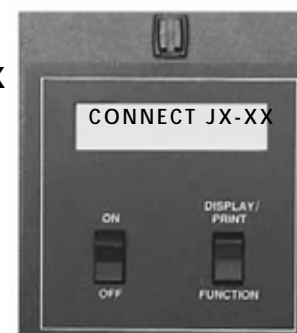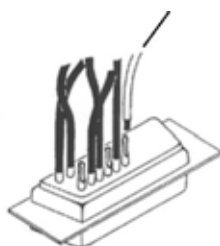
CONNECT JX-XX

3. Once you have corrected all the shorted connections, the analyzer will either prompt GOOD CABLE, or CONNECT JX-XX. If the analyzer prompts BREAK JXXX, you have another short. Go back to step 2 and try again.

Note: The analyzer may prompt Intermittents as you rework the connection. To clear this prompt, press the MEMORY button on the back of the analyzer.

Removing shorts between nets
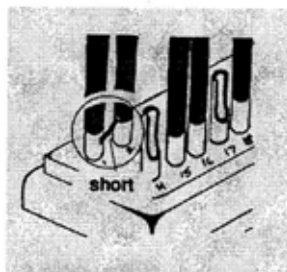If the analyzer detects short circuits in the cable or harness you are testing, it will tell you where to make cuts to correct the shorts. This will happen if two *nets* should become shorted. To correct a detected short:

1. The analyzer will prompt, CUT JX-XX FROM JX-XX, where X indicates the adapter position and pin number.

2. Locate the short between the net and remove it.

Correcting opens
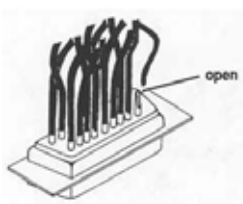If the analyzer prompts CONNECT JX-XX TO JX-XX; the cable you are testing has an open circuit.

To correct an open:

3. Locate the open circuit prompted in the analyzer's display.

4. Make the correct connections in the cable as indicated.
   - Once you have connected the open(s), the analyzer will prompt GOOD CABLE. If another short occurs, the analyzer will prompt BREAK JX-XX.

Guided Assembly

To use guided assembly to build pin-to-pin cables.

To build cables pin-to-pin:

1. Following the documentation for the kind of cable you want to build, install the correct connector adapters onto the 1000HX (see page 3).

2. Either connect a Sample Cable of the kind you want to build, or retrieve the correct wirelist from memory (see page 21). **If you are using a retrieved wirelist**, skip step 3 and go to step 4.

3. Turn on the analyzer, learn the Sample Cable, and disconnect the Sample Cable.

4. Install the same kinds of connectors used in the Sample Cable onto the cable adapters already installed in the analyzer.

5. Make the first connection in your cable that is specified in the documentation. The analyzer should prompt OPEN DETECTED.

6. Press DISPLAY/PRINT *once.* The analyzer will display the next set of points to connect.

7. Connect the next set of points prompted by the analyzer. If the connection is correct, the analyzer will display ATTACH JX-XX TO JX-XX.

8. Repeat the last step by connecting the next set of points prompted. If you create a short, the analyzer will prompt BREAK JX-XX.

9. Continue connecting points as prompted by the 1000HX until the analyzer prompts GOOD CABLE or READY TO HIPOT. This indicates you have finished wiring the assembly.

Build Cables with One End Terminated

To build cables that have only one end terminated with a connector:

1. Following the documentation for the kind of cable you want to build, install the right cable adapters onto the analyzer, and replace the cover plate.

2. Either connect a Sample Cable of the kind you want to build to the analyzer, or retrieve the wirelist from the analyzer's memory (see page 20). **If you use a wirelist retrieved from memory**, skip step 3 and go directly to step 4.

3. Turn on the analyzer, learn the Sample Cable, and disconnect the Sample Cable.

4. Insert the connector on the terminated end of the cable into the cable adapter on the analyzer.

5. Insert an empty connector (type correct for the cable) into the other cable adapter on the analyzer.

6. Plug the probe into the PROBE jack on the back of the analyzer.

7. Make the first connection specified in your cable documentation. The analyzer will prompt OPEN DETECTED.

   - If the analyzer prompts ERRORS DETECTED, you have created a short instead of connecting the two points that should be connected. Break the short, check your build list, and try again until the analyzer prompts OPEN DETECTED.

8. Press DISPLAY/PRINT to enter rework mode.

9. Probe the loose end of one of the wires. The display will prompt PROBE ON JX XXX. Connect this wire to the appropriate pin on the empty connector, according to your cable documentation.

10. If an error is detected in the analyzer, the display will read BREAK JX-XXX. Remove the error, and try reconnecting the loose wire at the correct position.

11. Continue until the display reads either GOOD CABLE or READY TO HIPOT.

Troubleshooting

Potential Problems

In this section we will tell you how to deal with three basic kinds of problems which may occur when you are working with your 1000HX:

- Error messages as prompted in the analyzer's display.

- General problems with the analyzer.

- Problems with printing.

Need more help? Call us!

Each section of this manual will help you solve problems you might have with your analyzer. You may be able to correct some of the problems yourself. If you find that the problem is a defective microprocessor or scanner assembly, or if for some other reason you cannot solve the problem yourself, please contact our customer support team at Cirris by calling 1-801-973-4600, or 1-800-441-9910. When you call, please have the following information ready:

- The model of your analyzer

- The purchase date (if you know it).

- The serial number

- What have you done already to try and solve the problem?

- Have your analyzer set up near your telephone so you can duplicate troubleshooting steps as our customer service team talks with you.
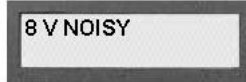
Error Messages

Every time you turn on your analyzer, it performs a complete self-test. If there is a problem in one of its systems, the analyzer will display an error message. If you see any of these error messages, call us at 801-973-4600 or 800-441-9910. This section lists all of the possible error messages, and some of the possible causes.

Possible Messages:

10 V HIGH	10 V LOW	10 V NOISY

Problem: The main power supply (located on the microprocessor assembly) is not working properly. This supply is powered from the wall mount transformer cube.

Possible Causes:
- Loose cable from the microprocessor assembly to the analog board
- Loose (or bad) wall transformer
- Bad microprocessor assembly
- Bad analog board
- Bad scanner assembly
- Incorrect line voltage in use (for example, 120 volts instead of 240)

Possible Messages:

8 V HIGH	8 V LOW	8 V NOISY

Problem: The measurement power supply (located on the analog board) is not working properly.

Possible Causes:
- Loose cable from the microprocessor assembly to the analog board
- Bad microprocessor assembly
- Bad analog board

Possible Messages:

NEG V HIGH	NEG V LOW	NEG V NOISY

Problem: The negative voltage supply (located on the microprocessor assembly) is not working.

Possible Causes:
- Loose cable from the microprocessor assembly to the analog board
- Loose cable from the analog board to the scanner boards
- Bad microprocessor assembly
- Bad scanner assembly
- Bad analog board

Possible Message:

```
6.2 ma ERROR xxx
110 < X 180
```

Problem: The current source (located on the analog board) needed for this test is not working.

Possible Causes:
- Loose cable from the microprocessor assembly to the analog board
- Bad analog board

Possible Messages:

```
OFFSET_C BAD xxx      OFFSET C_BAD xxx      OFFSETF_HxxxLxxx
66 < X <79            X > 100 ON G8         36 < X , 47
```

```
OFFSET COARSE         OFFSET FINE
CANT GET TO 25        CANT GO TO 23
```

Problem: The measurement system (located on the analog board) cannot control the input signal.

Possible Causes:
- Loose cable from the microprocessor assembly to the analog board
- Bad analog board

Possible Messages:

```
LOW CURRENT CAL       OFFSET CAL ERROR      GAIN xx X vvv
 ERROR xxx            nnn
```

```
CANT ADJUST           CANT ADJUST           CALIB. # xxx
OFFSET COARSE         OFFSET FINE           HI<= LO
```

```
CALIB # xxx
HI-LO=vv OPB=nnn
```

Problem: The analyzer was unable to calibrate the measurement system (located on the analog board).
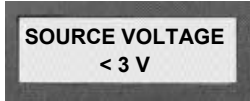
Possible Causes:
- Bad analog board

Possible Message:

```
HV ERROR xnnnnnn
```

Problem: A problem with the high voltage system (located on the analog board) was found.

Possible Causes:
- Relative humidity in the surrounding environment is above 75%
- Analyzer has been exposed to solvents or contamination
- Moisture has condensed on analyzer
- Loose cable between the analog board and the scanner assemblies
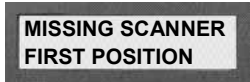- Bad scanner assembly
- Bad analog board

Possible Message:

```
SOURCE VOLTAGE
      < 3 V
```

Problem: The current source (located on the analog board) used to test the scanners is not working properly.

Possible Causes:
- Loose cable between the analog board and the scanner assemblies
- Loose daughter board on a scanner assembly
- Bad daughter board
- Bad scanner assembly
- Adapter on scanner has pin connected to earth ground

Possible Message:

```
MISSING SCANNER
FIRST POSITION
```

Problem: The first scanner cannot be found.

Possible Causes:
- Loose cable between the analog board and the first scanner assembly
- First scanner daughter card is not installed
- Loose daughter board in first scanner position
- First scanner daughter card is bad
- Bad analog board

Possible Message:

> **SCANNER OUT OF**
> **SEQUENCE**

Problem: One of the scanners is missing, or is not connected correctly to the analyzer.

Possible Causes:
- Scanner boards not installed properly
- Loose cable from the analog board to the scanner board
- Loose scanner daughter card
- Bad scanner daughter card
- Bad scanner mother board
- Bad cable from analog board to scanner boards
- Bad analog board

Possible Messages:

> **BOX n DB V PT nn**
> **SCR ERR**

> **BOX n DB V PT nn**
> **SNK ERR**

> **BOX n DB v PT nn**
> **CLR ERR**

Problem: A test point on a scanner board is not functioning properly. The point is located on daughter board 'v' on scanner assembly 'n.'

Possible Causes:
- Loose scanner daughter board
- Cable or harness presently connected to analyzer has a point connected to earth ground or to some power source
- Loose cable from the analog board to the scanner assembly
- Bad scanner daughter board
- Bad analog board

General Problems with the Analyzer

There are problems you may see with the analyzer that are not detected internally.

Problem: The analyzer's display is blank and there is no sound.

Possible Causes:
- Bad 10 VAC wall mount transfer
- The intensity control for the display is not adjusted correctly
- Bad microprocessor assembly

Things to do:

1. Be sure the wall transformer is plugged into a _live_ wall outlet, and then feel if it is warm. If the transformer stays cold, it is probably bad. If the outlet is good and the transformer is bad, call Cirris to replace the transformer.

2. If the transformer feels warm, check to see if the microprocessor assembly feels warm. It should warm up within about five minutes after you turn it on. If it is still cold after five minutes, the transformer is bad. Call Cirris to replace it.

3. If the microprocessor assembly feels warm and the display has a blue back-ground, but is otherwise blank, adjust the Display Intensity control at the back of the analyzer by turning it clockwise. If the display is still blank, call Cirris to replace the microprocessor assembly.

Display Intensity contro

4. If the microprocessor assembly is warm, but the display is totally blank, or there is no blue background showing in the display, call Cirris to replace the microprocessor assembly.
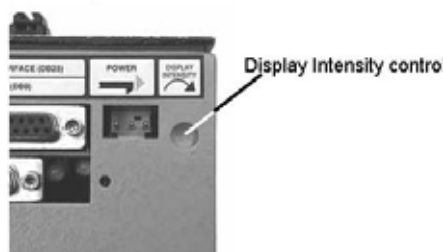
Problem: Display shows a darkened row, or gibberish characters.

Possible Causes:
- Display Intensity control is not adjusted properly
- Scanner assembly is bad
- Microprocessor assembly is bad

Things to do:

1. If both rows of the display are dark, try adjusting the Display Intensity control at the back of the analyzer by turning it counterclockwise. If this does not solve the problem, go to step 2.

2. Turn off the analyzer, disconnect the microprocessor from the rest of the system, and then turn on the microprocessor. The analyzer should prompt 10 V LO. If it does, the analog board or one of the scanner boards is bad. Call Cirris to replace it.

Problem: When a cable is disconnected, the display still prompts PLEASE VERIFY.

Possible Causes:
- One or more of the cable adapters is bad
- The scanner assembly is defective

Things to Do:

1. Remove the cable adapters from the analyzer while the analyzer is still on. If the analyzer still prompts PLEASE VERIFY, the scanner is probably defective. Call Cirris to replace it.

2. If the analyzer prompts READY TO TEST after step one is done, you have unwanted connections in your cable adapters or adapting cables.

Problem: Connections are not recognized by the analyzer

Possible Causes:
- One or more bad cable adapter
- Bad scanner assembly

Things to do:

1. Using the hand-held test probe as a diagnostic tool, use the sharp steel tip of the probe to pierce the insulation on the connecting wire for the connection that is not being recognized. The pin which is displayed by the analyzer when the insulation is pierced is the pin that makes a connection to the wire. The pin that is not displayed is the one that is open. Remove the connector and check the connector adapter with the probe to see if the missing pin is recognized there. If it is recognized at the test adapter, you may have a worn contact, or contaminants such as solder flux on the contacts.

2. If you are using an adapting cable, move back to the test point on the adapter connected to the analyzer, and see if the analyzer will recognize it there. If the analyzer recognizes the point, the adapting cable is bad. Rework the adapting cable.

3. If you are using an AUNV-64, or AHR2-64 adapter, be aware that some pins are used to identify these adapter's signatures. Because they are incorporated into the adapter signature, these connections may cause test points to no longer be recognized. If this is the case, you have miswired your connections, and you will have to rework them.
   - To isolate a problem with an AUNV adapter, remove all connections to pin 31, 32, 33, and 34 on a 34-pin adapter.
   - If you have an AHR2-64 adapter, make sure there are no connections to pins 33 and 34.
   - If, after removing these connections, you can now identify these pins with the probe, you have found the type of miswire described above. Rework your adapting cable.
   - It is possible the adapter is bad. Check for worn contacts on the adapter. Also check for continuity of the adapter pin on the bottom of the adapter to the test connector on top. If you find open or worn connections, replace the adapter.
   - If you find a bad pin after applying all of these tests, call Cirris to replace the scanner assembly.

Problem: The analyzer stops operating while it is being used.

Possible Causes:
- Damage from static electricity
- Bad microprocessor assembly
- Overheating

Things to do:

1. If static electricity may be a problem, be sure the safety ground on the wall plug is connected. Take measures to control static in your work area.

2. If the microprocessor is bad, call Cirris Systems to replace the microprocessor assembly.

3. If overheating may be a problem, let the analyzer cool for a few minutes. If the analyzer comes back on, you may want to direct a cooling fan on the analyzer.

Problem: Speaker problem. There is no sound, but the display works.

Possible Causes:
- The ERROR TONES option is set to OFF
- The speaker inside of the analyzer is not plugged in
- The microprocessor assembly is bad

Things to do:

1. If you can hear a clicking sound for cables that test as good, but no sounds for cables that test as bad, the ERROR TONES option is set to OFF. See page 15 for instructions on how to change this option setting.

2. Connect the speaker wire to the microprocessor assembly.

Problem: The sounds coming from the analyzer is disturbing to others.

Things to do:

- Set the ERROR TONES option to OFF or LOW
- Place tape over the speaker opening in the metal case to muffle the sound
- Disconnect the speaker from the microprocessor

Problem: The analyzer will not learn a cable.

Possible Causes:
- The CREATE TEST FROM option is set to LAST CABLE
- The Conn Resistance threshold or Insulation Resistance threshold is not set properly

Things to do:
1. A cable's wirelist cannot be learned when the CREATE TEST FROM option is set to LAST CABLE. Therefore, change the option setting to SAMPLE CABLE (see page 13).

2. If the Insulation Resistance is set to less than the Connection Resistance (which can take place if the Connection Resistance option is set to AUTO), the analyzer will prompt INSULATION RESIS < AUTO.XXX. The Insulation Resistance should be raised to a value above the Connection Resistance setting.

Problems with Printing
Printer failures usually take place due to user errors, bad printers, bad cables, and bad microprocessor assemblies.

Problem: Nothing prints

Possible Causes:
- Printer is not on-line (selected)
- Cable between analyzer and printer is not connected properly
- Printer has a serial interface instead of a parallel interface
- Bad cable
- Bad printer
- Bad microprocessor assembly

Things to do:
1. Make sure the printer is turned on, that on-line is selected, and that the printer has paper.

2. Check the cable connections for the analyzer and the printer. The cable should be firmly connected to the back of the analyzer where PRINTER-PARALLEL INTERFACE is marked.

3. Your printer must have a parallel cable interface. **Warning!** Be sure _not_ to use a printer with an RS-232 serial interface, or you will damage the analyzer.

4. If you think the cable might be bad, try another cable.

5. If you think the printer might be bad try another printer, or test your original printer and cable with a standard computer. If the printer does not work with the PC then it is probably bad.

6. If the cable and printer work with a PC, the microprocessor assembly inside the analyzer is probably bad; call Cirris to replace it.

Problems with Printing
Printer failures usually take place due to user errors, bad printers, bad cables, and bad microprocessor assemblies.

Problem: Nothing prints

Possible Causes:
- Printer is not on-line (selected)
- Cable between analyzer and printer is not connected properly
- Printer has a serial interface instead of a parallel interface
- Bad cable
- Bad printer
- Bad microprocessor assembly

Things to do:
7. Make sure the printer is turned on, that on-line is selected, and that the printer has paper.

8. Check the cable connections for the analyzer and the printer. The cable should be firmly connected to the back of the analyzer where PRINTER-PARALLEL INTERFACE is marked.

9. Your printer must have a parallel cable interface. **Warning!** Be sure _not_ to use a printer with an RS-232 serial interface, or you will damage the analyzer.

10. If you think the cable might be bad, try another cable.

11. If you think the printer might be bad try another printer, or test your original printer and cable with a standard computer. If the printer does not work with the PC then it is probably bad.

12. If the cable and printer work with a PC, the microprocessor assembly inside the analyzer is probably bad; call Cirris to replace it.

Problem: There are characters missing in the printout.

Possible Causes:
- Bad printer cable
- Printer cable is too long
- Printer is incompatible with the analyzer
- Bad microprocessor assembly

Things to do:

1. Verify that the printer cable is correctly built. Check for shorts in pin 11.

2. If the printer cable is more than 10 ft long, you may have printing problems. The electrical signals from the printer become weaker with a longer cable. Use a shorter printer cable.

3. Try using the printer cable with a PC. If it works, the printer is probably not compatible with the analyzer.

4. If the cable and printer work with a PC, the analyzer's microprocessor assembly is probably bad. Call Cirris to replace it.

Problem: There are incorrect characters in the printout.

Possible Causes:
- Bad printer cable
- Bad printer
- Printer cable is too long
- Bad microprocessor assembly

Things to do:

1. The printer cable may be bad. Check for shorts, opens, or miswires on pins 2 through 9. Either fix the cable, or replace it with a good cable.

2. The printer may be bad. Try using another printer with the analyzer, or test your original printer cable and printer with a PC. If the printer does not work with the PC, the printer is bad. Replace the printer. If the printer and cable work with a PC, the analyzer's microprocessor assembly is probably bad.

3. The printer cable may be too long. Your printer cable should not exceed 10 ft in length.

4. If you have another Cirris 1000HX analyzer available, it is possible to exchange microprocessor assemblies. If using a different microprocessor assembly solves the problem, the original microprocessor is bad. Call Cirris to replace it.

Specifications

Test Point Capacity	128 points expandable to 256 points
Test Levels	5 VDC @ 6mA max. current
Connection Resistance Sensitivity	0.1 to 1KΩ ± 4%, also 1KΩ to 6KΩ, 1M ± 10%
Insulation Resistance Sensitivity	5M, 10M, 20M, 50M, 100M, 200MΩ ± 10%, and 500 MΩ ± 20%
Typical Test Rate	Tests 256 points in less than 1 second, 128 points in less than 0.3 seconds
Maximum Points Per Net	50 points
Maximum Capacitance Per Net	@50V 0.1 microfarad, 100V 0.1 microfarad, 200V 0.03 microfarad, 300V 15 nanofarad, 400V 7 nanofarad, 500V 4 nanofarad, 630V 3 nanofarad.
Humidity	Will test without error in environments with zero to 75% relative humidity. Relative humidity above 75% will affect performance.
HV Energy Limit	Current limited to 6ma max. for ten ms duration
Printer Output	Standard Epson/Centronics-type parallel interface. Pinout matches IBM PC parallel port
Probe	For test point idientification
Memory	Nonvolatile storage for up to 50 wirelists. Lithium battery backup
Power	105-135 VAC, 60Hz 16 Watts (210-260 VAC 50Hz optional)
Size	Main unit: 13"w X 6.5" d X 5" h./33 X 16.5 X 13cm
Weight	Main unit: 9 lbs (4kgs) Expansion box: 5lbs (2.3 kgs)
Display	2-line x 16-character LCD
Warranty	1 yr parts and labor. Replacement modules available next working day

Warranty

Cirris Systems Corporation warrants the 1000HX 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 1000HX Analyzer.

ANY IMPLIED WARRANTIES ARISING OUT OF SALES OF THE 1000HX 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: _____

Glossary

cable signature   A six-character alphanumeric code that changes with any change in interconnections. Valid characters include the numbers 0 through 9, and the letters A through F.

connection resistance   Option setting that allows you to select the maximum allowable resistance that a "good" connection can have.

connector adapter   Connector adapters are adapters mounted on small printed circuit boards, which allow you to connect the cables you want to test to the 1000HX. There are three types (single-high, double-high, quad-high). Each adapter has its own unique adapter signature. Adapters are usually kept organized in a 3 x 5-inch card file. You identify the adapter by its signature, either on the cardboard sleeve in which the adapter is shipped, or by the signature printed on the label on the adapter itself. Adapters are identified by the connector they mate to, not the connector mounted on the adapter.

connector adapter position   The location either on the analyzer's main unit, or on an expansion box where connector adapters are mounted. The main unit has four such positions, marked as J1, J2, J3, and J4. Each expansion box also has four connector adapter positions.

control   The regulation of manufacturing or assembly processes; particularly the use of a cable signature for verifying the test setup against the documentation.

cable documentation   The written definition of how a cable should be constructed. Usually consists of a wirelist, and a complete set of notes on what connectors, materials, and special techniques should be used to build the cable successfully.

hipot   Hipot stands for "High Potential." Hipot tests are done to verify that the resistance between pins that are not supposed to be connected is sufficiently high. Generally used to check the effectiveness of insulation and/or spacing between conductors in a cable.

hipot duration   The length of time for which hipot voltage is applied to each net during hipot testing.

insulation resistance   Option setting that allows you to select the minimum allowable resistance between points that should not be connected.

insulation short   An Insulation Short occurs when the resistance of a connection is higher than the Connection Resistance setting and lower than the Insulation Resistance setting. In other words, the connection has a resistance too high for the analyzer to see it as a "good" connection, and too low for the analyzer to see it as effective insulation.

interconnection	A situation where continuity exists between two connector pins. Continuity most commonly exists here because a wire connects the two pins.
intermittent	The 1000HX detects an *intermittent* fault when a cable develops shorts, opens, or excessive resistance after it has tested as good.
known-good cable	A known-good cable is a cable that you know is built correctly. We most often refer to such a cable as a *Sample Cable*. You can program the 1000HX to test cables which are supposed to be like the Sample Cable by letting the analyzer learn the Sample Cable. When the list of interconnections and the other properties of a cable you are testing are not the same as those of the Sample Cable, the signature of the cable you are testing will not match the signature of the Sample Cable. This signature mismatch will be reported as a "bad" cable.
last test setup	The last wirelist (including all test parameters and adapter information) learned by the analyzer. This can be loaded into the analyzer for testing either by learning a Sample Cable, or by retrieving the wirelist information for a cable from the analyzer's memory.
memory location	The 1000HX has one "last learned" memory location, and as many as 50 "permanent" memory locations. The number of available locations depends upon the size of the wirelists being stored. Large wirelists take up more memory space than small ones do. You can load cable information into the analyzer for testing by retrieving the information from one of these memory locations. It is also possible to delete old wirelist information from specific memory locations to free up memory for storing new cable information.
microprocessor	The electronic assembly which includes the LCD display. As you look at the analyzer from above, the microprocessor assembly is located to the left.
miswire	A type of interconnection error where a one pin is *incorrectly* connected to another pin. For example, if a connection is supposed to exist between pins 5 and 6, but actually exists between pins 5 and 7, the error will be reported as a miswire.
net	Any group of pins which are connected together. The analyzer automatically assigns a number to each group of interconnected pins (called *nets*). This number appears on the left-hand side of printed documentation, and in the left-hand side of the analyzer's LCD display.
open	A kind of interconnection error where there is no continuity between two connector pins which *are* supposed to be connected. A connection which the cable's master documentation says should exist does *not*, in fact, exist in the cable.

parameter signature   When it displays signatures, the analyzer displays a six-digit alphanumeric *cable signature* followed by a hyphen. After the hyphen, the analyzer displays a five-digit alphanumeric known as the *Parameter Signature*. The parameter signature represents the various test options you have selected for your test setup. Two different kinds of cables will always have different cable signatures; but they may have the same parameter signature if the option settings for both types were identical.

pin   An electrical contact point within a connector. In this manual, the word "pin" is used in place of terms such as "point," "contact," "socket," "termination," etc.

sample cable   A *Sample Cable* is a cable you know is built correctly according to your master build list.

scanner assembly   If you look at the analyzer from above, the scanner assembly is located on the right-hand side of the unit's top. This assembly contains the "J" positions onto which you install your connector adapters. It also contains the electronics which control continuity testing between all connector pins in all possible combinations.

setup   The steps involved in preparing the analyzer to test cables.

short   A kind of interconnection error where there is continuity between two points that are not supposed to be connected. A connection is present that does not appear in the master cable documentation.

Blank Forms to Photocopy

We have designed three forms that will help you document the cables you will test:

- **Master Parts List:** This form will help you keep track of cables by their part numbers and cable signatures.

- **Directory of Wirelists Stored in Analyzer's Memory:** This form allows you to easily write down which cable's information is stored in each of the analyzer's permanent memory locations.

- **Cable Documentation Form:** This form allows you to keep track of signatures, options settings, and net lists for each cable you test.

PHOTOCOPY THESE! You should photocopy these forms instead of writing directly on them. That way you will have a fresh supply of blank forms when you need them.

Master Parts List

Cable Part Number	Description	Signature

Directory of Wirelists Stored in Analyzer's Memory

Memory Location	Cable Description	Signature
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
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26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		

Memory Location	Cable Description	Signature
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		

Cable Documentation Form

Memory Location #:_____   **Cirris Analyzer Model:** _____

Cable Signature: _____   **Parameter Signature**: _____
          (first six characters)   (last five characters)

Cable Description: _____

Adapter Signatures for:
Main unit	1st Expansion	Box 2nd Expansion	Box 3rd Expansion Box
J1_____	J5_____	J9_____	J13_____
J2_____	J6_____	J10_____	J14_____
J3_____	J7_____	J11_____	J15_____
J4_____	J8_____	J12_____	J16_____

Notes: The following options may not appear in your type of analyzer:

Create Test From
Connection Resistance
Hipot Voltage
Insulation Resistance
Hipot Duration
Apply Hipot To
Single Net Error
Auto Hipot
Error Tones Are
Sorted Wire List is
Count All Cables is
Auto Print is

Net Number	Common Interconnections
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

List continues on next page….

Net Number	Common Interconnections
16	
17	
18	
19	
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21	
22	
23	
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