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Cirris 4200 Series User Manual

for 4200 & 4250 Testers

Table of Contents

1. Safety

Please make the following safety information available to any person who comes in contact with Cirris equipment.

Cirris will not be held liable for injuries suffered if the tester is not properly maintained or if safety guidelines are not followed.

1.1 Symbols

	The **Electricity Hazard** Warning symbol, found on the front of the 4250 tester, indicates that high voltage is produced by the tester and, therefore, there is a risk of electric shock during use. The symbol is also used in this manual to highlight unsafe conditions presenting a risk of electric shock.
	The **Disconnect Mains Plug from Electrical Outlet** Mandatory Action symbol used in this manual indicates that for safety, the tester must be disconnected from power before proceeding the described process.
	The **No Children Allowed** Prohibition Symbol indicates that children are not permitted to operate the tester.
	The **No Access for People with Active Implanted Cardiac Devices** symbol indicates that no person using an electronically-controlled medical device is permitted to perform high voltage testing.

1.2 High Voltage Warning

This manual provides instructions for two separate, but very similar testers. The chief difference between the two is that the 4200 performs only low voltage testing while the 4250 is also capable of performing high voltage Dielectric Withstand (DW) and Insulation Resistance (IR) testing.

By design and purpose, the output of high voltage test equipment presents a risk of electric shock. The extent of the risk is a function of the voltage, current and high voltage energy or charge. In order to mitigate the risk, the high voltage energy limit of the 4250 is 35 mJ and the high voltage charge limit is 45µC. These limits prevent circuits energized during high voltage testing from meeting the definition of hazardous or dangerous live points found in international standards.

- IEC 61010-1:2010, which specifies general safety requirements for electrical test and measurement equipment, states in section 6.3.1 that in a dry environment 60 volts DC or 30 Volts RMS (or greater) are deemed to be “HAZARDOUS LIVE” if the current exceeds 0.5 mA RMS or 5 mA DC and the level of capacitive charge or energy exceeds 45µC at the same time. The maximum charge limit of 45µC means the high voltage output of the 4250 is not considered HAZARDOUS LIVE.

- European standard EN 50191 defines requirements for the erection and operation of electrical test equipment and focuses on measures to ensure operator safety. It states that compliance with the standard is not necessary if contact with live parts presents no danger, which it goes on to say is the case if the discharge energy does not exceed 350 mJ. The requirements of the standard are not mandatory for the 4250 due to the unit’s 35 mJ high voltage energy limit.

1.3 Medical Warning

Individuals using a cardiac pacemaker, an insulin pump, or any other electronically-controlled medical device should NOT perform high voltage testing.

1.4 High Voltage Safety

The restricted high voltage energy and charge limits of the 4250 do not mean that performing hipot testing with the tester is entirely without risk as operators can still receive a startling or even painful shock. Therefore, it's necessary and prudent to protect operators. Consider the following while recognizing it is not an exhaustive list.

1.4.1 Training

Operators should only use the test equipment after they have been properly trained.

- Operators should understand the hazards of electricity and that electric current will take any path to ground including through a person.
- Operators should know how to use the test equipment and how to recognize when high voltage testing is being performed.
- Operators should understand not to touch the product being tested or any test fixture hardware during high voltage testing
- Operators should understand test processes and their importance
- Operators should understand that untrained workers should not be allowed to use the test equipment.

1.4.2 Test Stations

Training alone is not as effective as eliminating access to hazards.

- Protection from energized points can be accomplished by insulation, covers, enclosures, obstacles or safe distance. A remote start button and/or safety interlock can be used as part of a protection strategy. The 4250 supports the use of either or both.
- Use a non-conductive surface for testing. Do not use an Electrostatic Discharge (ESD) station for testing. Conductive materials can create a connection path between exposed connections or connector shells and the operator.
- Do no use the tester is a wet environment or in the presence of flammables gases or explosive fumes.
- Verify that the power outlet provides a properly wired, low impedance earth ground. The connection to earth ground is integral to the power cord supplied with the tester.
- Isolate high voltage testing from untrained employees and post high voltage warning signs at the test station boundary.
- See *Ideas for Improving Hipot Safety* on the Cirris web site for more information.

1.5 Intended Use

4200 Series testers are designed for electrical testing and are intended to be used indoors, in a dry environment, at a temperature of 50-104 degrees Fahrenheit (10-40 degrees Celsius). Best performance can be achieved at a relative humidity of less than 70%. Insulation Resistance measurements will degrade at over 70% relative humidity.

Never apply live voltages to the test points or probe input of your Cirris tester. Power supplies and other accessories not approved by Cirris may cause damage or present a hazard.

> ***Warning:*** *If the equipment is used in a manner not specified by the manufacturer, built-in protections provided by the equipment may be impaired.*

1.6 No User-Serviceable Parts

The tester includes no user-serviceable parts. Attempting repairs or altering the tester in any way will void the warranty and may lead to an unsafe condition. Contact Cirris Technical Support for assistance with tester issues. See Section 27 for additional information.

Section 2.5 of this manual provides instructions for installing Expansion Scanners, which requires access to the inside of the tester chassis. As described in Step 1 of that process, the power must be disconnected any time the inside of the tester chassis is accessed.

1.7 Moving the Tester

Before lifting or carrying the tester, Cirris recommends removing all wires and cables from the tester. Be sure the power cord is unplugged. Handles are provided on the front of the tester to make lifting and carrying the tester more convenient.

1.8 Help/Support

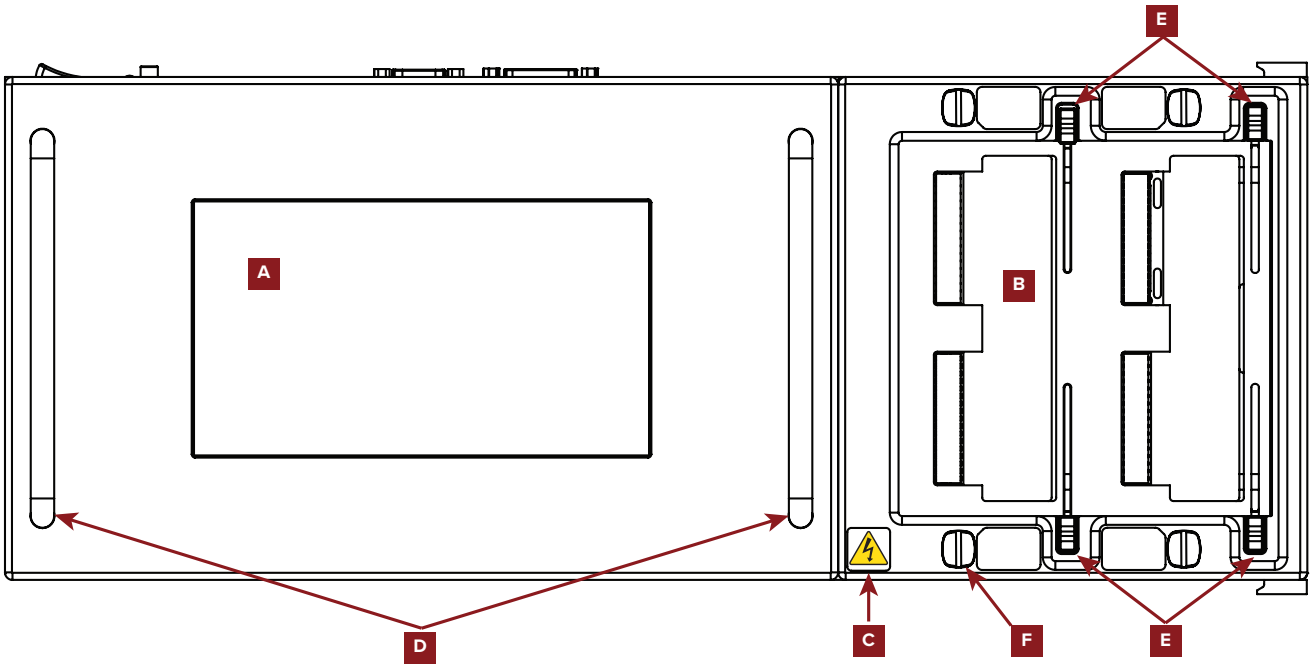
For assistance:

- Visit the Learning Center of the Cirris Web Site (www.cirris.com/learning-center) to view articles on Cirris products and other testing subjects.
- Contact our technical support team by email at techsupport@cirris.com or by telephone at +1 801 973 4600, ext. 666 (or ask for Tech Support). Normal business hours are 8:00 AM - 5:00 PM Mountain Time in the United States.
- Visit the Contact page of the Cirris Web Site to find sales and service contact information.

2. Hardware Set Up

2.1 You should have received

- Cirris 4200 Low Voltage or 4250 High Voltage Cable Tester
- Power cord
- PC (USB A to USB B) cable
- Probe
- Antenna
- USB flash drive containing software/documentation
- Optional: Adapters, expansion boxes, tilt stands, and other accessories.



2.2 Front of Tester

a. 7" full-color graphical display with capacitive touch screen (800 x 480 pixel resolution).

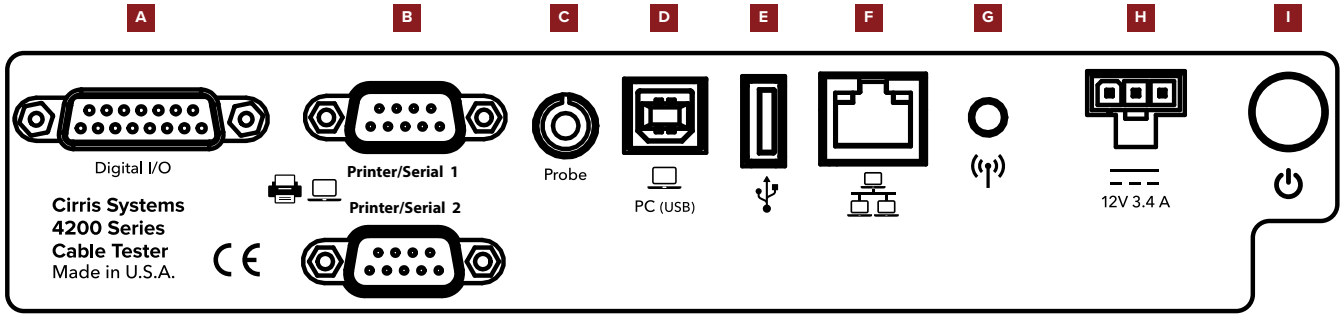
b. Cirris adapter system creates an easy fixturing setup system.

c. High voltage warning symbol

d. Handles for portability

e. Adapter slidelocks

f. 1/4 - turn fastener (4 places on base tester & on each expansion scanner)



2.3 Top of Tester

a. Digital I/O: Test programs can be configured to accept digital inputs to output digital signals to initiate events or indicate specified conditions.

b. Serial ports: Can be used to connect a qualified Zebra label printer, for connecting a qualified report printer using a smart serial to USB cable available from Cirris or for connecting a PC for communication in some automation applications.

Note: *The serial ports are interchangeable. Both can be used for printing, PC control, or LUA scripting. However, the ports cannot be used for the same purpose at the same time. For example, only one printer can be connected to the tester at a time.*

c. Probe: Attach the probe to identify test points, for troubleshooting and for help diagnosing failures.

d. PC (USB Type B port): A PC can be connected to the tester using a standard USB Type A to Type B cable. With the tester connected to power but turned off, the tester's memory will appear as a flash drive to the PC.

e. USB Type A port: Use a flash drive to back up or transfer test programs. Connect a bar code scanner to enter Lot IDs. A bar code scanner can also be used to enter other data, like serial numbers, using the optional scripting capability.

f. Ethernet: Use an Ethernet cable to connect your tester for network printing and back up using the Cirris Hub software.

g. Antenna: Connect to the Cirris Hub on a network using WiFi.

h. Power Cord: Attach the power cord.

i. Power button: Turns tester on and off.

2.4 Setting up the Tester

Set Up Test Hardware

1. Connect the power cord to your tester.

2. Plug the power cord into a grounded outlet (surge protector recommended).

3. Connect the probe.

4. Press the power button to turn on the tester.

5. The tester will perform a system diagnostic (see *page 53*).

6. After startup, the tester may require that you set the date and time for your area.

7. The Main Menu screen will open.

Set Date and Time

Setting the date and time ensures the correct information will show on test reports.

From the Main Menu, press System Settings.

The date and time are displayed on the buttons so you will be able to see if they need correcting. Press the button to change the information.

Press the button for the field you wish to change. For example, if you wish to change the month, press the month button and select the correct number.

You can also select how you want the date and time displayed by pressing the drop down inside the date or time menu and selecting an option from the list.

Once finished, press the OK button to save the changes.

Press Done to return to the Main Menu.

Set Mains Frequency

Also known as Power Line Frequency, you will want to set this value to 50 or 60 Hz depending on your country's AC line frequency. The correct selection will improve test measurement accuracy.

From the Main Menu, press System Settings.

Press the Mains Frequency button to switch it to either 50 or 60 Hz.

Press Done to return to the Main Menu.

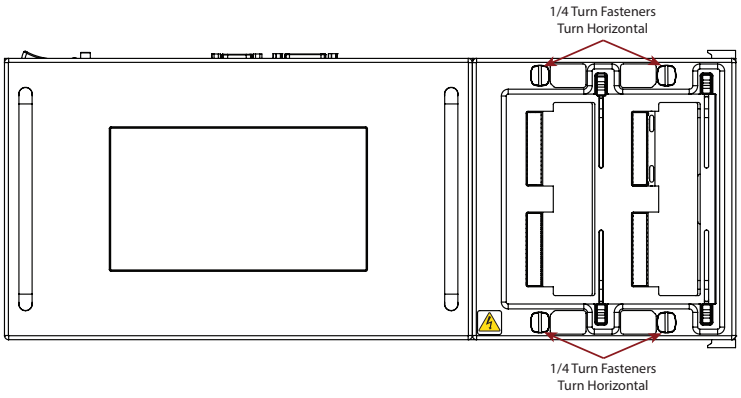
> ***Note:*** *For more setup options, such as changing the language or volume, see System Settings on page 53.*

2.5 Expansion Scanners Installation

Each expansion scanner provides an additional 128 test points. Up to seven expansion scanners can be added to a base unit for a total of 1024 test points.

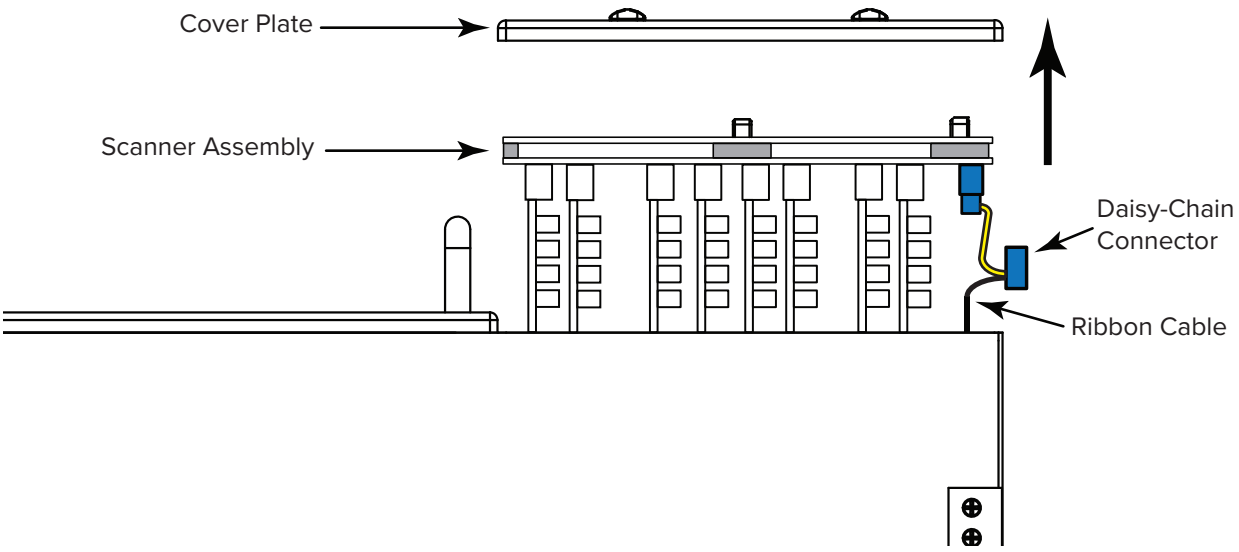
1.  Turn the tester off and disconnect the unit from power.

2. On the Base Tester, use a screwdriver or a quarter to turn the 1/4-turn fasteners to a horizontal position and remove the cover plate from the chassis by lifting it vertically.

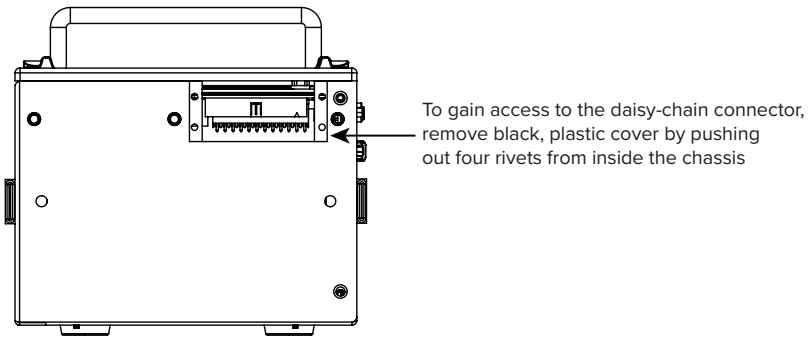


3. Remove the scanner assembly by lifting it vertically out of the chassis and place it face down next to the tester. Do not disconnect the ribbon cable connecting the scanner to the tester base.

4250 Shown - 4200 Similar



4. Using a flat object, like the side of a flat-blade screwdriver, from the INSIDE of the chassis, press out the four rivets on the right side of the Base Tester detaching the plastic cover piece.

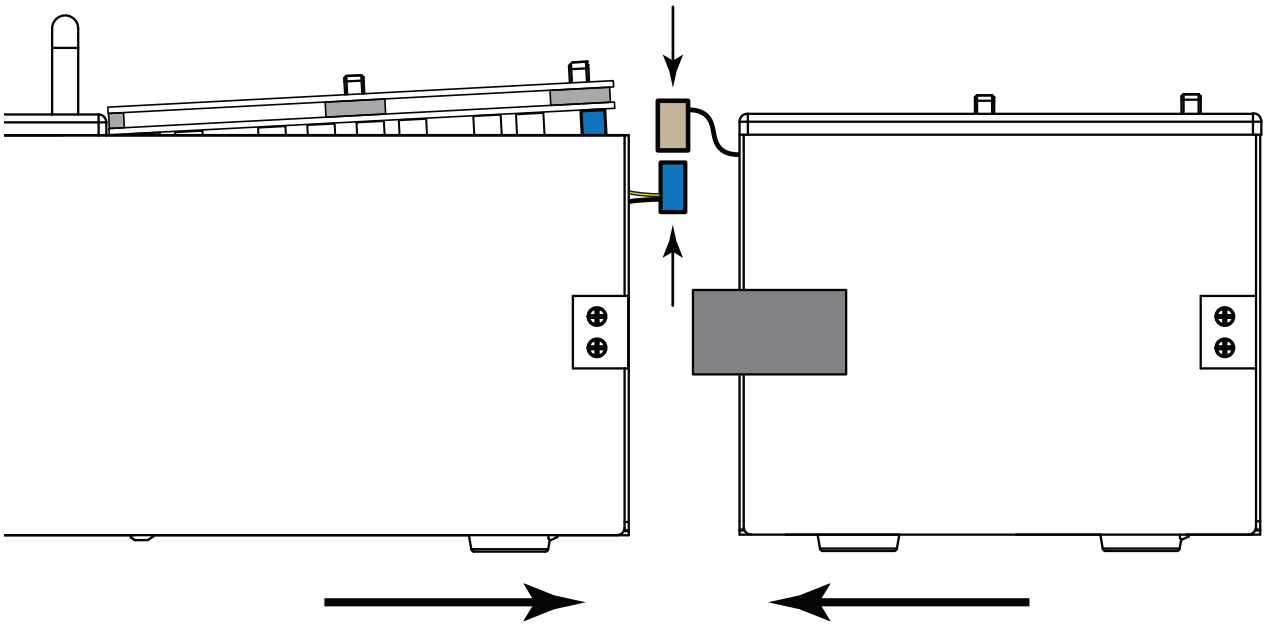


Right Side View of Base Tester

5. Replace the scanner assembly with the daisy-chain connector temporarily accessible outside the Base Tester chassis. Do not replace the cover plate yet.

6. Connect the Expansion Scanner, male, daisy-chain connector to the female, daisy-chain connector on the Base Tester ribbon cable. The daisy-chain connectors on 4200 testers have 34-positions and the daisy-chain connectors on 4250 testers have 40 positions.

4250 Shown - 4200 Similar



7. While pushing the Expansion Scanner and the Base Tester together, insert the mated daisy-chain connectors into the Base Tester chassis. Posts on the Expansion Scanner will fit into corresponding holes on the Base Tester to guide the units together. Secure the Expansion Scanner to the Base Tester using the two side latches on the Expansion Scanner and reinstall the cover plate.

8. Space is available on the cover plate of each Expansion Scanner to write the adapter positions. You may also consider using removable stickers for this purpose. For example, you could continue the number system and label each adapter position as J5, J6, J7, etc.

9. If attaching more than one expansion box, repeat the process as necessary.

2.5.1 Expanding 4250 Testers to 1024 Test Points

If a 4250 tester will be equipped with its maximum of 7 expansion scanners (1024 test points total), a special internal cable, part number CBL-1024, is required. The cable is ONLY needed when expanding the tester beyond 896 points.

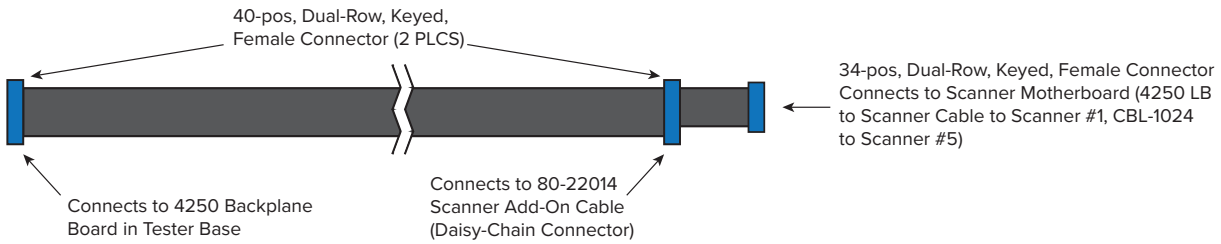
1. With power disconnected and the internal scanner removed from the chassis (steps 1-3 above), find the connection point for the ribbon cable that connects the internal, base unit scanner to the Backplane board, which is mounted vertically inside the chassis on the back panel. The cable is marked **4250 LB TO SCANNER** and it's attached to a connector marked **PRIMARY SCANNER SET** near the right side of the Backplane board.

2. On the Backplane board, immediately to the right of the **PRIMARY SCANNER SET** connector is an unused, 40-position, dual-row connector. Connect the end of the CBL-1024 cable that has a single, dual-row, 40-position connector to the previously unused connector on the backplane board.

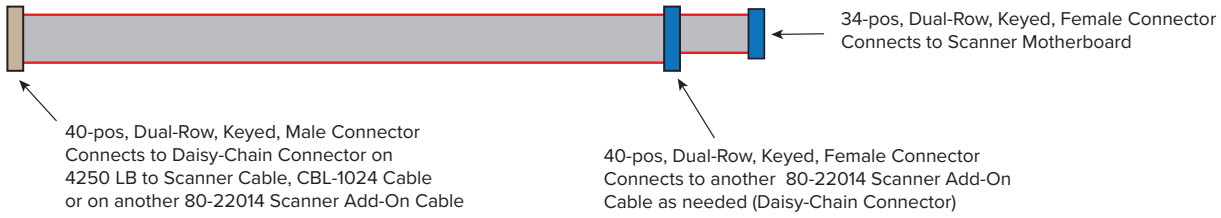
3. Connect the first three Expansion Scanners to the Base Tester using the primary daisy-chain as described in steps 1 - 9 above. At the same time, route the CBL-1024 cable through the first three Expansion Scanners using the same chassis cutouts used for the primary daisy-chain.

4. Connect the CBL-1024 cable to the fourth Expansion Scanner (scanner #5) using the dual-row, 34-position connector at the end of the cable assembly.

4250 LB to Scanner and CBL-1024 Cables (same design - different lengths)

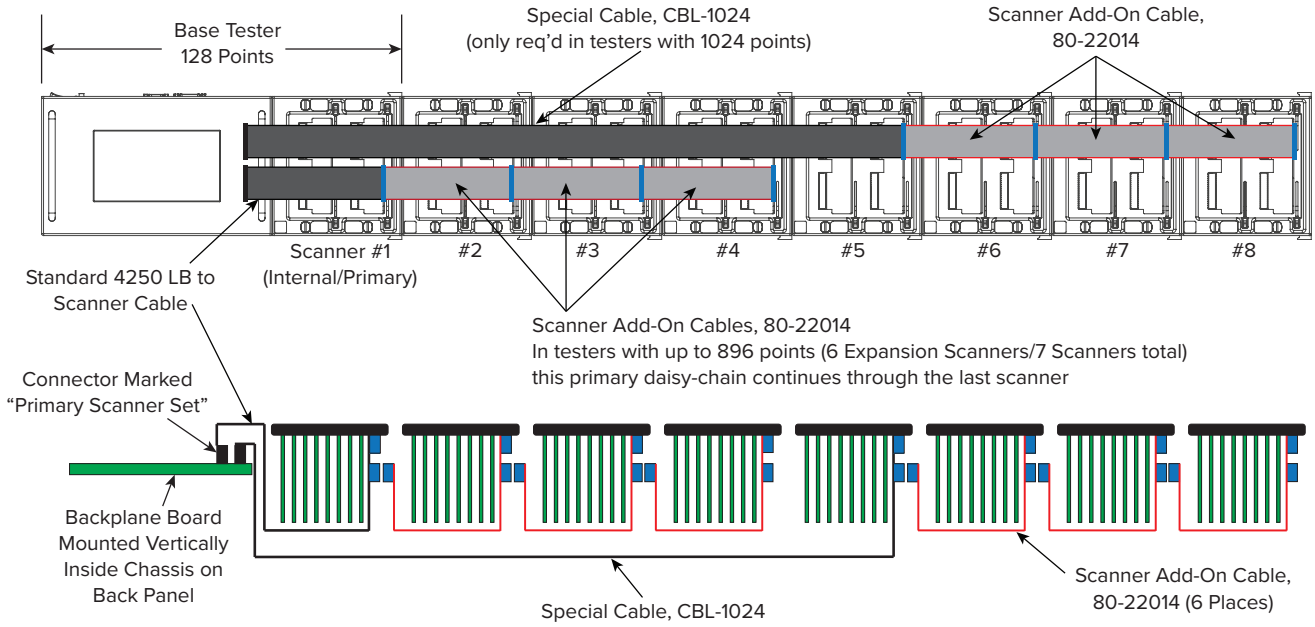


80-22014 Scanner Add-On Cable



5. Use scanner add-on cables, part number 80-22014, to connect scanners 6, 7 and 8 to scanner 5 in the standard daisy-chain configuration. The single dual-row, 40-position connector on one end of the 80-22014 Scanner Add-On Cable connects to the 40-position, in-line connector near the end of the CBL-1024 cable at Scanner 5.

4250 Cable layout with detail removed for clarity (Cables routed internally through enclosures)



Cross-section View (Backplane pictured horizontally for clarity)

3. Installing Adapters/Fixturing

3.1 Installing Adapters

The 4200 Series uses interchangeable adapters that connect the DUT to the tester. Cirris sells a variety of adapters that mate to standard connectors. We can also create custom adapters for less common connectors. Visit cirris.com to learn more.

Push the slidelocks to the outward positions.

Set an adapter in one or more of the J1-J4 slots. With a firm but gentle force, push the adapter forward (toward the tester's screen). You may have to use more pressure than expected to move the adapter completely into position. Be careful not to bend any pins as you slide the adapter into place.

> ***Note:*** *Larger sized adapters can take one, two, or four positions at once. For example, a connector could use both the J-1 and J-2 positions. An adapter in this position will register in the software as a J1 adapter.*

Once the adapter is firmly connected, move the slidelocks to the inward position to hold the adapter in place.

3.2 Fixturing

Sometimes cables are built with connectors that cannot attach directly to the tester. For this reason, fixturing must be built to provide a way to connect the device-under-test (DUT) to the adapters in the tester.

Fixturing refers to the interface between the DUT and the tester. Fixturing can be a significant portion of the investment in a test system. Good fixturing is an essential part of ensuring the accuracy of test results and maximizes the test station's throughput. This means fixturing needs to be at least as good, if not better than the quality of your DUT. Remember, you want to test the DUT, not the fixturing.

Cirris makes generic mating cables with one end that connects to the tester while the other end has unterminated wires. These cables save time by completing part of the work of creating fixturing cables. To learn more, visit cirris.com or contact your account manager.

3.3 Mating Cycles

The quality of parts used will affect the life of your fixturing. Each time a connector mates with another connector, it experiences wear. Connectors are rated for a specified number of mating cycles before the contact resistance increases.

Lower quality connectors (typically with tin plating) may be rated for as few as 10 to 50 cycles, while more expensive connectors (typically with gold plating) are often rated for over 500 cycles. In practice, these connectors can often experience far more mating cycles and still perform adequately for test measurements.

If you are focused on having very precise resistance measurements in your testing, you will want to carefully consider the materials you use for fixturing, and maintain a maintenance schedule to ensure connectors are replaced before they cause errors in your resistance measurements.

4. Cirris Hub Software

Before continuing with the tester setup, it's recommended that you consider installing the Cirris Hub software on a networked PC in order to take advantage of the built-in networking capability of the 4200 Series testers. While a connection to the Hub is not necessary, and it can always be added later, the version of the Hub included with the tester provides a variety of capabilities, including:

- Storing test programs on a network drive for easy backup of the files.
- Sharing test programs stored on a network drive or cloud drive among multiple testers.
- Sharing test programs with remote locations.
- Printing reports to network printers.
- Printing reports as .pdf files.
- Editing test programs using the Hub editor.
- Organizing testers with custom names and tracking calibration status and firmware version.
- Monitoring the current status of testers (Online / Offline / Testing).

A free version of the software is found on the USB flash drive that came with your tester. For more information and installation instructions, see the *Cirris Hub Manual*.

5. Testing Basics

5.1 Types of Tests

The 4200 Series allows you to customize which tests you want to run on a cable. While the tester will always perform a low voltage test, you can choose to include a high voltage or intermittents test.

Low Voltage Test

Low voltage testing detects errors such as shorts and opens by applying current to a wire and measuring the voltage. The wire will have a current affected by several factors including resistance and components. If the wire is connected correctly, the test will read low resistance. That means current is flowing through the wire as expected and reaching the required connections. If the tester reads high resistance it means something is impeding the current from reaching its destination. This could be caused by a number of errors:

- **Open error:** The expected connection is not present.
- **Miswire error:** The wire is connected to the incorrect point.
- **High Resistance:** The expected connection is measuring above the pass/fail threshold but less than the low voltage insulation resistance (isolation) threshold.
- **Incorrect test setting:** A test setting is set to an incorrect value or has another mistake.

High Voltage Test

A high voltage or hipot test checks for good isolation. Having good isolation helps to guarantee the safety and quality of electrical circuits. If the points are isolated, no current will flow between points where there should be no current. A hipot test takes two conductors that should be isolated and applies a very high voltage between the conductors. If too much current flows the points are not well isolated and they fail the test.

Hipot tests are helpful in finding:

- Nicked or crushed insulation.
- Stray wire strands or braided shielding.
- Conductive or corrosive contaminants around the conductors.
- Terminal spacing problems.
- Tolerance errors in Insulation Displacement Contact (IDC) cables.

All of these conditions might cause a device to fail.

There are three common high voltage tests.

- **Dielectric Withstand Test:** Determines that a cable can withstand voltage for a certain amount of time.
- **Insulation Resistance Test:** Determines that cable's insulation is sufficient.
- **Dielectric Breakdown Test:** Determines how much voltage the cable can tolerate before it fails. Once the cable fails, it is usually damaged or destroyed. Cirris testers do NOT perform this type of high voltage testing in any shape or form.

Intermittents Test

Since intermittent problems are just that --intermittent--they are much more difficult to detect than stable defects. Intermittent errors are usually caused by a mechanical change including mechanical vibration, or physical flexing, which changes (temporarily) the electrical characteristics of the cable. The Intermittents Test allows the user to check for potential defects by moving the cable while the tester continuously checks continuity. If any failure is detected—even momentarily, the test will fail.

5.2 Types of Errors

Each of the tests performed by a Cirris tester will look for certain errors in the cable. Understanding the errors will help you determine which tests you want to run as well as how to avoid creating these errors in your cable.

Low Voltage Errors

Open Error: The intended electrical path contains a gap across which electric current cannot pass at the low voltage.

Short Error: An unintended connection between two or more points. This failure indicates insufficient insulation between unintended connections.

Miswire Error: An unintended connection which is the result of unexpected contact. This error is often referred to as an open and a short combined.

Component Errors

A new test program containing a component will measure the component value in the sample device and assign a default tolerance range. During a test, if the tester measures a value outside of the tolerance range, the component instruction will fail with an error message that indicates the measured value as well as the expected value.

High Voltage Errors

Overcurrent Error: This error occurs because the tester expects to measure a certain amount of current, but a larger amount of the current flows through the wire than the tester expects. The tester assumes the current is escaping and reports an overcurrent error.

Often this error is attributed to capacitance. With wires acting as conductors and insulation acting as a barrier, cables can build up high amounts of capacitance. The tester cannot tell the difference between insufficient insulation and capacitance. Both causes will result in an overcurrent failure. If you know the wire is highly capacitive you can set the test program to prepare for the error.

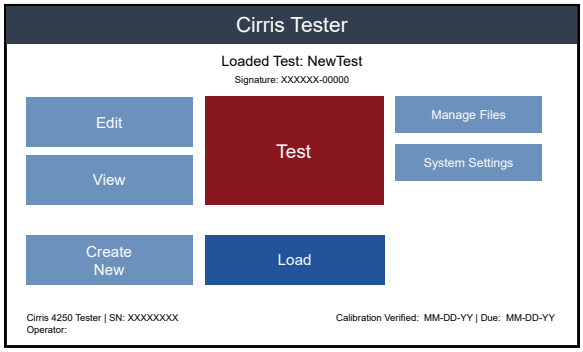
Had Leakage: This error occurs because too much current leaks between unconnected points. It is natural for some current to leak through insulation or through contaminants such as flux residue. A Had Leakage error occurs because more current leaks from the wire than is acceptable.

Dielectric Failure: A Dielectric Failure means voltage has arced from one of the wires. This normally occurs between two exposed pieces of metal. The test will immediately abort and report a Dielectric Failure.

In rare instances, a dielectric failure will go away, such as when a dielectric failure caused by small solder slivers vaporizes during the high voltage test.

6. Main Menu

From the software's Main Menu, you can access other areas of the software such as the test screen, edit test screen, and other menus.



- **Loaded Test:** Displays the name of the currently loaded test program.
- **Signature:** Displays the loaded test's signature. Tests that are imported from other Cirris testers will show the same signature as displayed on those testers.
- **Edit:** Change settings for a loaded test program.
- **View:** View details of a loaded test program.
- **Test:** Perform a test using the loaded test program.
- **Create New:** Create a new test program.
- **Load:** Load an existing test program to edit, view, or test.
- **Manage Files:** Copy, move, or delete test programs and files.
- **System Settings:** Perform a variety of tasks related to the setup and maintenance of the tester software including changing volume, date, time, etc.

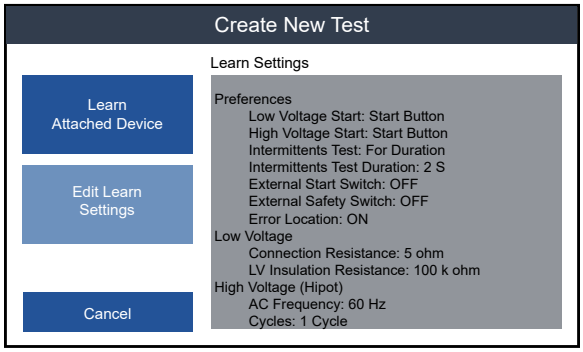
7. Create a New Test Program

A test program must be created before testing a device. This is done by attaching a known-good sample to the tester, adjusting the test settings, and performing a Learn. The tester will create a list of test instructions based on the specified settings and the sample cable. Subsequent cables of the same type can then be tested using the instructions created during the learn.

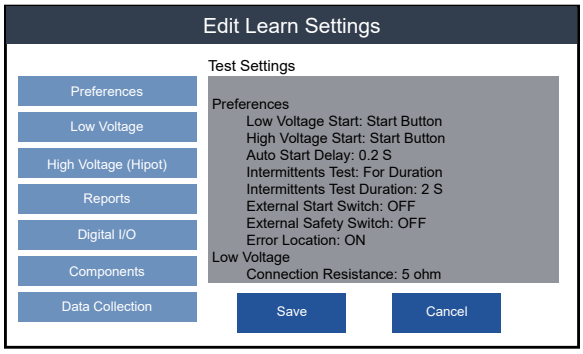
1. Attach the fixturing (*page 14*) and sample cable to the tester. From the **Main Menu** > **Create New**.

2. The summaries on the right side of the screen describe the current test program settings. Press **Edit Learn Settings** to adjust the settings per the sample cable specifications (voltage, components, etc.).

   Note: *The default test settings for a new program are the same as those used on the last previous test created.*



The **Edit Learn Settings** screen allows the user to edit the preferences and parameters for the new test program. With the exception of **Components**, these settings can be adjusted later by selecting **Main Menu** > **Edit**. The **Components** option only appears in the **Edit Learn Settings** where it's used to instruct the tester which components to search for during the learn. After the test program has been created, the nominal values of components and their pass/fail parameters can only be edited on a PC.



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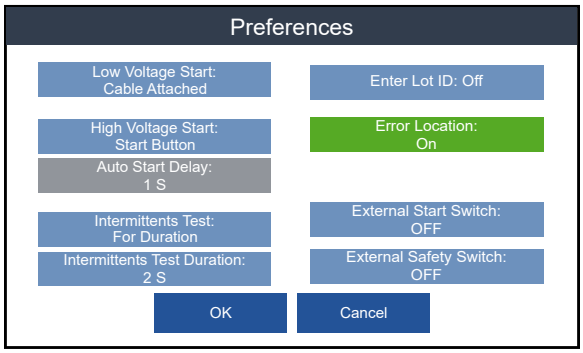
- Low Voltage – *page 22*
- High Voltage (4250 only) – *page 24*
- Reports – *page 27*
- Digital I/O – *page 36*
- Components (new test only) – *page 38*
- Data Collection – *page 39*

When satisfied with the settings, press **Save** to return to the **Create New Test** screen.

8. Preferences

Low Voltage Start - specify which condition starts a test.



- **Start Button:** The test begins when **Start Test** is pressed or an external switch is triggered with Digital I/O.
- **Cable Attached:** Test will begin automatically when a device is connected to the tester. This condition is generally used for testing a high volume of simple cables because it eliminates the time it takes to push buttons on the tester screen to start each test. However, with this start condition one of the following actions is required for a bad cable:
  - Press **Finish Test**: If the device contains an error, the low voltage test will not complete until you press the **Finish Test** button. The screen will update the failed test tally.
  - Remove cable: If the device contains an error and you remove the device before pressing the **Finish Test** button, the test will be aborted with no record of the test.

High Voltage Start – 4250 only

- **Start Button:** The high voltage test will begin when the operator presses **Start Test** or when an external switch is triggered with Digital I/O. This lets the operator choose when the high voltage test starts.
- **Auto Start:** The high voltage test will automatically start after a slight delay. The delay is used to allow operators sufficient time to ensure their hands are free of the tester and product before the high voltage test begins.

Intermittents Test

An intermittents test repeatedly performs the low voltage portion of the test to give the operator the opportunity to stress the product while the tester checks for intermittent faults. For example, the operator can flex the device in an effort to induce intermittent failures such as loose connections.

- **OFF:** No intermittents test is performed.
- **Press to Stop:** The intermittents test continues until the operator taps the **End Test** button.
- **For Duration:** The intermittents test continues for a predetermined amount of time. Test duration can last up to 120 seconds.

Note: If **Press to Stop** is selected and the DUT is removed before the operator taps the **End Test** button, the test will fail. Likewise, if **For Duration** is selected and the DUT is removed before the specified time elapses, the test will fail.

Enter Lot ID

A **Lot ID** is a unique identifier of the user's choosing for a group or batch of cables. The **Lot ID** input is requested at the beginning of a test run and applies to all cables in that run. The operator can enter the **Lot ID** by using the pop-up keyboard or by using a bar code scanner connected to the tester's USB port to scan the input.

- **ON:** When this setting is enabled, the user must enter a **Lot ID** before the test window will open.
- **OFF:** No **Lot ID** is required before testing and won't appear on reports.

Error Location

If open or a short is detected, the tester will use capacitance to determine on which end of the net the error is located. The tester will display the location on up to five errors. An asterisk indicates the error location on Error Reports.

> ***Note:*** *With the Error Location option turned on, the test time will increase when an open or short error occurs as the tester performs the capacitance measurements required to determine at which end of the net the error is located.*

External Start Switch

External Switch allows the tester's digital I/O port to receive an input signal from an external switch to start a test. Use Pin 1 on the digital I/O connector for the external start switch. The external switch can be a foot pedal or a button.

- **ON:** The tester starts a test from the external switch signal.
- **OFF:** The tester does not look for the external switch signal.

> ***Note:*** *Turning "External Switch" on does not inhibit your ability to press START TEST on the tester display.*

External Safety Switch

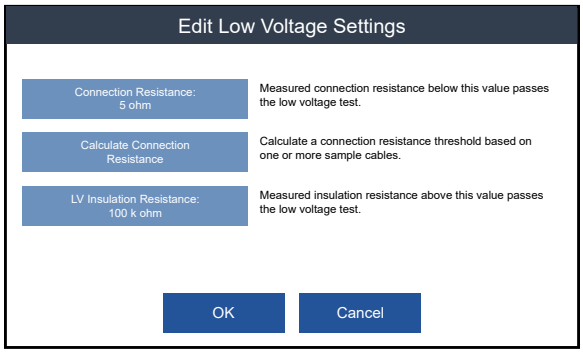
Safety Switch requires that the tester sees a high signal on pin 2 of the digital I/O connector before starting the hipot test. Safety Switch can be used to help ensure an operator does not shock themselves during a hipot test. Safety Switches can be dual palm switches wired in series, a foot pedal, or a sensor in automated test equipment.

- **ON:** The tester will look for a high signal on pin 2 of the digital I/O connector before starting a hipot test.
- **OFF:** The tester ignores the signal status of input pin 2 on the digital I/O connector.

> ***Note:*** *For more information on Digital I/O, see* *page 36**.*

9. Low Voltage

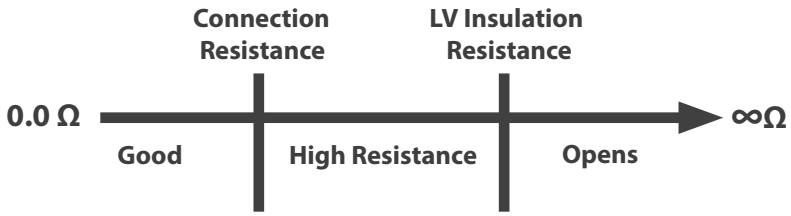
A low voltage test checks for shorts, opens, miswires and high resistance connections. The following settings control how the low voltage test is performed:



Connection Resistance

This setting determines if the device passes or fails based resistance settings—i.e. connections with resistances measured above this value will fail.

- Range: 0.1 ohm – 5.0 M ohm
- As shown in the graphic below, connections measured below or equal to the connection resistance value will pass while any measurement above this value will fail. A resistance measured above the connection resistance value, but below the LV insulation resistance value, will be reported as a high resistance error. A measurement above the LV Insulation Resistance Value will be reported as an Open error.



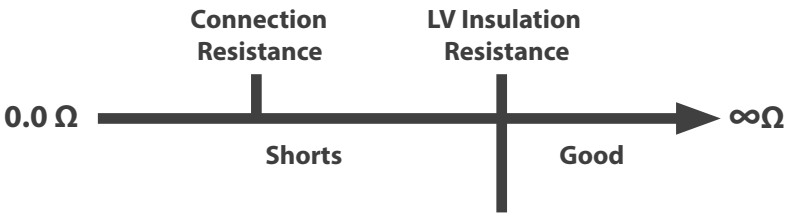
Calculate Connection Resistance

This feature calculates the connection resistance from one or more sample cables. You can use this calculation to set an adequate connection resistance for testing.

LV Insulation Resistance

Isolation between nets that measures less than the threshold value results in a Short. Intended connections that measure above the LV insulation resistance value are considered Open during a low-voltage test (and ignored during a Learn).

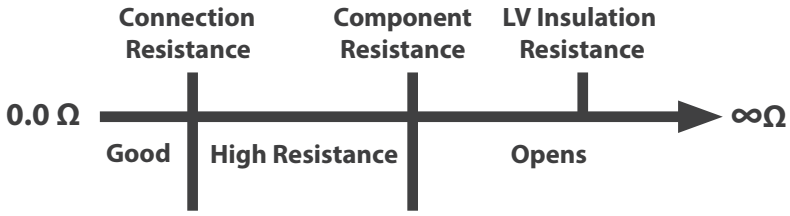
- Range: 0.1 ohm – 5.0 M ohm
- As shown in the graphic below, during a shorts test (checking for unintended connections), resistance measurements above the LV insulation resistance value will pass. Any connections detected below this value will be reported as a Short error.



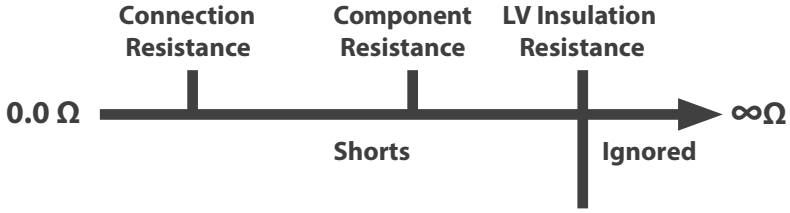
Component Resistance

This value is only used when there are components in the test and is auto-set during the Learn process. It should be 5-25% less than the lowest component found in the device being tested.

- Range: 0.1 ohm – 5.0 M ohm
- The following graphic shows how component LV settings define errors for intended connections if there are components in the test. This value has no impact on whether an intended connection passes or fails, but does influence whether a failing connection is labeled as High Resistance or Open.



- As shown in the graphic below, the Component Resistance value has no impact on the Shorts test.



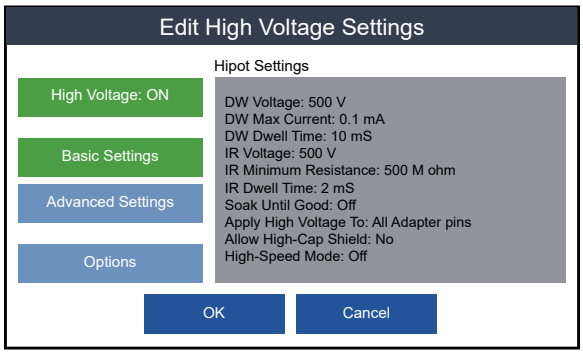
10. High Voltage (Hipot) - 4250 only

High voltage or “hipot” testing is used to find defects and contaminants that could cause the cable to fail.

WARNING: Read the Safety/Support section of this manual (*page 4*) before performing high voltage testing. For more ideas on high voltage safety, visit cirris.com/safety.

10.1 High Voltage Testing

High voltage settings can only be edited when high voltage is turned ON.



- **ON:** The tester will perform a high voltage test after a successful low voltage test.
- **OFF:** The tester will not perform a high voltage test.
- **Basic Settings:** Adjust the basic high voltage settings you might find in your test specifications, such as voltage, insulation resistance, and dwell time. Other settings are automatically set accordingly.
- **Advanced Settings:** Adjust individual settings for the Dielectric Withstand (DW) test and the Insulation Resistance (IR) Test.

Note: *Once Basic Settings or Advanced Settings have been changed, the button will turn green while the other button will turn blue.*

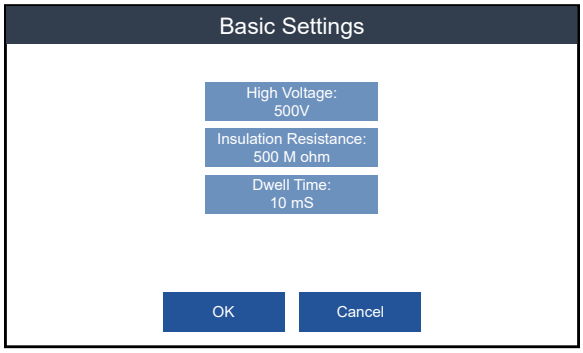
- **HV Options:** Adjust other settings having to do with the high voltage test such as selecting which pins will be included in the test, whether a high-cap shield is present on the cable, and if you want to use high-speed mode.

10.2 Basic Settings

High Voltage: Set the voltage limits required for your cable’s specifications.

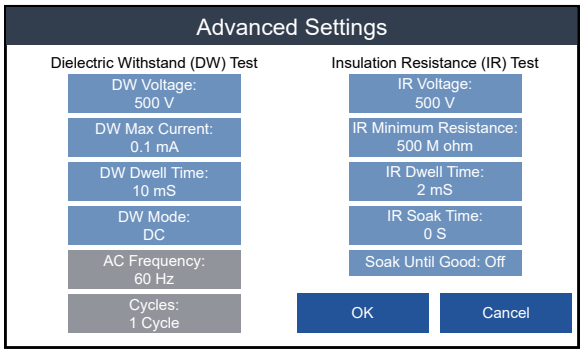
Insulation Resistance: Set the resistance limits in order to measure your cable’s isolation. The measured insulation resistance must be equal or greater to the insulation resistance setting for the test.

Dwell Time: Set the amount of time the IR value must remain good to pass the test. The reported resistance value for the IR test is an average of the measurements taken over this time.



10.3 Advanced Settings

10.3.1 Dielectric Withstand Test



In a Dielectric Withstand (DW) Test, a voltage much higher than the normal operating voltage is applied between points on the device-under-test. This ensures the wire insulation can withstand a higher amount of voltage (such as a surge) without failing. This test will also find near shorts, such as those caused by surface contaminants on connectors or wires that are almost touching.

DW Voltage: The voltage used for DW test.

- **Range:** 50 VDC – 1500 VDC or 50 VDC - 2000 VDC depending on the model.
- **Optional AC:** As an option the 4250 can be equipped with the capability to perform DW testing using from 50 - 1000 VRMS, at 25, 30, 50 or 60 Hz.

DW Max Current: The maximum leakage current allowed during the DW test.

- **Range:** 0.1 mA – 1.5 mA

DW Dwell Time: The amount of time voltage is applied during a DC DW test. For a DW test performed using AC voltage, the duration of the test is controlled by the **Cycles** parameter and the **DW Dwell Time** has no effect.

- **Range:** 10 mS – 120 S

DW Mode: On 4250 testers equipped the AC option, toggle between DC and AC

AC Frequency: Only active when AC is selected as the DW Mode.

- **Range:** 25, 35, 50 or 60 Hz

Cycles: Controls the duration of DW tests performed using AC voltage. *(Note: The **DW Dwell Time** parameter has no effect on AC DW tests.)*

- **Range:** 1, 10, 60, 300, 3600 or 7200 Cycles. Duration time is dependent on the chosen frequency which specifies the number of cycles per second.

10.3.2 Insulation Resistance Test

An Insulation Resistance (IR) Test measures the overall electrical insulation resistance to ensure that it meets the specified value. For a cable to pass the IR test, the measured insulation resistance must be equal or greater than the insulation resistance setting for the test.

IR Voltage: The DC voltage used for the IR test.

- **Range:** 50 V – 1500 V (up to 2000V on testers equipped with the extended range)

IR Minimum Resistance: Minimum resistance needed for insulation to pass the test.

- **Range:** 5.0 M – 1000 M ohm

IR Dwell Time: The amount of time the IR Resistance value must remain good to pass the test (this is how long the test will run after soak time). The reported resistance value for the IR test is an average of the measurements taken over this time.

- **Range:** 2 mS – 120 S

Note: *Because the reported value is an average, this setting can also be used to filter out noise caused by the AC power coming into the tester. For the highest test accuracy, use an IR dwell of at least 17 mS to filter out 60 Hz noise and 20 mS to filter out 50 Hz noise.*

IR (Max) Soak Time: The amount of time that the tester applies voltage before performing the final IR measurement. The test can be configured to soak for a period, or until the IR test passes. This setting is useful in humid environments or when the cable insulation has problems with dielectric absorption.

- **Range:** 10 mS – 120 S

Note: *When an IR Max Soak Time is set, the tester continues to monitor the dielectric withstand current. If the dielectric withstand current is exceeded, the tester reports a "Dielectric Failure".*

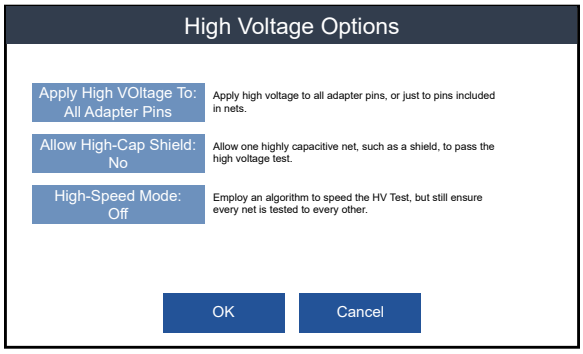
Soak Until Good: Applies a voltage to the cable until the tester measures IR values that exceed the IR minimum resistance or reaches the IR (Max) Soak Time.

- **ON:** Applies voltage until the tester measures IR values that exceed the IR minimum resistance (i.e. could take less time than Max Soak Time).
- **OFF:** Always applies voltage for duration of IR (Max) Soak Time.

10.4 Options

Apply High Voltage To: This setting determines which test points get high voltage applied to them during the high voltage test.

- **All Adapter Pins:** All test points in the tester interface connectors will be included in the test, regardless of whether they have connections to other points in the test.
- **Connections Only:** High Voltage is applied only to test points that have connections defined in the test program.



Allow High-Cap Shield: This option allows the user to continue high voltage testing a device that would normally fail the test due to a single over-current error. This error is presumed to be caused by a highly capacitive shield around the device.

- **YES:** Test continues with a single over-current error.
- **NO:** Test fails when any error occurs, regardless of the cause.

Note: *High Cap Shield is available to assist with highly capacitive shields, which would fail with standard high voltage settings. By turning on the High Capacitance Shield setting you can successfully test a cable with a high capacitive shield.*

High-Speed Mode: The HV test applies a voltage to multiple nets simultaneously while still ensuring that each net is tested against every other net, thus speeding up the test process. If an error is found, each net is tested individually to locate the exact net that has the error.

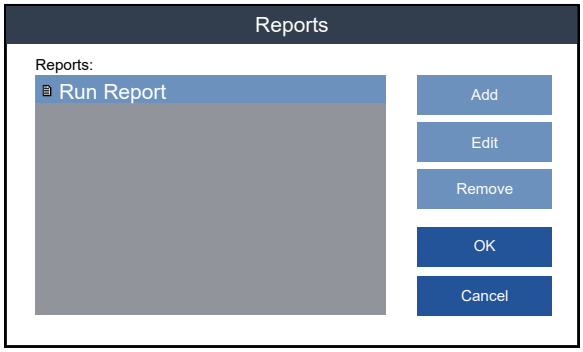
- **ON:** Tester applies HV to nets in groups for faster testing.
- **OFF:** Tester applies HV to each net one at a time while all other nets are pulled to ground.

WARNING! *High-Speed Mode used on highly capacitive devices can slow testing. Highly capacitive nets may cause over-current failures, meaning the nets will need to be tested individually. This could cause the test to slow significantly.*

11. Reports

The 4200 Series testers can output the following reports and labels:

Run Report: The Run Report provides a results summary for the units tested in a test run including the number of Good, Bad and Total units tested. A “Run” is the test session that starts when an operator selects the **Test** button on the **Main Menu** and ends when the tester is returned to the **Main Menu** by selecting **Done** on the test screen. The report prints when the test run ends.



Batch Test Report: The Batch Test Report is similar to the Run Report except that it includes only the number of Good units tested. The report is often provided to customers as evidence of testing. The report prints when the test run ends by returning to the **Main Menu**.

Test Report: The Test Report is a detailed record for a single unit that passed a test and can also be sent to customers. The report prints after the tested unit is disconnected from the tester.

Error Report: The Error Report provides a detailed error description for a single unit that failed a test. This report is often used for reference when reworking assemblies. The report prints after the tested unit is disconnected from the tester.

Fail Label: Prints a “Failed” Test Label for labeling a device after it has failed a test. The label prints when the device is removed from the tester.

Pass Label: Prints a “Passed” Test Label for labeling a device after it has passed a test. The label prints when the device is removed from the tester.

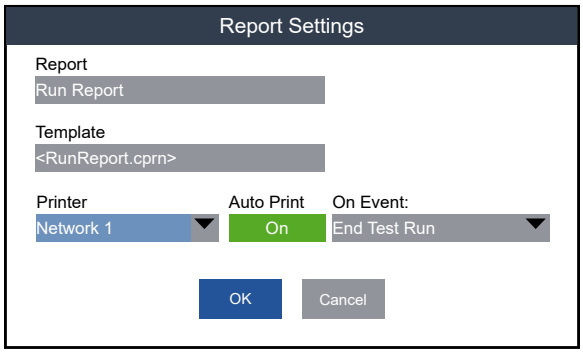
To add reports to a test program:

1. With the test loaded, from the **Main Menu** > **Edit** > **Reports** > **Add**.

2. On the Add Reports screen, use the drop down box to select a report and tap the Add box to add it to the test program.

3. On the Report Settings Screen, use the drop down box to select the printer to which the report will be printed. If the tester is connected to the Cirris Hub, there will be a choice of two network printers in addition to the two local printers. It should be noted that the Hub allows the user to specify **Print to Pdf** as one of the Network printers, which enables the tester to save a .pdf version of the report to the Reports Directory specified by the Hub.

4. Press **OK** to save.



11.1 Editing Report Templates

The default report and label templates included with the tester can be edited but new templates cannot be added. To access the templates, with the **tester turned off**, but still connected to power, connect a PC to the tester using a USB cable. In Windows File Explorer, the internal memory of the tester will appear as the drive named “4200 SERIES (X)” where “X” is the drive letter assigned by Windows. Make sure under the View tab that the Hidden items box is checked so that hidden folders and files are visible. The templates can be found under the path: X:\~Cirris\System\Reports.

Tokens are used to add variables to reports and labels. The available tokens are listed in Section 11.1.3 below and appear in the templates within brackets, which is the required syntax (e.g. {TestStatus} for the Test Status token). Text not within brackets is fixed output meaning the text appears in the report or label as it appears in the template. If the data for a variable field is not available, it will be left blank on the report or label.

11.1.1 Report Templates

The Report Templates are designed to print on size A paper (8 1/2” x 11” letter / 216 x 279 mm) or to .pdf files. There are four templates. To edit a report template, open it in an editor like Notepad. The templates are simple text so making changes is very straightforward. For example, to remove a line from the report simply delete it in the template and save the file to the tester overwriting the original version.

- Run Report (filename: RunReport.cprn)
- Batch Test Report (filename: BatchTestReport.cprn)
- Test Report (filename: TestReport.cprn)
- Error Report (filename: ErrorReport.cprn)

```
RUN REPORT

{TestName}
Date: {Date}, {Time}
Operator: {Operator}

Cable Signature: {DeviceSignature}
Parameter Signature: {ParamSignature}

Cable Serial Number: {DeviceID}

Adapter Signature(s):
{Adapters}

Parameter Settings:
{Parameters}

Connections:
{Connections}

Components:
{Components}

GOOD CABLES TESTED: {PassedCount}
BAD CABLES TESTED: {FailedCount}
TOTAL CABLES TESTED: {TotalCount}


Notes:
```

```
BATCH TEST REPORT

{TestName}
Date: {Date}, {Time}
Operator: {Operator}

Cable Signature: {DeviceSignature}
Parameter Signature: {ParamSignature}

Cable Serial Number: {DeviceID}

Adapter Signature(s):
{Adapters}

Parameter Settings:
{Parameters}

Connections:
{Connections}

Components:
{Components}

GOOD CABLES TESTED: {PassedCount}
```

```
TEST REPORT

{TestName}
Date: {Date}, {Time}
Operator: {Operator}

Status: {TestStatus}

Cable Signature: {DeviceSignature}
Parameter Signature: {ParamSignature}
Cable Description: {DeviceDescription}

Cable Serial Number: {DeviceID}

Adapter Signature(s):
{Adapters}

Parameter Settings:
{Parameters}

Connections:
{Connections}

Components:
{Components}

Fourwire Kelvin Pairs:
{KelvinPairs}

SPC Data Collection:
{SpcSettings}


Notes:
```

```
ERROR REPORT

{TestName}
Date: {Date}, {Time}
Operator: {Operator}

Error Signature: {ErrorSignature}
Cable Description: {DeviceDescription}
Cable Serial Number: {DeviceID}

Low Voltage And High Voltage Errors:
{ErrorDetails}




An asterisk * shows on which side the
tester senses the error. The 4250 shows
error location for opens and shorts.
The 4200 shows error location for
shorts only.
```

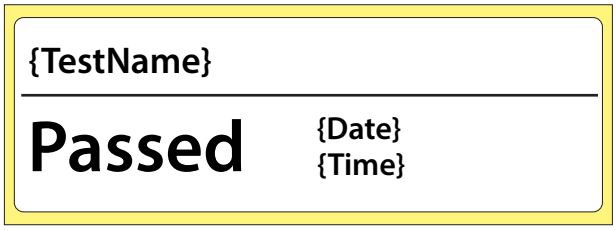
Notes:

The font size and style–such as bold–cannot be changed on reports. Capitalization can be used when needed for emphasis. This limitation only applies to reports printed from standard page printers. Label templates formatted using Zebra Designer V2, allow more flexibility.

To retrieve the original default template, delete the revised template on the tester. When the tester is next powered up, the default template will be restored.

11.1.2 Label Templates

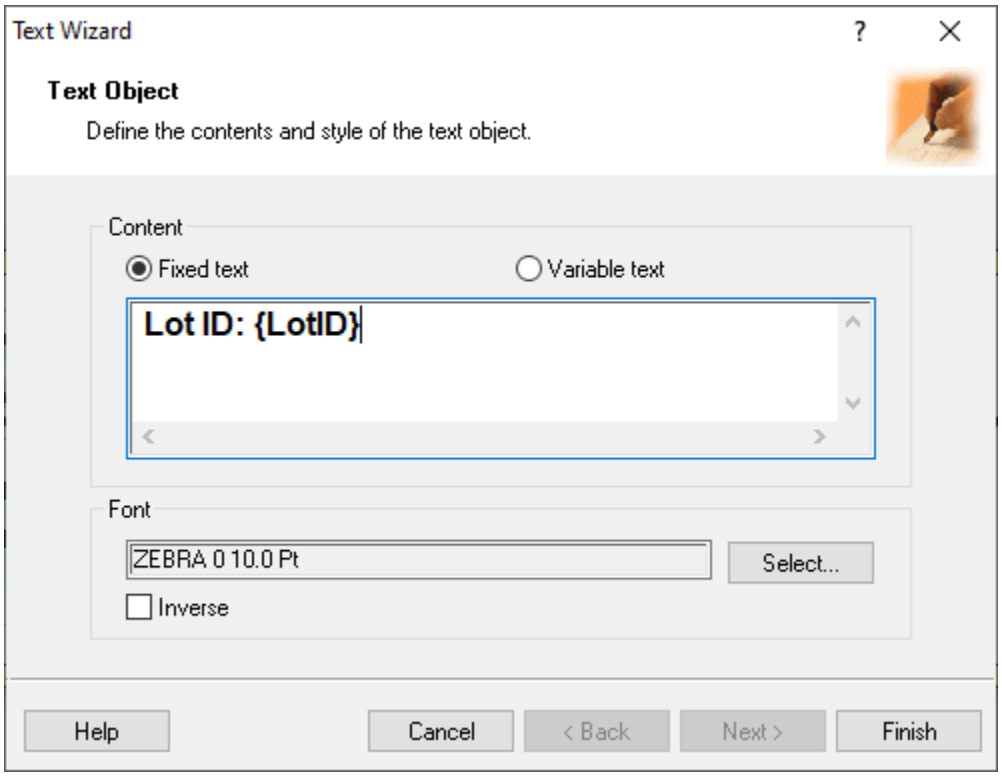
Default templates for pass and fail labels are included in the tester. They are designed to print on 3” x 1” label stock and include the test result (Passed or Failed depending on the label type), test program name, date, and time. The FAIL label also includes the error details. The “Passed” and “Failed” are fixed text and the other fields are variables added by using tokens. The design of the templates can be edited using the free Zebra Designer software, which would have been included with the printer or can be downloaded from the Zebra web site. The software allows tokens, images, and other elements to be added to the label templates. It’s also possible to change the size of the label stock.



It's important to understand that the Zebra Designer label design files are saved with the ".lbl" filename extension but the label templates used by the tester have a ".prn" filename extension. Both file types have different formats and only files with a .lbl filename extension can be edited by the Zebra Designer software. To make a label design available to the tester, it must be printed to a file using the Zebra Designer software. The resulting file will use a .prn filename extension. The only two label templates available to the tester are named "FailLabel.prn" and "PassLabel.prn" and these are the only two filenames that should be used when printing or transferring label templates to the tester for use as Pass or Fail labels.

To edit the PASS or FAIL label:

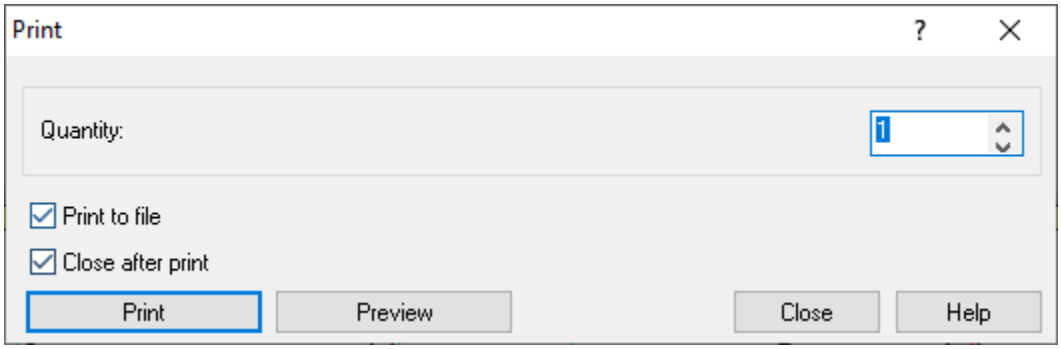
- Install and open the Zebra Designer software.
- Install the driver for your Zebra printer by selecting **File** > **Install Printer**. Select and install the correct qualified printer - DO NOT install the "EPL" version of printers.
- New label designs can be created from scratch, but at least in the beginning it's likely easier to start with an existing label design. To view and/or edit an existing label design, with the PC connected to the tester using a USB cable, and the tester powered off, open the label Pass or Fail source file in the Zebra Designer software. Remember, the tester will appear as a drive named "4200 SERIES (X)" where "X" is the drive letter assigned by Windows. The label source files can be found under the path X:\~Cirris\System\Reports\LabelSrc. The filename for the PASS design label is "SingleDevicePassLabel.lbl." The filename for the FAIL design label is "SingleDeviceFailLabel.lbl."
- More detail can be found in the Zebra User Manual, but here are a few tips for using the Zebra Designer software.
    - Existing objects can be deleted by using the select tool to select the object and then the delete key on the keyboard.
    - New fixed text or variables can be added by selecting the Text tool and clicking on the label. This will open the Text Wizard window. The content should be "Fixed text" even when using a Cirris variable and **always use a Zebra font**. Fixed text and a token can be used in the same text box as shown in the example below.



After selecting **Finish** the text box will be placed on the label where its location can be adjusted as needed. The content and font can be edited by right clicking on the object and selecting **Properties** from the fly out menu to reopen the Text Wizard.

- Images, such as a logo, can be added to a label by selecting the Picture tool and then clicking on label where the image should be placed. The Open dialog will open where the source file can be selected.

- **Important!** When finished editing, select **File > Print**. In the Print dialog window, select the check box for **Print to file**. In the Print to file window that opens, navigate to the Reports folder (X:\~Cirris\System\Reports) and print to the file named FailLabel.prn or PassLabel.prn as appropriate to overwrite the exiting label template. The .prn files are the templates used for label printing on the tester. As an alternative, the .prn files can be printed to the PC's hard drive and subsequently transferred to the tester to overwrite the default template file(s).



- Edited or new Zebra Designer label design files, those files with a ".lbl" filename extension, can be saved to the PC hard drive or to the tester using a filename of the users choice as they are not used by the tester directly.

Note: To retrieve the original default template, delete the revised template. When you next turn on the tester, the default template will be restored.

11.1.3 Tokens

The following tokens are available for use on Reports and Labels.

Token	Description
{Adapters}	Position & signature of adapters in the test program
{Components}	Components in the test program
{Connections}	Connections in the test program
{Date}	Date of test
{DeviceDescription}	Device description can be added to test program in an editor (See Section 15.3)
{DeviceID}	Serial number of device tested (can only be collected using the scripting option)
{DeviceSignature}	Device signature automatically created by tester
{ErrorDetails}	Low voltage & high voltage error details
{ErrorSignature}	Error signature automatically created by tester
{FailedCount}	Number of failed units in a test run
{KelvinPairs}	4-wire (Kelvin) pairs in the test program
{LotID}	Data is available when Lot ID is set to ON in the test program under Preferences
{Operator}	Operator can be entered under System Settings on the tester
{Parameters}	Test parameters used in test program
{ParamSignature}	Parameter signature automatically created by tester
{PassedCount}	Number of passed units in a test run
{SpcSettings}	Settings for optional Data Collection feature
{TesterID}	Tester serial number
{TesterType}	4200 or 4250
{TestName}	Test program name
{TestStatus}	Pass or Fail
{Time}	Time of test
{TotalCount}	Total number of units tested in a test run

11.2 Printing Reports & Labels

11.2.1 Network Printing

The 4200 Series testers can print reports to any network printer using the Cirris Hub Software installed on a network PC. See the *Cirris Hub Manual* for more information.

11.2.2 Local Printing

The 4200 Series testers are capable of printing both reports and labels locally.

Local Report Printing

To connect a full-page report printer to your tester, you must use a Serial-to-USB Smart Cable available as Cirris part number SER2-USB. Cirris pre-programs the cable for 4200 Series testers. This cable will allow local printing to a qualified printer.

Qualified Local Printers

- Brother HL-L6200DW
- Brother HL-5340D
- HP LaserJet Pro M118DW
- HP LaserJet Pro M203DW
- HP LaserJet Pro M402N

Unqualified Local Printers

- Brother HL-L2350DW

Local Label Printing

4200 Series testers can print labels using any Zebra Programming Language (ZPL) capable printer. The printer connects directly to one of the 4200 Series tester's built-in serial ports using a one-to-one serial cable.

Qualified Zebra Label Printers

- Zebra GC420t (can be purchased from Cirris)
- Zebra GX420t
- Zebra GK420t

> ***Note:*** *Zebra also makes thermal direct versions of these printers which can be used for printing on 4-Inch wide thermal sensitive label roll.*

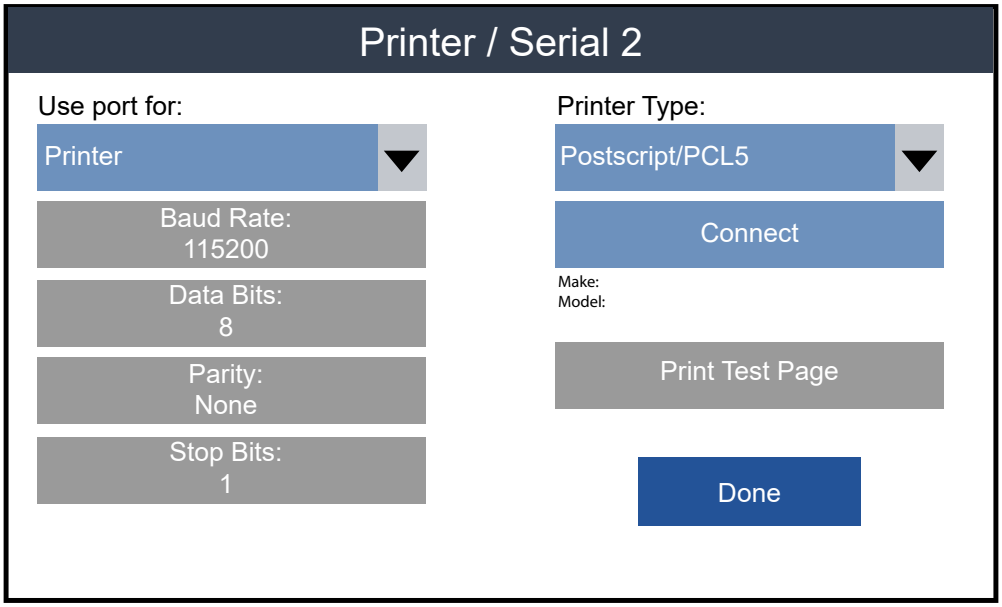
To purchase a qualified printer and the Smart Cable from Cirris, talk to your Cirris representative.

11.2.3 Local Report Printers

To set up a qualified local printer, first connect the Serial-to-USB Smart Cable. The 9-position D-Sub connector on the cable can be connected to Serial Port 1 or 2 on the tester, the USB Type B connector to the printer and the power plug to AC power. If using more than one tester, it's beneficial to use the same port on each tester for the report printer as test programs, which may be shared among the testers, specify the port to which reports are printed.

From the tester's **Main Menu** > **System Settings** > **Local Print/Serial** - select **Printer / Serial 1** or **Printer / Serial 2** for the port being used by the printer. On the Printer / Serial 1/2 screen:

- On the **Use port for** drop-down box, select **Printer**.
- On the **Printer Type** drop-down box, select **Postscript/PCL5**.
- All other settings will be fixed.
- Select **Connect** and follow the instructions on the screen.
- When the connection has been successfully established, the **Connect** button will turn green and display **Connected** and the **Make** and **Model** fields will be populated with the printer information. A test page can be printed by selecting the **Print Test Page** button.
- Select **Done** when finished.

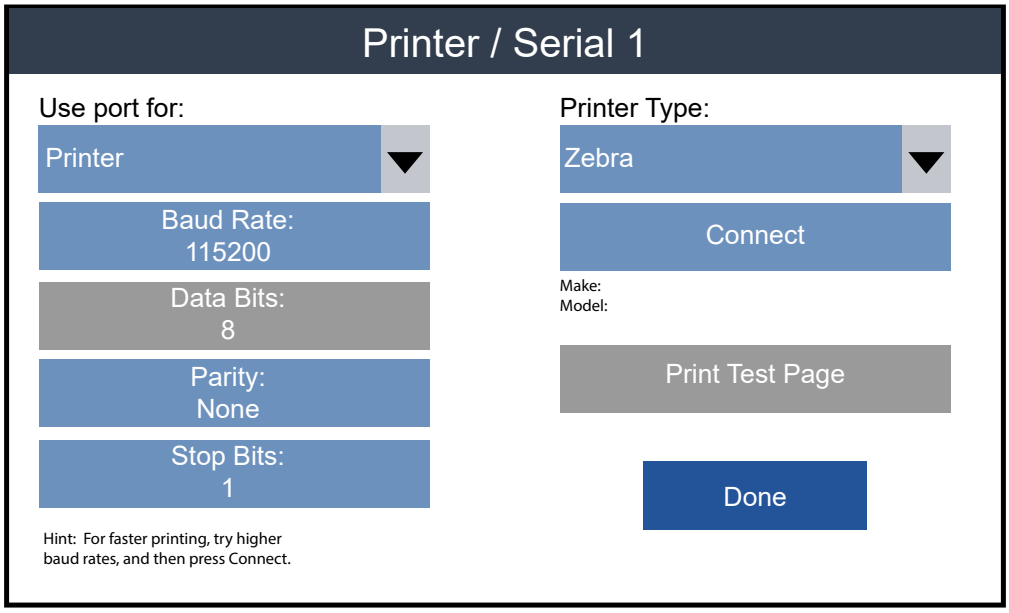


11.2.4 Zebra Label Printers

The process of setting up reports printers will be familiar to most users. However, setting up a Zebra label printer will be new to many. The Zebra *Quick Start Guide* and *Users Guide* are the best reference sources for information about the printers and their set up, but the following provides the tester-specific set up steps and includes some quick tips that may be useful.

- The Zebra label printer may be connected to either of the serial ports on the tester using a one-to-one serial cable. If using more than one tester, it's beneficial to use the same port on each tester for the label printer as test programs, which may be shared among the testers, specify the port to which labels are printed.
- The serial port being used for the Zebra label printer must be configured on the tester. From the tester's **Main Menu** > **System Settings** > **Local Printer/Serial** > select the port to be used for the label printer. On the Printer / Serial 1/2 screen:
    - On the **Use port for** drop-down box, select **Printer**
    - For faster printing, try a higher **Baud Rate** such as 115200.
    - **Data Bits** cannot be edited**.**

- **Parity** should be set to **None**.
- **Stop Bits** should be set to **1**.
- Set the **Printer Type** to **Zebra** by using the drop down list.
- When the parameters are set, select **Connect** to establish communication with the printer.
- With the tester connected and communication established, the **Print Test Page** button can be used to print a test label. Don't be concerned if the test message prints partially off the label stock.



- If using a thermal printer, the ribbon will need to be loaded before using the printer. If you're unfamiliar with these processes, Zebra has very helpful, short videos on their web site that walk through both steps.
- To tell the Zebra printer what size labels are being used, press and hold the button on the top of the printer while it blinks once then after blinks twice, release the button. The label stock should feed to a tear-off position.
- If your printer has been used previously with other equipment and you're having difficulty with the printer, pressing and holding the button on the top of the printer until it blinks four times will return the printer to its default settings.
- If creating a new Fail label from scratch, you may want to examine the Fail label file, filename FailLabel.prn, in a text editor first. The line that includes the {ErrorDetails} token has been edited to make the error text wrap through multiple lines if necessary. The Zebra Label Designer software will not add the characters needed to make this happen which makes it necessary to edit the FailLabel.prn manually using an editor like Notepad. The line may be edited something like the example below:

  Original line: ^FT23,96^A0N,20,19^FH\^FD{ErrorDetails}^FS

  Edited line: ^FO23,96^FB580,7,0,L,5^A0N,20,19^FH\^FD{ErrorDetails}^FS

  The **^FB** command is used to define a text field block for test. The lines above show up to 580 horizontal dots (about 3 inches at 203 dpi resolution) will be printed on the label, and a maximum of vertical rows, zero space between lines, left (L) justification, and a 5 horizontal dots for the first line horizontal indent.

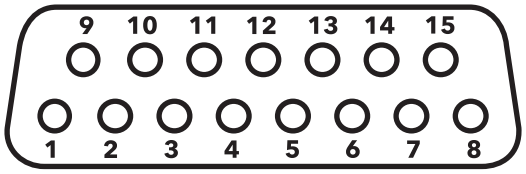
  The **^FO,** Field Origin, command orients this text block.

  Reference the Zebra ZPL II Programing Guide for more information on these commands.

12. Digital I/O

With digital I/O, the tester can start a test based on input from an external switch, such as a foot pedal. Through its outputs, the tester can also activate devices such as LEDs.

The digital I/O port is located on the back of the tester. The pinout is as follows:

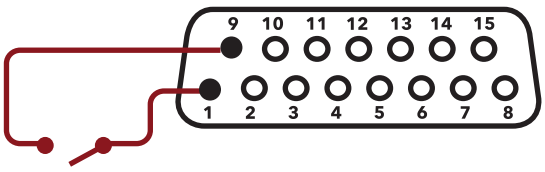


Pin	Function	Pin	Function	Pin	Function
1	Input Switch LV Start	**6**	Output	**11**	Output
2	Input Switch HV Start	**7**	Output for good test	**12**	Power + 10 VDC, 100 mA max.
3	Input	**8**	Output for bad test	**13**	N/A
4	Input	**9**	Power + 5 VDC, 100 mA max	**14**	Ground
5	Output	**10**	Output	**15**	Ground

To use the External Switch input, you must set the test program's **Start Condition** to **Press Button** (with the test program loaded, from the **Main Menu** > **Edit** > **Preferences** > **Low Voltage Start** > **Start Button**).

12.1 Inputs

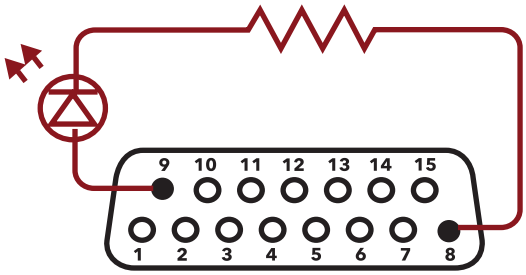
The 4250 tester has two inputs, pins 1 and 2. The low voltage input is on pin 1 of the digital I/O connector. If a DC +5 volt (logic high) is applied to pin 1, the tester behaves as if START TEST were pressed. You can use the DC +5 volt power source on the digital I/O connector to supply the DC +5 voltages through the switch circuit. Make sure you wire your external switch so it is normally open. Do not apply an AC voltage to the input.



Example of Digital I/O input wired with start switch.

12.2 Outputs

The tester's outputs are "sinking" (open collector) outputs. When activated they will connect (or sink) to ground, in effect turning ON the output circuit. The outputs can sink up to a nominal 24 volts at 500 milliamps. To limit the output current, always ensure adequate resistance between power supply and the output.



Example of Digital I/O output wired with LED.

As an example, let's say you want to light an LED to indicate a bad test. You will want to connect the LEDs to pins 8 (output for bad test) and 9 (+5V). The LED requires only 20 mA, so we can use the +5 DC volt supply on the digital I/O port to power the circuit. Use a resistor in series with the LED to limit the current going through it. How do you choose the resistor? The LED in this instance has a forward bias voltage drop of two volts; therefore, three volts must drop across the current limiting resistor. Knowing the voltage drop is three volts across the resistor and the desired current is 20 mA, Ohms Law can be used to determine the resistor value.

V/I = R

3V/20mA = 150 Ohms

In this example, you would use a 150 Ohms resistor to limit the current through the LED.

When a test completes, the tester will pull the output to ground allowing current to flow in the circuit, and the LED will turn on. If the test fails, pin 8 will be pulled low. Pin 7 will be pulled low when a test passes. These results will only activate when all tests finish (including after the intermittents test is complete).

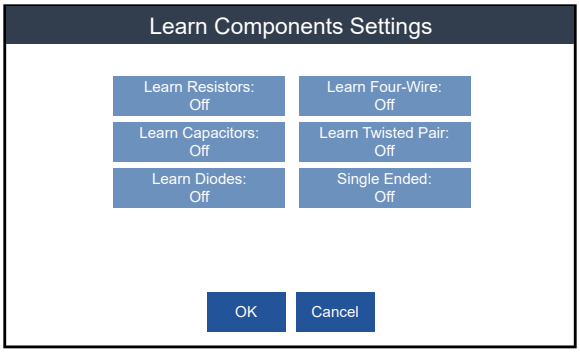
12.3 Cirris Test Language (CTL)

The Cirris Test Language (CTL) is not strictly related to the use of digital I/O, but users interested in Digital I/O might also appreciate the capabilities of CTL. CTL includes a series of English-like commands that enable communication from an external device with Cirris testers via a serial or USB interface. Using CTL commands, a wide range of tester functions can be controlled by an external application. For more information on CTL, see the *Cirris Test Language User's Guide*.

13. Components (New test program only)

Components can be automatically added to a test program during the Learn process for a new test program. If not originally Learned, the test program can be edited with a text editor on a PC. The 4200 Series can Learn the following components:

- Resistors
- Capacitors
- Diodes
- 4-Wire (Kelvin)
- Twisted Pair (4250 only) – Checks for split pairs
- Single Ended (4250 only) – With only one end of an assembly connected to the tester, using capacitance measurements, the tester will learn and test which connector pins have wires connected to them.



Select the required component(s) to add it to the test program.

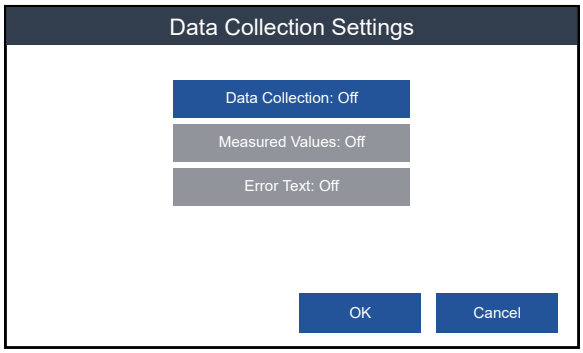
- **On:** The component type will be Learned by the tester and added to the test program.
- **Off:** The test program will not include the component.

Component	Learn Range	Test Range
Resistors	0.1Ω - 100KΩ; (>100KΩ -5MΩ learned as links - can be edited)	0.1Ω - 1MΩ
Capacitors	400nF - 100µF	5nF - 100µF ± 10% / ± .02nF (relative measurements to 10pF);
Diodes	Common silicon diodes (Zener diodes leaned as a standard diode if zener voltage > 4V. The tester can't learn or test germanium diodes, Shottky diodes and diodes in series with some resistors. These components recognized as opens and shorts.)	Same as learn + LEDs
4-Wire (Kelvin)	4200 — .005Ω - 10.0Ω ±2% / ± .005Ω 4250 — .001Ω - 10.0Ω ±2% / ± .001Ω	Same as learn
Twisted Pairs (4250 only)	Min length 1 - 6 feet depending on electrical characteristics of twisted pairs. Min 3 wires in cable.	Same as learn
Single Ended (4250 only)	Capacitance measurements are used to differentiate pins from wires. The user specifies the learn range - Single Ended Pins <5pF - 500pF; Single Ended Wires >5pF - 500pF.	Same as learn

The tester will learn the nominal value of resistors and capacitors within the learn range and set a default tolerance of ±10%. The pass/fail threshold for 4-wire tests and the test parameters for single ended tests will be automatically set by the tester. However, all these variables can be adjusted using the Cirris Hub editor or another editor such as Notepad (See Section 15.3).

14. Edit Data Collection Settings

Data Collection is an optional capability of the tester. Three data sets are available when Data Collection is turned on in a test program - Summary Data, Measured Values Data and Error Text Data.



The following default fields are stored and included in each data set:

- Run Number (sequence number that increments each time a test session occurs for a given test program)
- Analyzer Serial Number
- Cable Description (can only be added to a test program using an editor - see Section 15.3)
- Cable Filename (test program filename)
- Operator (if defined on tester)
- Date and time tested

The Summary Data is saved when Data Collection is turned on. In addition to the default data it includes:

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

The Measured Values data set includes the default data and the following:

- Cable Number
- Net or Instruction Label
- Net or Instruction Measurement

The Error Text data set includes the default data and the following:

- Cable Number
- Error Number
- Error Code
- Error Text

When data collection is turned on, at the end of the test session, when the user returns to the **Main Menu** from testing, the data is automatically saved to one of three locations using a base filename of the tester's serial number with a ".c_d" filename extension. The tester requires that a folder named "spc_data" exists in the target directory in order to save the data. The folder exists by default on the Cirris Hub and in the internal memory of the tester. If saving data to a USB flash drive, the folder must be created on the root directory of the drive manually.

- If the tester is connected to the Cirris Hub, the data will be saved to the network (F) drive in the spc_data folder in the directory designated by the Hub.
- If the Hub is not available, the tester will next look for a USB flash drive and if one is installed AND it includes a folder with the name "spc_data" in the root directory, the data will be save in that folder.

- If the Hub is not available and a USB flash drive is not installed, or the flash drive does not include a folder with the name “spc_data” in its root directory, the data will be saved to the internal memory of the tester (C drive). The file can be accessed by connecting a PC to the tester using a USB cable and with the tester turned off, but connected to power, the tester’s memory will appear as a USB flash drive in Windows File Explorer. With View > Hidden Items turned on, the data file can be found under the X:\~Cirris\Spc directory.

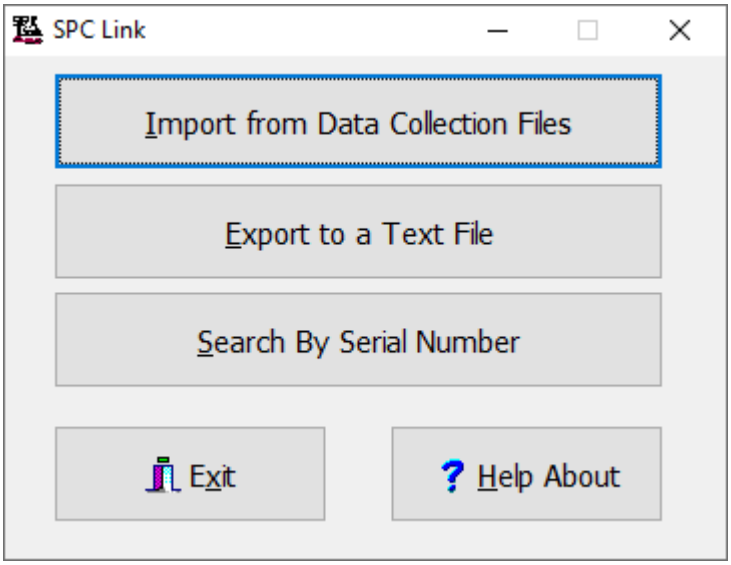
14.1 SPC Link

The saved data file can be viewed in a text editor, but the Cirris SPC Link application is typically used to manage the data. The application will import the saved data from the “.c_d” file and can export that data to tab delimited or comma delimited text files so it can be readily imported to other applications such as Microsoft Excel.

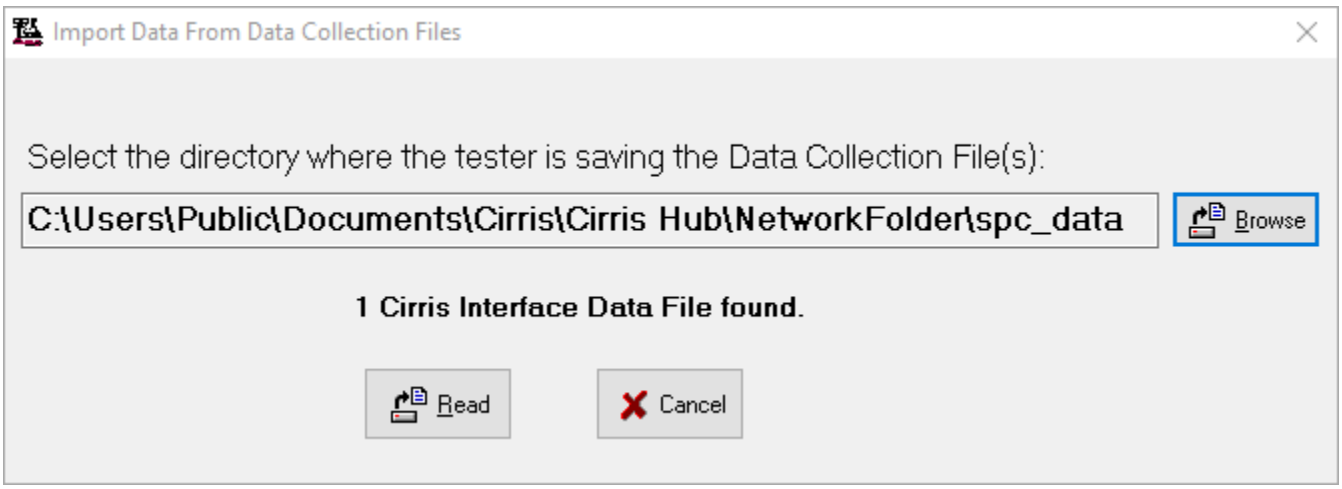
The installation for the SPC Link software can be found on the USB flash drive supplied with the tester. The installation is a straightforward process that can be accomplished by following the instructions on the screen. When finished a shortcut will be placed on the Windows Desktop.

14.1.1 Importing Data

The **Main Menu** of the software is very simple with only a few options. To retrieve the saved data, select **Import from Data Collection Files**.



On the window that opens, using the **Browse** button navigate to the spc_data folder where the .c_d data file is stored. If the data file is stored on a network drive using the Hub, the path for the spc_data folder can be found on the Hub Interface **Server Status** page under the heading **Data Collection**. When ready, select **Read** to import the data in the specified folder.

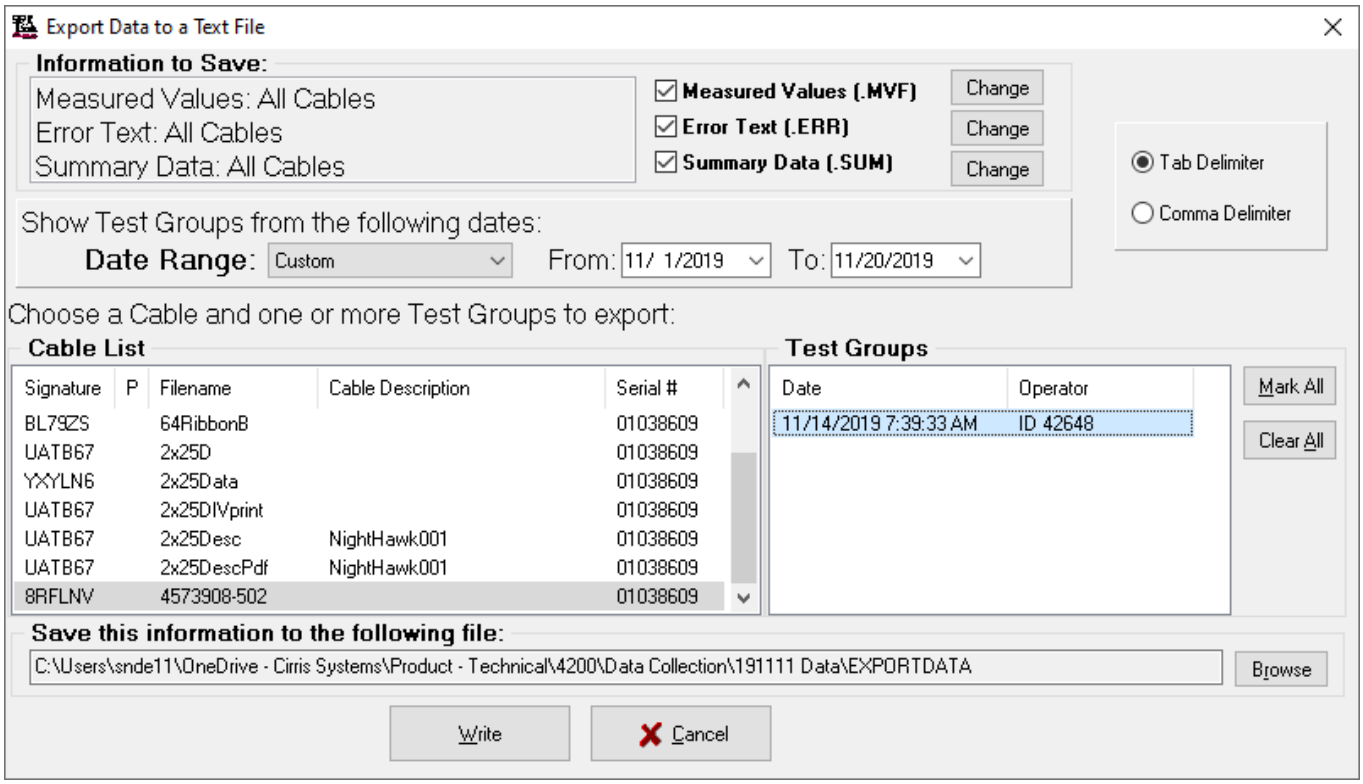


The Importing SPC Data window will open and the status bar will show the progress. Select **OK** when the import is complete.

14.1.2 Exporting Data

After returning to the SPC Link **Main Menu**, select **Export to a Text File** to export data to a comma delimited or tab delimited file. To export the data, in the **Export Data to a Text File** window:

- Begin by setting a **Date Range** filter. Data sets available for testing performed within the specified range will appear in the Cable List
- Select the **Filename** for the test program of interest in the **Cable List** and then select (mark) **Test Group(s)** to include in the export.
- Select the file types to be exported. The options include **Measured Values (.MVF)**, **Error Text (.ERR)** and **Summary Data (.SUM)**. The availability of the data will depend on the data collection preferences specified in the test program. The data for each will be exported to a separate file using the filename "EXPORTDATA" and the extensions referenced above (.MVF, .ERR and/or .SUM). The Change buttons allow the user to select the fields included in the export. The default is to include all the fields.
- Select the preference for a **Tab Delimited** or **Comma Delimited** export format.
- Use the browse button to select the directory to which the data will be exported.
- When ready, select **Write** to export the data.
- The data in the exported files can be readily imported into Microsoft Excel or other applications for analysis. Keep in mind that the .MVF, .ERR and .SUM filename extensions won't allow the file types to be automatically recognized as comma delimited or tab delimited files by Windows and for that reason it may be necessary to change the import file type category to "All Files (*.*)" when importing the data into an application.



15.1 Perform a Learn

The 4200 Series tester creates test programs by scanning a cable and forming a list of instructions based on the cable and test settings.

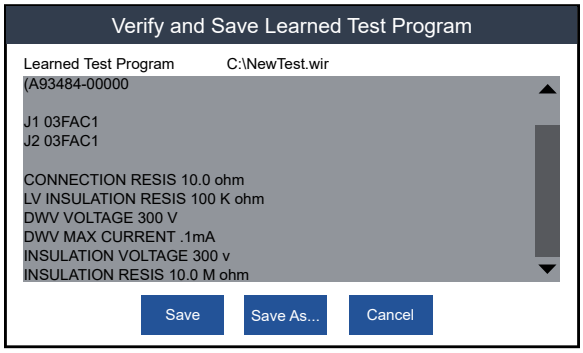
1. From the **Main Menu** > **Create New** to access the **Create New Test** screen.

2. After editing the Learn settings, make sure the cable is attached and press **Learn Attached Device**. The tester will scan the attached cable and create a test program.

   Note: *If there were any errors during the Learn, you will be alerted with a* ***Learn Failed*** *notification. Check the Learn/Test settings for errors. Also check the cable that was used during the Learn. Once you have made adjustments to either the settings or the cable, press* ***Learn Attached Device*** *once more. If the Learn fails again, repeat this process to find the cause of the failure.*

3. In the Learned Test Program window, verify the test instructions match the required specifications. If the test program is correct, select one of the following options:

   - **Save:** By pressing **Save**, the tester will name the test program "NewTest.wir" and will store it in a default location. The next time a Learn is performed, selecting **Save** will overwrite the test program saved in the default location.



If you save the test location in the default location, the test program will be overwritten the next time you press Save when creating a new test program.

   - **Save As...:** By pressing **Save As**, you will be able to select a storage location and name for the test program.

     a. Navigate to a location within the directory to save the test program. If you are using Cirris Hub Software, you can choose a location on the network. This will allow other networked testers to use the test program as well.

     b. To name the new test program, select **New...** and type in a name and press **Done**.

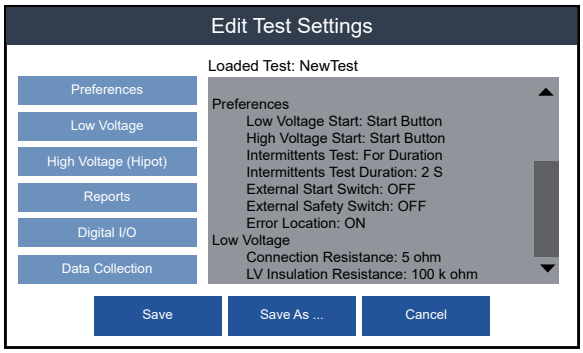
Once you have selected a location, you will be brought to the same location where the test was saved the next time you save or load a test.

   - **Cancel:** Return to the Learn screen without saving.

If the test program is not correct, press Cancel to return to the Learn menu. From there you can adjust the test settings and perform a new Learn.

15.2 Edit a Test Program

Load an existing test program and select **Edit**. The settings that can be edited are the same as those explained in the previous sections. Alter the specifications for the Test Program, including:



- Preferences
- Low Voltage
- High Voltage (Hipot) – 4250 only
- Reports
- Digital I/O
- Components
- Data Collection (an optional feature)

Components cannot be revised at this point on the tester. If you need to revise components, you can edit a test program using a text editor on a computer. One way to do this is using Cirris Hub Software (see *page 15*).

After revising a test, you have the option to Save, Save As, or Cancel the changes.

- **Save:** Saves the test program with a default name and location and returns to the main menu.
- **Save As:** Allows you to choose a name and location for the test program.
- **Cancel:** Return to the previous screen without saving.

15.3 Edit Test Programs on a PC

Test programs can be edited using the Cirris Hub or by using an editor such as Notepad. Common reasons to edit a program include adding LABELS or revising the pass/fail tolerance of components.

If test programs are being stored on a network drive using the Cirris Hub, navigate to the desired test program under the **File Management** page of the Hub software. Double-click on the file to open it in the Hub editor.

To access test program files from a PC if the programs are stored on the internal memory of the tester:

1. Using the provided USB cable, connect the tester to a PC. Make sure power is supplied to the tester but that the tester is turned **OFF**.
2. When powered off and connected to a PC, the tester will behave like a flash drive. In Windows File Explorer, the memory of the tester will appear as a drive named “4200 SERIES (X)” where “X” is the assigned drive letter.
3. Files can be moved to the PC using standard Windows copy and paste functions or test programs can be edited without transferring them to the PC by opening the file in a text editor such as Notepad. Files that were moved to the PC and edited must be saved then copied back to the tester. Programs edited on the tester simply need to be saved. In either case, edited programs would be available when the tester is disconnected from the PC and powered on.
4. After editing the test program, turn on the tester. Load the edited test program. From the **Main Menu** press **View** to see the changes to the test program.

15.3.1 Sample Test Program

This test program was created by learning a sample product on a 4250 tester and then was edited to add a Cable Description & Labels.

```
Filename: 25X2DIV.wir
*NightHawk001

(D512F2-MULTI

 J1  03FAC1
 J2  F5B4E0

WIRE LIST SIGNATURE:1A3A18-JD8M0
INSUL TEST PARM SIGNATURE:8L6FH
CONNECTION RESIS  10.0 ohm
COMPONENT RESIS >  228 ohm
LV INSULATION RESIS  100 K ohm
HIPOT VOLTAGE 300 V
INSULATION RESIS  10.0 M ohm
HIPOT DURATION  .01 SEC
HIPOT SOAK TIME  0 SEC
APPLY HIPOT TO ALL ADAPTER PINS

1   J1-001  J2-001
2   J1-003  J2-021
3   J1-005  J2-006
    J2-007
4   J1-007  J1-008
5   J1-009  J1-010

CHECK COMPONENTS
1 Diode J2-003 J2-010
2 RESIS J1-009 J2-024 301 ohm 10 %
3 CAP J1-021 J1-024 22.1 uF 10 %

LABELS
J1-001 = P1-01
J1-002 = P1-02
J2-001 = P2-01
J2-002 = P2-02

*Version:4
*TEST PREFERENCES
*START CONDITION: START BUTTON PRESSED
*INTERMITTENTS TEST: FOR DURATION 2 S
*HIPOT START CONDITION: AUTOMATIC
*HIPOT DELAY 0.2 S
*HIGH SPEED HIPOT: OFF
*EXTERNAL SAFETY SWITCH: OFF
*EXTERNAL START SWITCH: OFF
*ERROR LOCATION: ON

*Version:4
*REPORTS
*Test Report{<TestReport.cprn>, Printer,
Network:1, TestPassed, On}

)
```

The filename is the name used to save the program on the tester. It can be changed in the Hub editor or by using "Save As" in an editor like Notepad.

The optional Cable Description can be only be added in an editor. The field is included in the default Test Report and Error Report templates and in data saved when using the optional Data Collection feature. The description must be proceeded by an asterisk symbol (*) and inserted before the opening parenthesis that signifies the start of the test program.

The opening parenthesis signifies the beginning of the test program. The program signature is assigned by the tester and it need not be edited.

Location and signature of adapters. Can be edited but must match setup.

The Test Parameters section includes both (a) values selected by the user on the tester before learning a sample product or subsequently by editing the program on the tester and (b) values assigned by the tester. The tester assigns the wire list signature, the test parameter signature and the components resistance value. The signatures need not be edited and it's typically not necessary to edit the component resistance (see Section 9). Although it's often easier to change the remaining settings on the tester, they can be edited, but must match the values available on the tester.

The Nets section includes a list of net numbers followed by a string of points in that net. Continuity tests will be performed between the points in each net. The tester also uses the net list as the basis for configuring low voltage (LV) insulation resistance (isolation) tests and high voltage (hipot) tests. The Nets section can be edited but it must match the device under test.

The CHECK COMPONENTS section lists components included in the test.

- The Signature Diode test parameters cannot be edited. The first point designated is the anode side (J2-003 in the example).
- The nominal value and the pass/fail percentage tolerance of resistor (RESIS) and capacitor (CAP) tests can be edited.

The tester uses the location of the adapters (J1, J2 etc.) and the pinouts of the connectors on the adapters to determine the default descriptions for test points. Preferred point descriptions (labels) can be used instead by adding a LABELS section to the test program in an editor. The labels will be used by the tester in error messages and in reports. Although it's not necessary, the LABELS section typically includes all the positions in each of the connectors. See the next page for label rules. *Helpful hint - when in the test mode on the tester, the unit's probe can be used to identify test points.*

The TEST PREFERENCES section includes selections made when learning or editing a test on the tester under the Preferences menu. Although it's typically easier to make changes to these variables on the tester, revisions can be made in an editor, but they must match selections available on the tester.

If reports were added to the program prior to learning the product or subsequently by editing the test program on the tester, the preferences selected will be included in the REPORTS section. Although this section can be edited, it's recommended that changes be made using the tester.

The closing parenthesis signifies the end of the program.

15.3.2 Rules for Labels

The following rules apply when adding a labels section to a test program.

- The proper syntax for a label is the default description followed by the equals (=) sign and then the label. White space is optional (e.g. either J1-001=P1-001 or J1-001 = P1-001 is acceptable).
- Labels can include the characters A-Z, a-z, 0-9, underscore (_), and hyphen (-). **Spaces are not allowed within labels**.
- Labels can't duplicate existing default descriptions. For example, if J1-001 is a default description for a test point, it can't also be used as a label. This includes any of its common substitutes like J1-01 or J1-1. *Suggestion - use an underscore as the leading character in the label (e.g. _J1-001).*
- It's not necessary to include labels for all positions in each connector. However, if an error occurs involving a position without a label, the default test point description will be used.
- The maximum length of a label is 30 characters.

15.3.3 Legacy Testers

On legacy Cirris testers such as the 1100 Series, some test preferences were controlled on a tester level. This means changes affected all test programs globally. On the 4200 Series, settings are controlled on a test-by-test basis. If one program is changed, it has no effect on other test programs.

These preferences include:

- Test start condition
- HiPot start preference
- Intermittent testing
- High Speed HiPot On/Off
- External Switch On/Off
- HiPot Safety Switch On/Off
- Error Location On/Off
- Report Printing
- Digital I/O

In the sample program on the previous page, notice that a 4200 Series test program includes a section of "preferences" near the bottom of the file including Test Preferences, Reports Preferences (if any were selected) and Digital I/O Settings (if any were added). These settings reflect selections made while creating or editing the program in the 4200 user interface. When running a test program created on a 4200 tester on an 1100 unit, the 1100 will ignore this section of the test program and instead defer to the global settings configured under the tester's Preferences menu.

Also see Section 21 for Legacy Settings.

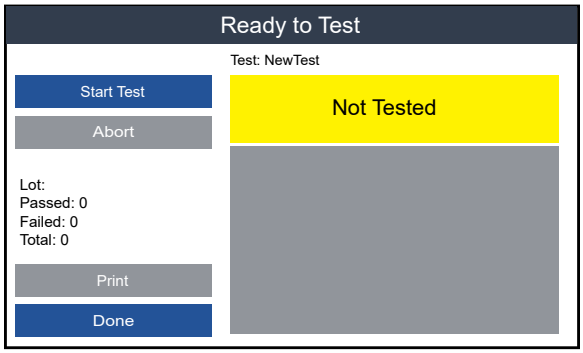
16. Run a Test

The tester performs three tests in the following order:

- **Low Voltage Test:** Tests for continuity and basic isolation.
- **High Voltage Test – 4250 only:** Tests for thorough isolation.
- **Intermittents Test:** Tests for intermittent errors that could arise while the cable is being moved.

Test Window Overview

The test window displays user instructions, test results, and other information.



User Instruction/Test Status: The box at the top of the screen displays instructions for the user or shows the status of the tester. For example, if the wrong adapters or no adapters have been inserted when the test is started, this box will display the signatures for the correct adapters.

Test name: The name given when the test program was created will display here.

Start Test button: This button is active when the **Start Condition** is set to **Start Button**.

Abort button: Ends test at any point. The aborted test will not be recorded as though it were never tested.

Lot: The **Lot ID** will act as an identifier to the batch of cables being tested. If turned off, the space next to **Lot ID** will be left empty.

Good/Bad/Total: Tracks number of cables tested including how many cables passed and failed.

Print: Press button to print test results if a report was selected for the test.

Test Results: This box will display one of three statuses:

- Not Tested
- Passed
- Failed

Result Details: Passes, fails, and error details from each test (Low Voltage, High Voltage, Intermittent) will appear in this window including error details.

16.1 Perform a Test

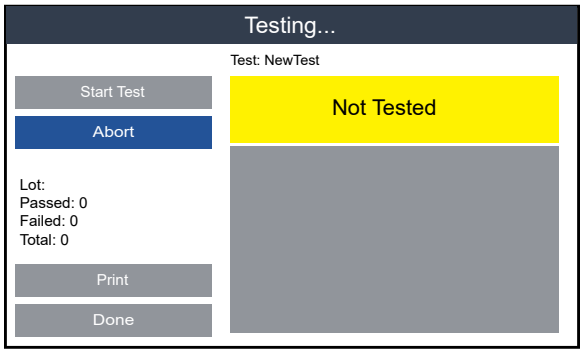
1. From the **Main Menu**, verify the required test program is loaded (the name of the test program is found at the top of the main menu screen) and then press **Test**.

2. If **Lot ID** is turned on, you may be prompted to enter an identifying series of numbers or letters. The **Lot ID** will be used to identify the batch of cables being tested. For more information on **Lot ID**, see *page 27*.

3. Depending on the chosen **Start Condition**, attach a cable or press **Start**. (The bar at the top of the window will prompt which action to take.)

16.1.1 Low Voltage Test

4. The tester will perform a low voltage test, checking for opens, shorts and test any components included in the test program. For some cables, this test can take less than a second. Don't be alarmed if the test passes without ever seeing the Low Voltage testing screen.

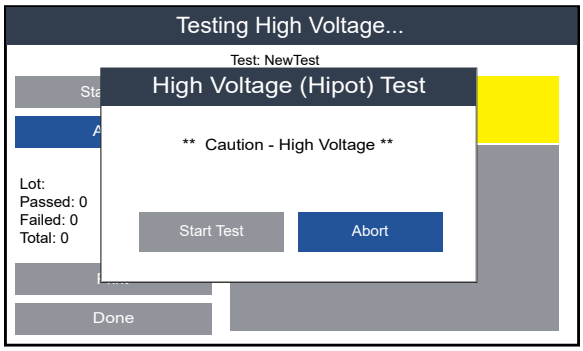


5. When the low voltage test finishes, either the intermittents test will begin, or if you are using the 4250, a window will prompt you to begin the High Voltage (Hipot) Test (if a High Voltage test was included in the test program).

16.1.2 High Voltage Test – 4250 only

6. Depending on the chosen start method, press Start Test or wait for the test to automatically begin.

WARNING! *To prevent an electrical shock to the operator, do not touch the assembly during the high voltage test.*



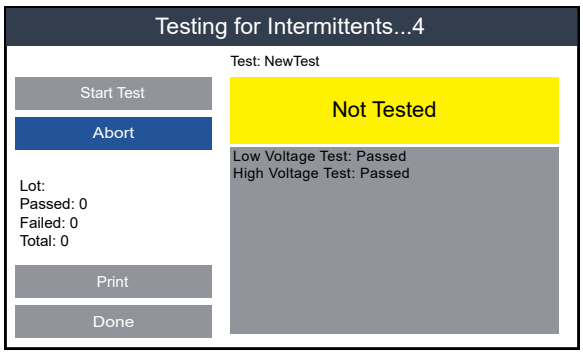
7. The tester will perform a high voltage test, checking for current leakage and dielectric failures.

8. When the High voltage (hipot) test finishes, the Intermittents Test will begin (if an Intermittents Test was included in the test program).

16.1.3 Intermittents Test

9. The Intermittents Test allows the user to check for potential defects by flexing or otherwise stressing the cable while the tester continuously checks continuity and isolation. If any failure is detected — even momentarily — the test will fail.

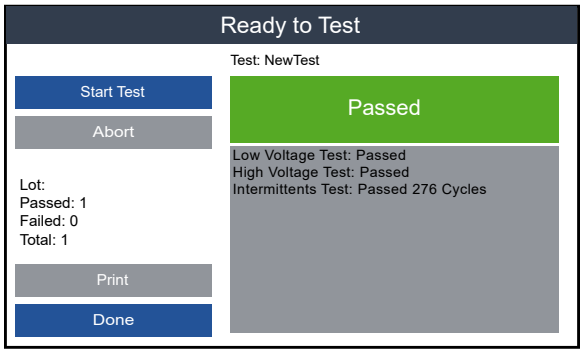
Note: If **Press to Stop** was the program option selected to end the Intermittents Test, and the DUT is removed before **End Test** is selected, the test will fail. Likewise, if **For Duration** was the option selected, and the DUT is removed before the specified time elapses, the test will fail.



16.1.4 Finishing a Test

10. Upon completing the test(s), you may want a printed report summarizing the results. If auto-print was selected from the **System Settings** menu, a report will print automatically, or you can press the **Print** button to print the report (see *page 27* for printing instructions).

11. If **Cable Attached** has been selected, remove the cable to complete the test. The results of the test will remain on the screen until the next cable is attached. The Lot information will update to show the results of the test.



12. At the end of the test—pass or fail—you have the option to retest the cable. Make any necessary adjustments to the hardware and press **Retest**. Pressing **Retest** will remove the last recorded test from the Lot information. The retest option is only available until the cable has been removed.

16.2 Test Results

Test results are displayed in the box on the right side of the screen. If an error occurred, the details of the error will be displayed. See *page 44* to learn about interpreting test results.

16.3 Printing Reports

In order for reports to print, the report must be added to the test program during setup.

When you press the **Print** button, a list of available reports will appear in a window. Select the report you wish to print and press **OK**.

If Auto-Print is set up, the report will print automatically upon the predetermined event.

16.4 Using the Probe

In the test window, probe any point on the attached connector to show information pertaining to the probed point. Release the probe to hide the window. This will help you locate errors within the cable.

17. Interpreting Test Results

When an assembly fails a test, the Test window will display the error type and the test points / nets involved in the error. The following examples show frequent errors operators may encounter:

Error Tones

When the start condition is set to Cable Attached and the volume is turned up, a failed cable will cause an error tone. The tone will change depending on the type of error. It will keep playing until the cable is removed. This feature can be useful during assembly when working with open and miswire errors.

Error Location

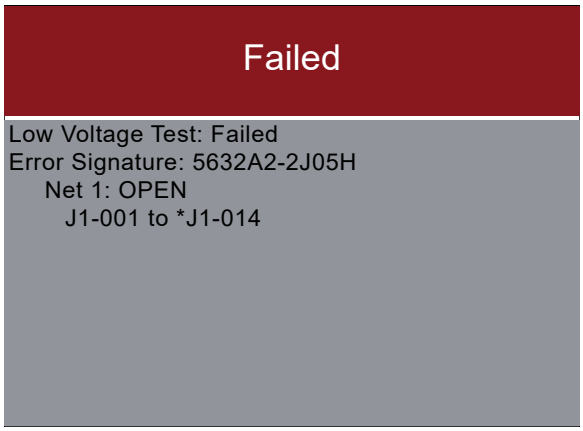
If you have an open or a short, the tester will use capacitance to determine on which end of the net the error is located. The tester will display the location on up to five errors. An asterisk indicates the error location on Error Reports.

Error Signature

Use error signatures to recognize previously encountered errors and test partially-built devices. Error Signatures display in the test window during a failed test..

Low Voltage Errors

Low voltage errors identify errors in the cable wire pattern. When the tester detects a low voltage error, the screen will display detailed information about the error.



The first line shows that the low voltage test failed.

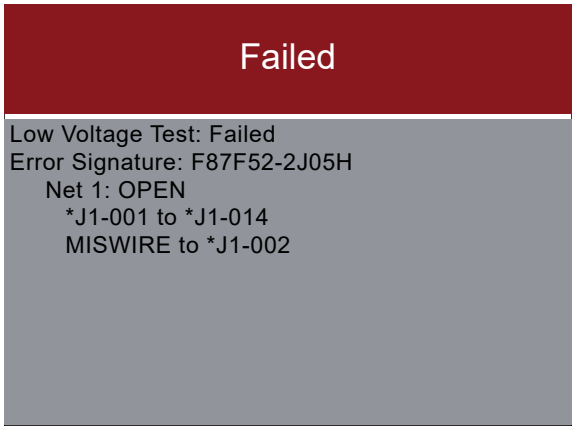
The second line describes the type of error.

- **OPEN:** The intended electrical path contains a gap across which electric current cannot pass.
- **SHORT:** An unintended connection between 2 or more points. This failure indicates insufficient insulation between unintended connections.

The third line defines the location of the error. For example, the above image shows an ***Open error between test points J1-001 and J1-014***.

In the case of a miswire, a fourth line will provide the third point in the error.

- **MISWIRE:** An unintended connection which is the result of unexpected contact. This error is often referred to as an Open and a Short combined.



The example to the right shows an Open error between test points J1-001 and J1-014 and a short from J1-014 to J1-002.

Component Errors

When the tester creates a new test program containing a component, it will measure the component value in the sample device and assign a default tolerance range. During a test, if the tester measures a value outside of the tolerance range, the component instruction will fail with an error message that indicates the value measured, as well as the expected value.

Note: *You can change the expected component value and the tolerance range by editing the test program in a text editor.*

High Voltage Errors – 4250 only

Overcurrent Error:

- An overcurrent error occurs when the current has exceeded an internal limit during the ramp phase for the net or point given in the error message. This often means that there is an unintended connection in the device so that more current is flowing than expected as the tester ramps up to the test voltage.
- This error could also be caused when the tester is charging the net or point given in the error message and the capacitance in the DUT is too high. A limit is in place to ensure safety while testing, so testing is immediately halted when the limit is reached.

Dielectric Failure Error:

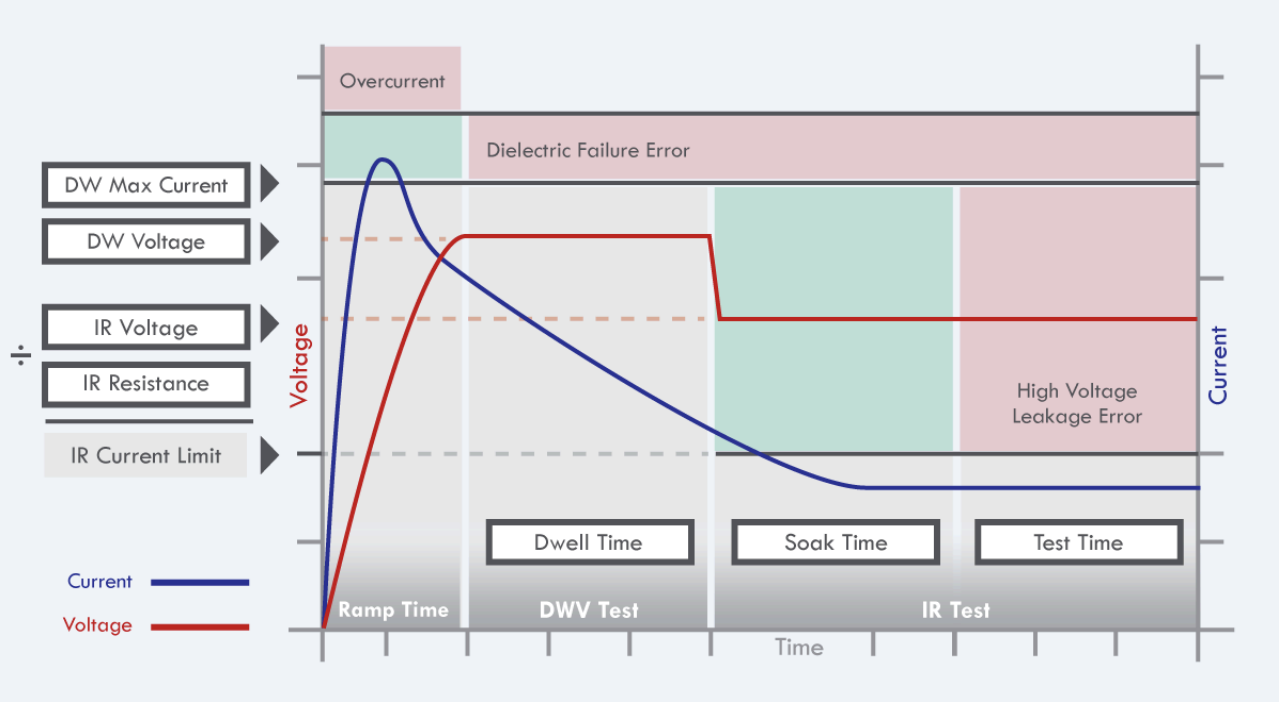
- This error indicates that an arc occurred during the high voltage test to the net or point given in the error message. This error will occur anytime the current exceeds the 'DW Max Current' test setting.
- This error most often occurs in pairs—Two different nets will fail. This generally means that the arc is occurring between these two nets. If the error occurs only on a single net, it may be the result of a highly capacitive net such as a shield. The 4250 tester has a setting that can overcome an error caused by highly capacitive shields. See *page 24*.

Leakage Error

This error is an indication that the measured insulation resistance is lower than specified by the IR Resistance test setting.

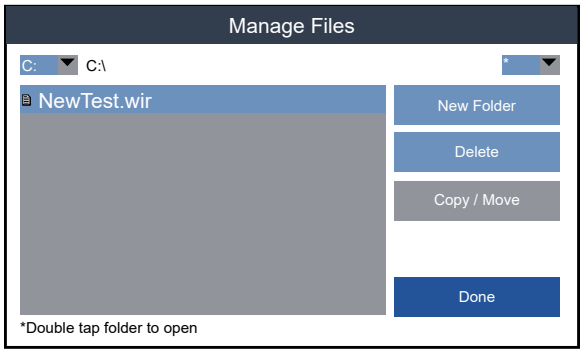
HV Errors Graph

The graph represents a normal, good set of high voltage tests. The red line represents voltage while the blue line represents current. If the blue current line ever enters one of the pink regions, the specified error will result. You can see how high voltage errors, like those described above, occur during a high voltage test.



18. Manage Files

All test programs, report templates, and other files can be accessed through the **Manage Files** menu. From this menu, test programs can be organized, copied, and deleted.



Filter files: Use the drop-down list to filter files. The ***.*** symbol shows all files.

Open a folder: Double-tap on a folder to open it.

Create a new folder: Press the **New Folder** button, type the name of the new folder, and press **Done**.

Return to the previous folder: Double-tap the top folder in the list showing the folder icon followed by two dots to return to the previous folder.

Copy a test program: Select a test program and press the **Copy/Move** button. Navigate to the folder where you wish to save the copied test program and press **Copy**. The test program can now be found in both the previous location and the new location.

Move a test program: Select a test program and press the **Copy/Move** button. Navigate to the folder where you wish to save the test program and press **Move**. The test program will no longer reside in the previous location but will only be found in the new location.

Delete a test program: Select a program or file and press **Delete**. Confirm that you want to delete the program or file by pressing **Continue**.

> ***WARNING!*** *There is no recovery option after a test program or folder is deleted. Verify the file selected before you delete any files.*

18.1 Test Program Backup via PC Connection

By connecting your tester to a PC, you can move files to and from the PC like you would with a USB flash drive. This allows you to back up test programs, organize files, and customize labels and reports.

1. Connect the PC to the tester using a USB cable.
2. Make sure the tester is connected to power but turned off. If the tester is running, you will not be able to access it from a PC.
3. In Windows File Explorer, the memory of the tester will appear as a drive named “4200 SERIES (X)” where “X” is the assigned drive letter. Accessing the tester’s memory provides the following capabilities:
   a. Test programs can be organized into folders for easy access.
   b. Test programs can be backed up to the PC.
   c. Test programs can be edited using an editor like Notepad and saved to the tester’s memory.
4. When finished, remove the PC cable, or turn the tester back on. Either action will disconnect the tester from the PC.

   WARNING! *Do not format your drive. Formatting your drive will permanently erase all test programs and test settings. If this happens, you must contact Cirris to make your tester operational again.*

18.2 Local Test Program Backup via USB Drive

To back up test programs using a flash drive:

1. Insert a USB drive into the USB port on your tester.

2. Copy your test programs onto the USB drive.

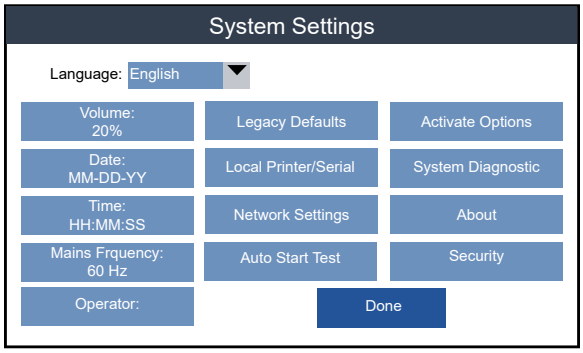
3. Remove the USB. With the test programs on the USB drive, you can save them onto a PC for safe keeping or for editing through a text editor.

Other USB drive uses:

- Update Firmware.
- Copy test programs between 4200 Series testers.
- Copy test programs between the tester and a PC.

19. System Settings

Various global settings and actions can be found under the **System Settings** Menu. Some of the items are self-explanatory while others require more in-depth descriptions that are provided in separate sections of the manual as noted below.



Volume: Adjusts the volume of tester tones.

Date: Sets the date and adjusts the date layout.

Time: Sets the clock for local time and adjusts the clock layout.

Mains Frequency: Also known as Power Line Frequency, should be set to 50 or 60Hz depending on your country's AC line frequency. The Correct selection will improve test measurement accuracy.

Operator: If desired, the operator name or ID can be entered which would allow the tester to add the operator name or ID to reports and, if the Data Collection option is enabled, to saved data.

Legacy Defaults: Reproduces the 1100 Series behavior on a 4200 Series. See *page 54*.

Local Printer/Serial: Sets the function of the two serial ports and their associated variables.

Network Settings: Adjust network settings. For more information, see the *Cirris Hub Manual*.

Auto Start Test: The tester can be set to automatically start testing when the unit is turned on or when power is applied, which can be useful in some applications including automated test cells,

Activate Options: After purchasing a new, optional feature, enter the feature key provided by Cirris into this menu to add the feature. Optional features include:

- 1000-volt AC Dielectric Withstand (DW) test capability (DC DW test capability is a standard feature).
- LUA Scripting
- Data Collection
- PC-Control for use with the Easy-Wire software

System Diagnostic: On startup, the tester runs a self-test to verify that the system is functioning properly. If a problem with the tester is suspected, a self-test can also be started from the **System Diagnostic** menu. If the tester fails the self-test, a window will open with a description of the details of the failure. Note the details of the failure and contact Cirris Tech Support.

The **System Diagnostic** menu is also the starting point to **Verify Calibration** using a Performance Verification Kit available from Cirris. The Zero/5 Meg Ohm test, which is a subset of the calibration verification process, can also be performed separately starting from the **System Diagnostic** menu. See the *4200 or 4250 Performance Verification Manual* for additional information.

About: Provides information about the tester configuration including:

- Station Name (Can be edited)
- Serial Number
- Firmware and Hardware versions
- Ethernet MAC
- WiFi MAC

Security: Users can be locked out of specified functions, like editing a test, the 42XX Security Utility. See Section 23.

20. **Legacy Defaults**

On legacy Cirris testers, such as the 1100 Series, some test preferences were controlled on a tester level meaning that changes affected all test programs globally. On the 4200 Series, these settings are controlled by the test program and changing one program has no effect on others.

For example, on the 1100H+ testers, the HiPot Start Condition is a global setting configured under the **Set Preferences** menu. However, on the 4250 testers, this setting is specified in each test program as a preference within the program. The same is true of the following:

- Test start condition
- HiPot start preference
- Intermittent testing
- High Speed HiPot On/Off
- External Switch On/Off
- HiPot Safety Switch On/Off
- Error Location On/Off
- Report Printing
- Digital I/O

To use test programs from a legacy tester, set the **Legacy Defaults** on your 4200 Series tester to match the system settings of your legacy Cirris tester. Once a legacy test program has been edited and saved on a 4200 Series tester, the new test program settings will be applied. The same test program can still be used on a legacy Cirris tester with the legacy tester applying its own system preferences and ignoring the 4200 program preferences.

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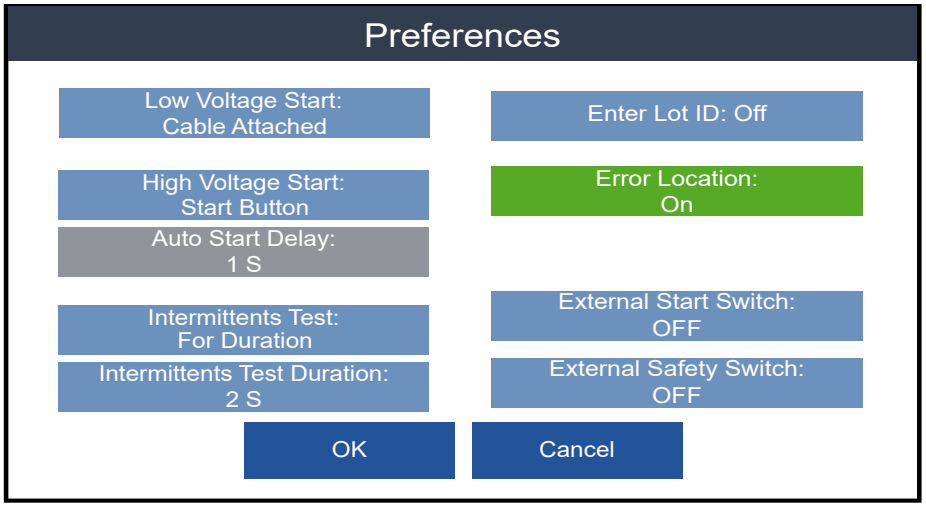


21. Network Settings

In order to print to a network printer and/or to share test programs between 4200 Series testers, the testers must be connected to the Cirris Hub running on a PC. Instructions for installing the Cirris Hub can be found in the *Cirris Hub Manual*.

All 4200 Series testers include networking capability. To connect the tester to the Hub over the network, from the tester's Main Menu, select System Settings, and then Network Settings. The options on this screen will allow your tester to communicate with a network running Cirris Hub Software.

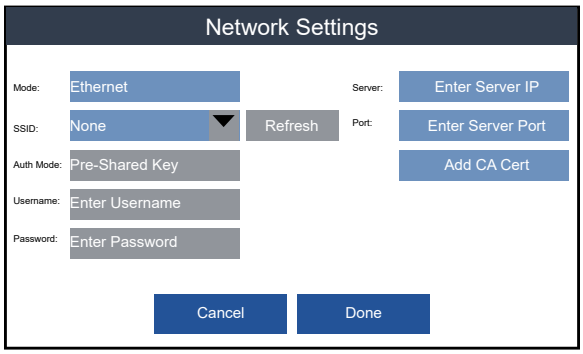
> ***Note:*** *An IT professional will likely need to help you in setting up your tester network settings.*

Choosing between Ethernet or WiFi

Ethernet is the most reliable method for connecting your tester to the Hub network. Once you have entered the settings for Ethernet and WiFi, you may switch between one or the other by simply by changing the Mode in Network Settings.

21.1 Ethernet

Cirris suggests using Ethernet whenever possible to ensure a reliable connection.



Using an Ethernet cable, connect your tester to the same network router or switch that is connected to the PC running Cirris Hub Software.

On the Network Settings screen:

- Mode: Ethernet.
- Server: IP address for the computer running Cirris Hub Software.
    - The tester will automatically detect the IP address of the computer running Cirris Hub Software If the tester is on the same subnet.
    - Enter the IP address or host name of the computer running the Cirris Hub Software if the network service is not detected. The IP address and the port can be found on the **Server Status** page of the Cirris Hub interface. See the *Cirris Hub Manual* for more information.
- Port: You do not have to enter a port if the tester automatically detects the Cirris Hub Server on its subnet. The default port is 12568 or enter the port number as set up by the IT administrator.

Press Done. The tester should say **Connecting to Cirris Hub...** then return to the **System Settings** screen. When you load a test from the **Main Menu**, you will notice that you can select F: drive.

Your tester should now appear on the list of available testers in the Cirris Hub Interface. See the *Cirris Hub Manual* for more information.

21.2 WiFi

Warning: *When using WiFi, you may on occasion notice the tester pause to reestablish network communication. Cirris recommends using a wired connection.*

1. On the Network Settings screen:

- Mode: WiFi
- SSID: Press **Refresh** then select the wireless network from the drop-down list.

Note: *The name of the wireless network must be broadcast. The tester is not capable of connecting to a non-broadcast wireless network.*

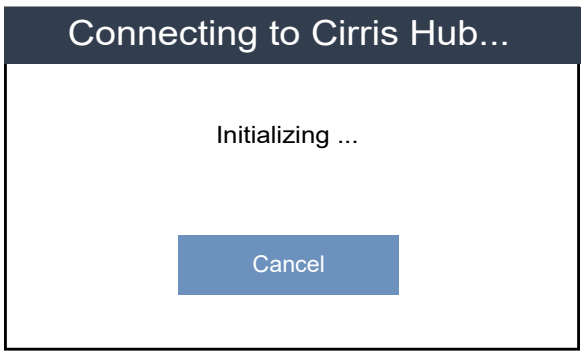
- Auth Mode: Select Enterprise or Pre-shared Key depending on your network environment.
- Username: Enter the Username if using the Enterprise mode.
- Password: Enter the password to connect to the network.
- Server: Server: IP address for the computer running Cirris Hub Software.
  - The tester will automatically detect the IP address of the computer running Cirris Hub Software If the tester is on the same subnet.
  - Enter the IP address or host name of the computer running Cirris Hub Software if the network service is not detected. The IP address and the port can be found on the **Server Status** page of the Cirris Hub interface. See the *Cirris Hub Manual* for more information.
- Port: You do not have to enter a port if the tester automatically detects the Cirris Hub Server on its subnet. The default port is 12568 or enter the port number as set up by the IT administrator.
- If a client CA Certificate is required, insert a USB drive containing the certificate into the USB port on the back of the tester. Press Add CA Cert to access the certificate.

Press **Done**. The tester should say **Connecting to Cirris Hub...** then return to the **System Settings** screen. When you load a test from the **Main Menu**, you will notice that you can select F: drive.

Your tester should now appear on the list of available testers in Cirris Hub Software. See the *Cirris Hub Manual* for more information.

21.2.1 Connecting to Cirris Hub...

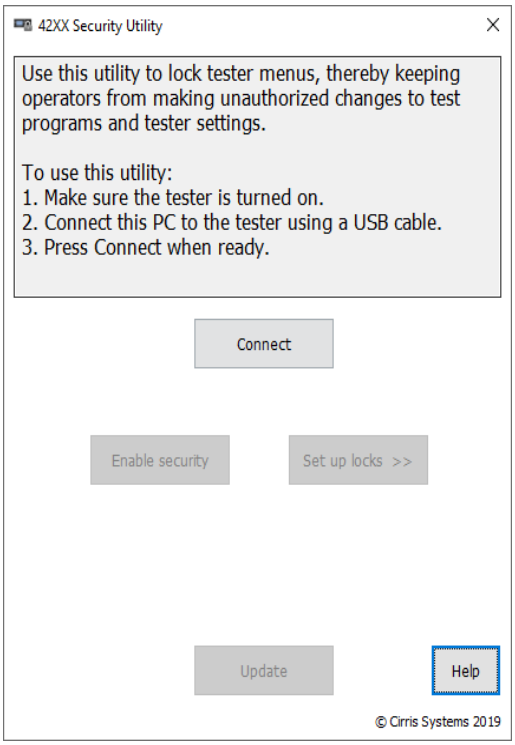
Depending on your environment, network, and other conditions, you may experience occasional pauses when using WiFi. These pauses can last several seconds while a window blocks the tester screen. Do not press cancel. Wait for the tester to connect to the network. Once the tester reconnects, the window will disappear and the test process can resume.



22. Security

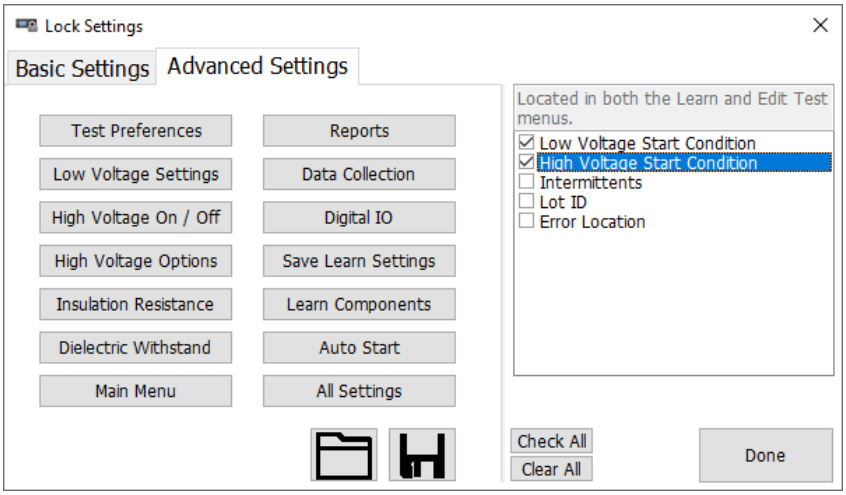
Using the 42XX Security Utility, selected functions of the tester can be locked to prevent users from accessing or specified functions. For example, operators can be prevented from editing and saving programs.

The 42XX Security Utility is included in the 42XX Utilities installation provided on the USB flash drive supplied with the tester. The installation will place a shortcut on your desktop or the program can be accessed under the Cirris programs folder. To run the utility, first connect the PC to the tester using a USB cable and turn the tester on. Open the utility and follow the instructions on the screen.



On the 42XX Security Utility **Main Menu**:

- The **Connect / Disconnect** button toggles between the two functions. **Connect** will place the tester in the remote mode and allow the application to send changes to the tester. **Disconnect** should be selected after preferences have been selected and the tester has been updated.
- The **Enable Security / Disable Security** button toggles between these two functions. **Enable Security** will activate the Set up locks >> and Password buttons. **Disable Security** removes security settings from the tester.
- **Set Up Locks >>** accesses additional screens on which specific functions to be locked can be selected.
- A **Password** must be entered to enable security on the tester. The password can be used on the tester under **Main Menu** > **System Setting** > **Security** to temporarily provide access to functions locked by the security settings.
- **Update** will send the new security configuration to the tester, locking the specified functions and updating the password.



The L**ocks Settings** screen, accessed by selecting the **Setup Locks>>** button, has two tabs - **Basic Settings** and **Advanced Settings**. Most users will find the **Basic Settings** sufficient, but selecting any of the category buttons under either tab will present a list of check boxes used to select functions within that category to lock.

Under the **Advanced Settings** tab, options for saving selected Lock Settings and loading saved Lock Settings are also available.

Selecting the “Floppy Disk” icon on the **Advanced Settings** tab will allow the user to navigate to a desired file directory and save the current Lock Settings as a file.

Selecting the “Folder” icon under the **Advanced Settings** tab will allow the user to load a previously saved Lock Settings file.

When finished selecting lock preferences, select **Done** to return to the **Main Menu**. Enter a password and select **Update** to download the settings to the tester. Select **Disconnect** to return the tester to local control and close the Security Utility.

On the tester, buttons for locked functions now include a small closed padlock icon signifying those functions are inaccessible. To temporarily override the locks, on the tester from the **Main Menu** > **System Settings** > **Security** and enter the password created in the 42XX Security Utility. Functions previously locked will now be accessible and will show an open padlock icon. Reentering the password will revert to the original, locked security settings. Power cycling the tester will also reset the locked settings.

If the password is lost, a new one can be created by running the 42XX Security Utility again.

To permanently disable security settings and remove the lock icons, follow the same process described above to connect the tester to the PC and open the 42XX Security Utility. On the 42XX Security Utility **Main Menu**, select **Disable Security** and then **Update** before selecting **Disconnect** to return the tester to local control.

23. High Voltage Guidelines (4250 only)

Use the following considerations to determine high voltage specifications:

- Customer needs, engineering necessities, or manufacturer's specifications for wires and connectors.

  Note: Do not confuse the rated running voltage with a maximum hipot value.

- Voltage applied to a cable which may be limited by the spacing between pins in a connector and the separation of the conductors in a cable.
- Available high voltage selections for the Insulation Resistance Settings (see page 25) – see the table below.
- Highly capacitive cables that the amount of high voltage that can be applied to the cable.

HV Insulation Resistance Table

The "HV Insulation Resistance" settings are limited by the high voltage settings. The table below shows the available Insulation Resistance settings at each of the high voltage settings.

Voltage	Min IR (Megohms)	Max IR (Megohms)
100 V	10	100
200 V	20	200
300 V	30	300
400 V	40	400
500 V	50	500
600 V	60	600
700 V	70	700
800 V	80	800
900 V	90	900
1000 V - Max	100	1000

HV Insulation Resistance Guidelines

IR Settings may be based on any of the following factors:

- Contamination: Fingerprints and mold release on your DUT may require you to lower the IR threshold.
- Humidity: A humid environment can aggravate the effects of contamination between contacts and affect insulation.

High Voltage Duration:

Insulation Resistance Duration may be set using the following guidelines:

- The default setting of 0.010 seconds (10 milliseconds) should be adequate to test most cables. A longer duration will increase the high voltage test time.
- Since absorbed moisture may not have time to be “dried out” before the Insulation Resistance Test, consider using the advanced Soak setting to “dry out” your insulation. A shorter soak time or not having soak time is more likely to fail due to humidity related problems

Dielectric Withstand Duration

- A longer duration provides a more stringent test for predicting dielectric failures (exhibited as sudden arcs); however, equivalent dielectric errors can be found by compensating a shorter duration with a higher high voltage setting.
- A longer duration may be better for predicting some types of insulation failures and may increase the chance of detecting a breakdown condition.

24. 4-Wire Kelvin Testing

To measure resistance, the tester applies a current source to one test point in a net while it connects a second point in the net to ground and measures the voltage drop between the two. It then calculates the resistance using Ohm's Law. Since voltage is measured through the fixturing, any resistance in the fixturing is included in the measurement. The 4-wire (Kelvin) test method eliminates the resistance of fixturing and also enables the testers to measure very low resistance values - as low as .001 ohm for the 4250 tester and as low as .005 ohm for the 4200 tester.

24.1 4-Wire Pairs

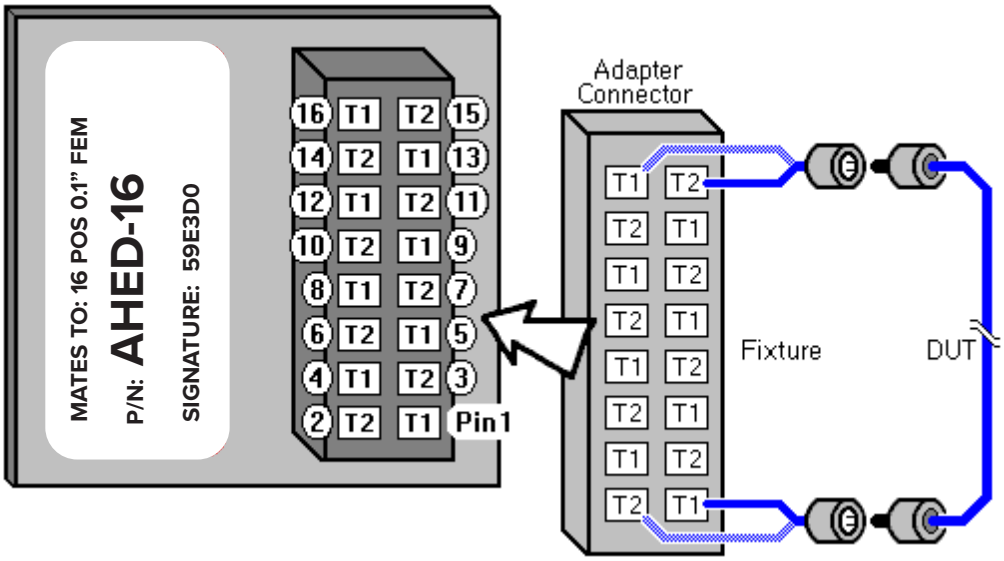
The 4-wire measurement method requires two test points for each termination in the device under test. These are called 4-wire pairs.

- One test point supplies current (referred to as "force")
- The other senses voltage (referred to as "sense")

It's necessary to use one force point and one sense point in each 4-wire pair. For the purpose of 4-wire testing, all positions in each Cirris adapter are EITHER a dedicated force point or a dedicated sense point. These identities can't be changed. Therefore, when making 4-wire fixtures or test cables, it's necessary to know whether a position in an adapter is a source point or a sense point before wiring the fixture. This manual will describe the two types of points as Type 1 and Type 2, or T1 and T2, but you may also see tester messages that refer to the two types as A and B. Whatever the terminology, the important thing to note is that each 4-wire pair must include one of each type.

> ***Note:*** *If a 4-wire pair is wired incorrectly, during the learn process the tester will display an error message indicating that both points in the specified 4-wire pair are the same type.*

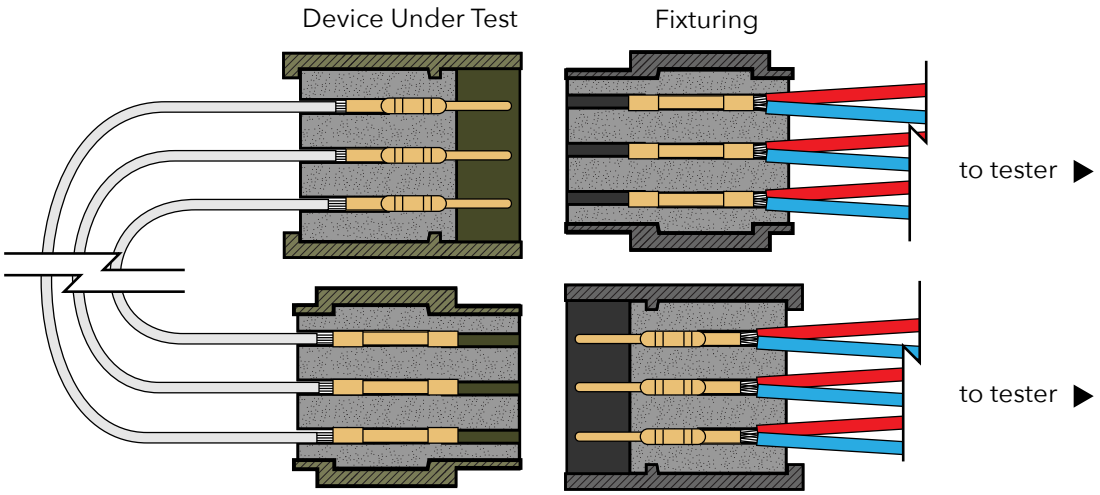
Although any Cirris adapter can be used for 4-wire testing, one of the easiest to use is the AHED series because the Type 1 and Type 2 points alternate side-by-side making it simple to identify proper 4-wire pairs as shown in the example of the AHED-16 adapter below.



Helpful tip: When learning a new test program that includes 4-wire components, the learn is a two-step process. The tester first learns the 4-wire pairs before learning the sample device. At the beginning of this first step, the tester will display the message "Attach Four-Wire Fixture." At this point the tester's probe can be used to identify points as Type A or Type B, the terms the tester uses to differentiate force and sense points. The probe can be used directly on adapter positions to differentiate the two types or on fixturing to check the point types.

24.2 4-Wire Fixtures

When making 4-wire fixturing or test cables, it's important to understand that 4-wire measurements includes only the resistance between where the source and sense points meet on both sides of the device being measured. This is very useful because it eliminates unwanted fixture resistance from the measurement. For this reason it's most often beneficial for the source and sense points to meet as close to the device under test as possible. The graphic below shows a typical 4-wire test configuration in which the source and sense points meet in the contacts of the product mating connector. In this setup, there may be some small resistance in the receptacle contact from the point where the source and sense meet, but then only the mating resistance of the contacts and the resistance of the device



under test is measured.

24.3 Creating a 4-Wire Test Program

To create a 4-wire test:

1. From the tester's **Main Menu** > **Create New**.
2. From the **Learn Menu**, press **Edit Learn Settings** > **Components**.
3. In the **Components Menu**, press **Learn Four-Wire** and press **OK** to return to the **Edit Learn Settings Menu**. When done making changes press **Save** to return to the **Create New Test Menu**.
4. With only the fixturing attached to the tester, press **Learn Attached Device**. A window will appear instructing the user to **Attach Four-Wire Fixture**. When this window appears, the probe can be used to identify points as Type A or Type B. When ready, press **Learn** to proceed with the learn process.
5. After the 4-wire pairs are learned, the tester will display a message instructing the user to **Attach Four-Wire Cable**. Connect the sample device to the fixture/test cable(s) and press **Learn** to learn the device.

24.4 Viewing a 4-Wire Test Program

There are a few items to note when viewing programs resulting from a 4-wire learn.

Points in 4-wire instructions are also included in the Nets list as standard connections. This is required for the tester to perform accurate isolation tests

Only one point in each 4-wire pair will be shown in the instructions, the other will remain invisible. The tester will make the lower-numbered test point in each pair the visible point regardless of whether that point is a source or sense point.

The tester will automatically set pass/fail thresholds for 4-wire tests based on the learned resistance values. The thresholds can be edited as required (see Section 15.3 for more information on editing test programs on a PC).

The 4-wire pairs are listed separately.

```
Filename: 4537908-501
(C62C28-MULTI

 J1  D507F1

WIRE LIST SIGNATURE:6B1614-5N8N1
INSUL TEST PARM SIGNATURE:8L6FH
CONNECTION RESIS  10.0 ohm
COMPONENT RESIS >  90.0 K ohm
LV INSULATION RESIS  100 K ohm
HIPOT VOLTAGE 300 V
INSULATION RESIS  10.0 M ohm
HIPOT DURATION  .01 SEC
HIPOT SOAK TIME  0 SEC
APPLY HIPOT TO ALL ADAPTER PINS

1   J1-001  J1-003
2   J1-005  J1-031
3   J1-019  J1-023
4   J1-041  J1-042
5   J1-043  J1-045

CHECK COMPONENTS
1 4W_WIRE J1-001 J1-003 < 0.089 ohm
2 4W_WIRE J1-005 J1-031 < 0.044 ohm
3 4W_WIRE J1-019 J1-023 < 0.044 ohm

*Version:4
*TEST PREFERENCES
*START CONDITION: START BUTTON PRESSED
*INTERMITTENTS TEST: FOR DURATION 2 S
*HIPOT START CONDITION: AUTOMATIC
*HIPOT DELAY 0.2 S
*HIGH SPEED HIPOT: OFF
*EXTERNAL SAFETY SWITCH: OFF
*EXTERNAL START SWITCH: OFF
*ERROR LOCATION: ON

FOUR-WIRE KELVIN PAIRS
J1-001 J1-002
J1-003 J1-004
J1-005 J1-006
J1-019 J1-020
J1-023 J1-024
J1-031 J1-032


)
```

25. **Calibration**

Each new Cirris tester is calibrated in accordance with the requirements of ANSI/NCSL Z540-1 before it leaves the factory and includes a certificate of calibration valid for one year. At a minimum, Cirris recommends that testers be returned to the factory annually for calibration or that the calibration be verified annually using a Performance Verification Kit available from Cirris.

The date of the last calibration verification is displayed on the tester's Main Menu along with the calibration verification due date. The default interval for calibration is one year but the due date can be changed during the verification process.

The Performance Verification Kit includes a manual detailing the verification process and calibrated standards, traceable to NIST, which when used together can verify the tester's calibration. No adjustments are made to the tester during the process. If a tester fails the verification, it typically indicates a hardware problem. After a failure, contact Cirris Technical Support with a description of the failure condition for assistance. If the tester passes, it's ready for continued use until the new calibration verification due date.

More information on the Performance Verification Kits can be found in the 4200 or 4250 Performance Verification Manuals. Contact your Cirris sales representative for pricing and availability.

Note: Do not open the tester chassis or make any attempt to repair the tester hardware as this action will void the tester's warranty.

26. Optional Features

26.1 PC Control with Easy-Wire™ Software

4200 Series testers can be controlled by a PC running the Windows 10 or operating systems and the optional Easy-Wire Software. Contact your sales representative for information on obtaining a software license.

Easy-Wire Software provides extra features and benefits such as:

- More reporting options
- Compatibility with other Cirris testers
- Expanded test methods and instructions
- And other features

See cirris.com for more information.

26.2 Scripting

The LUA programming language can be used to develop scripts that can accommodate a wide range of custom functions including specialized device testing and unique automation communication protocols. Scripting is available as an option on the 4200 Series testers. Contact your sales representative to discuss your application needs in detail to determine if the optional scripting capability will support your requirements.

- Reference the Cirris Easy-Wire scripting manual when the tester is controlled by Easy-Wire.
- Reference the Cirris LUA Scripting manual when scripting is run on the 4200 tester without Easy-Wire.

26.3 Data Collection

The Data Collection option enables 4200 Series testers to collect and save test results data for archive purposes and/or for analysis. See Section 14 for more information.

26.4 AC Dielectric Withstand (DW) Testing

As an option, the 4250 tester can be equipped with the capability to perform Dielectric Withstand (DW) testing at up to 1000 VRMS using a maximum current threshold of 0.1 mA to 1.5 mA.

27. Maintenance and Service

27.1 Maintenance

Do not open the tester chassis. Opening the chassis will void your warranty. The 4200 Series tester contains no internal user serviceable parts. Cleaning or routine maintenance of internal parts should be done at Cirris.

Do not try to replace the lithium battery on the MCAN board. Should this battery, or any internal parts malfunction, contact Cirris for a repair.

Any exterior cleaning should be done using a clean, damp rag. Avoid using cleaning agents or chemicals on any part of the unit.

27.2 Firmware Updates

The firmware that controls the 4200 Series testers is regularly updated to add the latest improvements. These updates are posted on the Cirris web site and it's recommended that users periodically check for new revisions and install the latest available version on the tester.

Checking for Firmware Updates

To check for updates visit the Cirris web site and from the Home Page select Products > Testers > 4200 or 4250. On the tester page select the Downloads tab. If the 4200 Series Firmware Updater displayed there includes a version newer than the one installed on the tester, download the updater. The firmware version currently installed on the tester can be found in one of two ways:

- On the tester, from the Main Menu select System Settings > About. The firmware version will be displayed as "Cirris OS" followed by the revision (e.g. Cirris OS v 2019.4.1.24).
- If the tester is connected to the Cirris Hub, the firmware version installed on each tester connected to the Hub is displayed under the Testers page.

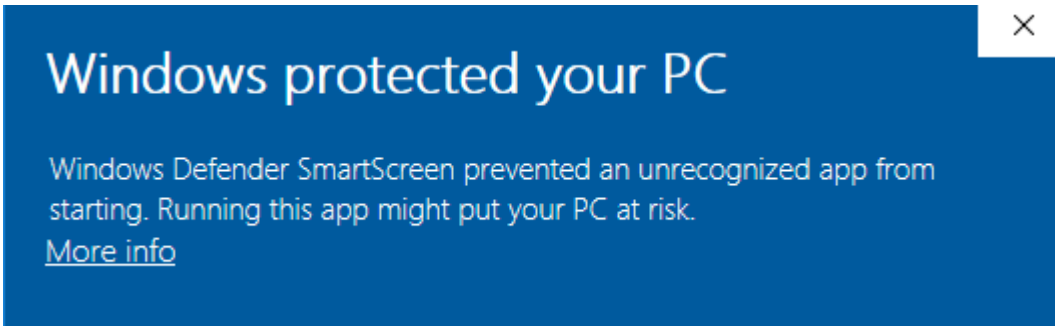
Downloading and Installing the Firmware Updater

The 42XX Firmware updater should be installed on a PC that can be connected to the tester using a USB cable.

1. From the Main Page of the Cirris web site, select Products > Testers > 4200 or 4250. On the tester page select the Downloads tab. Select the link for the 4200 Series Firmware Updater and download the installation package.

2. Unzip the 42XX Firmware Updater to an accessible location on the PC. Contact Cirris if the unzipping the updater requires a password.

3. Install the 42XX Firmware Updater on the PC by running the downloaded installation package and following the instructions on the screen. During the installation, Windows Defender may pause the installation and display the message below. If so, click on "More Info" then "Run anyway" on the subsequent window. If the installation pauses for an unknown reason, it's likely this window is hidden behind another. You may also see a pulsating Windows Defender shield icon in the task bar.



Updating the Firmware

To run the 42XX Firmware Updater:

1. Open the 42XX Firmware Updater. The installation does not place a shortcut on the desktop. Therefore, click on the Windows Stat button and then expand the Cirris folder to show the list of installed Cirris software. Select the 42XX Firmware Updater to open the application.

2. Turn off the tester but make sure it's connected to power and connect the tester to the PC using a USB cable.

3. Follow the instructions on the 42XX Firmware Updater screen to complete the update. The default location the firmware directory is the location in which the installation stored the required files. It's not necessary to change this directory unless you've been provided with beta firmware, in which case you'll be provided with additional instructions.

27.3 Service and Repairs

If technical support is required or if your tester needs service, please contact your Cirris sales representative. In the United States you can also reach our Technical Support Department directly at TechSupport@Cirris.com or by telephone at 1-801-973-4600, extension 666.

28. **Frequently Asked Questions**

How can I know what values to use in each test setting?

If settings are not specified in the cable build instructions and you are hesitant about using the default settings in the software, you can turn to the industry accepted wire assembly guide, A-620. More information about this guide can be found by visiting cirris.com.

You can also calculate some settings using tools such as the Cirris calculators found at cirris.com.

Is high voltage testing dangerous?

The 4200 and 4250 testers are designed to limit the hazards associated with electrical testing. However, high voltage testing on the 4250 presents some risk and, therefore, children, women who are pregnant, and people with electronically controlled medical devices should not perform high voltage testing. To limit the shock hazard of high voltage testing the high voltage energy limit of the 4250 is 35mj and the high voltage charge limit is 45 µc.

How do I calibrate my tester?

The act of calibrating a tester should only be performed by Cirris or a third-party calibration lab. To verify calibration and functionality, you can purchase a Performance Check Kit from Cirris.

Every Cirris tester that leaves our factory is calibrated in compliance with ANSI/NCSL Z540-1-1994 and ISO-10012 to standards traceable to the NIST in the United States. For more information, visit cirris.com.

The calibration of the tester should be verified annually at a minimum.

Where do I find current manuals?

The most current manuals can be found by contacting your Cirris representative or visiting cirris.com.

29. Factory Defaults

The following table lists the settings for the 4200 Series testers and their corresponding factory defaults.

Preferences	
Low Voltage Start	Cable Attach
High Voltage Start	Auto Start Delay
HV Auto Start Delay	0.5 S
Intermittents Test	For Duration
Intermittents Test Duration	2 S
Enter Lot ID	OFF
External Start Switch	OFF
External Safety Switch	OFF
Error Location	OFF

LV Settings	
Connection Resistance	10.0 ohm
LV Insulation Resistance	100 k ohm

High Voltage - 4250 only	
High Voltage	ON

HV Basic Settings	
High Voltage	50 V
Insulation Resistance	5 M ohms
Dwell Time	2 mS

HV Advanced Settings	
DW Voltage	50 V
DW Max Current	0.1 mA
DW Dwell Time	10 mS
AC Frequency	60Hz
Cycles	1 Cycle
IR Voltage	50 V
IR Minimum Resistance	50 M ohm
IR Dwell Time	2 mS
IR Soak Time	0 S
Soak Until Good	OFF

Components Settings	
All	OFF

Data Collection	
Data Collection	OFF
Measured Values	OFF
Error Text	OFF

System Settings	
Volume	20
Date	MM_DD_YY
Time	24
Mains Frequency	60 Hz

30. **Troubleshooting**

Visit www.cirris.com/learning-center for articles on troubleshooting. If you need additional help, contact Cirris Technical Support at techsupport@cirris.com or 1-800-441-9910 ext 666.

A high percentage of tests fail

Too many tests failing could be caused by several possibilities.

- **Error in the Learned device:** If a cable with mistakes or defects is used as the primary cable to create the test program, then all good cables will fail because they are tested using bad test instructions.
- **Fixturing:** Failures can occur if the fixturing is not built and connected correctly. See the Fixturing section of this manual for help (*page 14*).
- **Tester Interface/Unit:** A problem with the tester may occur on the tester interface (the part of the tester visible to the user), or within the tester unit (the wiring and other pieces contained inside the chassis). Problems with the tester interface might be repairable by the user while problems with the tester unit should be evaluated by the tester manufacturer. If you suspect a problem with your tester unit, verify your tester is calibrated. You can purchase a verification kit from Cirris. If necessary, you may have to send the tester to Cirris for repair.
- **High Voltage – 4250 only:** To troubleshoot a high voltage failure such as a dielectric failure, remove the DUT and Learn a new test program with the same high voltage settings. The tester may display a warning indicating no connections are found. Proceed to perform the Learn and test. If the same dielectric failure occurs, the problem is either with the test fixture or the tester interface. If possible, try testing the same device with different fixturing. If the problem still occurs, the error is the most likely source of the problem.
- **Environment:** Occasionally failures can be caused by factors in the environment such as humidity and materials. For example:
  - **Humidity:** Humidity related IR failures will usually report as an IR or HV leakage failure. High humidity can allow moisture paths for small amounts of current to flow between unintended connections.
  - **Materials:** Consider the materials selected, the type of environment you operate in, and the number of cycles the fixturing can endure. If there is any question of suitability in materials, try looking at the manufacturer's specifications.

No Sound

The tester uses sound prompts to provide feedback to the operator. If the tester is not making any sound, check the tester volume.

From the Main Menu, press System Settings.

Press the Volume button.

If the volume is set to 0, the tester will not make any sounds. Enter a number between 1-100.

31. Glossary

Adapters: Interchangeable devices with connectors that attach the cable being tested to the tester

Connections: The continuous electrical path between 2 or more points wherein current flows. The path is constructed with metal parts, such as copper wire, contacts, terminations, splices, and mating contacts of connectors.

Device-Under-Test (DUT): The cable, harness, or other assembly that is being tested by the cable tester.

Dielectric Withstand (DW): The tester applies the required voltage for the determined amount of time and watches for current flow. Ideally, no current flows and the cable is not harmed.

Fixturing: The test interface or adapter cables that connect the device-under-test to the tester.

Hipot/High Voltage Test: A high voltage or hipot test checks for “good isolation.” This test checks that no current flows between points where there should be no current.

Intermittent Errors: Errors that occur sporadically or inconsistently.

Intermittents Test: Gives the operator a chance to move and flex the cable, searching for intermittent errors.

Insulation Resistance (IR): The test applies a voltage and measures the current to determine if the resistance of the insulation is high enough.

Had Leakage error: Occurs because more current than is acceptable leaks between unconnected points.

Learn: The process of the tester scanning a known-good cable to create a test program.

Low Voltage Test: The tester applies a current to the wire and measures the voltage. If the wire is connected correctly, the test will read low resistance, meaning current is flowing through the wire as expected and reaching the required connections.

Miswire: An unintended connection which is the result of a misplaced contact within a connector.

Net: Two or more interconnected points in a cable or harness.

Open: The intended electrical path contains a gap across which electric current cannot pass.

Overcurrent error: A larger amount of the current is able to flow through the wire than the tester expects.

Short: An unintended connection between 2 or more parts. This failure indicates insufficient insulation between metal conductors which were not intended to be connected.

Test Program: The list of instructions used to test cables and harnesses.

32. **Specifications**

Test Points

128 points; expandable to 1024 points in 128-point increments

Low Voltage Test

2 Wire

- **Voltage:** 4 V max
- **Current:** 3 µA to 6 mA
- **Resistance:** 0.1 Ω to 100 k Ω ± 1% ± 0.1 Ω, 100k Ω to 5 MΩ ± 10%

4 Wire

- **Voltage:** 4 V max
- **Current:** 1 mA to 1 A
- **Resistance:**
  - **4200:** .005 Ω to 10 Ω ± 2% ± .005 Ω
  - **4250:** .001 Ω to 10 Ω ± 2% ± .001 Ω

Component Tests

- **Diodes:** Silicon, LEDs, zeners with breakdown > 4V
- **Resistors:** 0.1 Ω to 100k Ω ± 1% ± 0.1 Ω, 100 kΩ to 5 MΩ ± 10%
- **Capacitors:** 5 nF to 100 µF ±10% ± 0.02 nF
- **Twisted Pairs:** Verify proper pairing in twisted pair cables (4250 only)

High Voltage Test – 4250 only

Insulation Resistance Test

- **Voltage:** 50 to 1500 VDC ± 5% ± 5 V (2000 VDC optional)
- **Resistance:** 5M Ω to 1000 MΩ ± 10%

Dielectric Withstand Test

- **Voltage:** 50 to 150 VDC ± 5% ± 5 V (2000 VDC optional, 50 to 1000 VAC optional)
- **Current Limit:** 0.1 mA to 1.5 mA
- **Max Capacitance Per Net:** 150 nF @ 300 VDC, 90 nF @ 500 VDC, 45 nF @ 1000 VDC, 30 nF @ 1500 VDC, 9.5 nF @ 1000 VAC
- **HV Energy Limit:** 35 mJ
- **HV Charge Limit:** 45 µC

Max Points per Net: 100

Digital Input/Output

4 Inputs / 6 Outputs, 24 V Open collector, +10 V and +5 V each current limited to 100 mA

Test Point Interface

Cirris Adapter System

User Interface

- **Display:** 7 x 3.5" color graphical display with capacitive touch screen (800 X 480-pixel resolution).
- **Localization:** English, Spanish, French, and Chinese with ability to translate to other languages as needed.
- **Memory:** Internal memory for test program storage (8 GB or more).
- **File transfer:** Transfer test programs either by connecting directly to a PC or using a USB flash drive.
- **Printing:** Local label printing via serial ports. Network printing via Cirris Hub™ Software.
- **Optional PC control:** Additional advanced features via Easy-Wire™ Software.

Power

105 -135 V, 60 Hz, 210 -260 V, 50 Hz

Size

- **Main Unit:** 17.35" x 6.47" x 7.08" (44.07 cm x 16.43 cm x 17.98 cm)
- **Add-on Box:** 6.24" x 5.22" x 7.08" (15.85 cm x 13.26 cm x 17.98 cm)

Weight

- **Main Unit:** 11.35 lb (5.15 kg)
- **Add-on Box:** 5.00 lb (2.27 kg)

All Cirris products are manufactured in Salt Lake City, Utah, United States of America.

Cirris 4200 Series User Manual
Version 2020.4.0
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www.cirris.com