5150
Performance Verification Manual

Version 2026.1.0

CIRRIS®

A KOMAX COMPANY

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1. Introduction

Cirris 5150 Base Units ship with a certificate of calibration that's valid for one year. The calibration can be verified using the instructions in this manual in conjunction with an 5150 Performance Check Kit and a calibrated multimeter. The kit includes standards that have been calibrated using instruments with accuracies traceable to the National Institute of Standards and Technology (NIST). The certificate of calibration included with a performance check kit is valid for two years.

1.1 Scope

As described in detail in this manual, there are two tests that comprise the 5150 Performance Verification - the 5150 Verification Test and the 5150 Zero Ohm Test.

The measurement hardware for a 5150 test system is located in the Base. The 5150 Verification Test is used to ensure that the unit's measurements are within specified tolerances thereby validating that the hardware is functioning properly. Only the performance of the Base Unit is verified in this way.

All the test point connectors on the Base and on any connected Expansion, are subsequently checked during the Zero Ohm Test to verify that the test system is measuring very low resistance through every connector pin. A typical cause of Zero Ohm failures is connector damage or wear.

No adjustments are made to the tester during the verification process. If the tester fails the verification, it indicates that a hardware problem exists, which requires service. Contact information for help and technical support can be found in the Help / Support section of this manual (*page 27*).

Finally, it may be helpful to note that 5150 test systems perform an extensive self-test during every startup. The self-test verifies that all the relays in the test point matrix are functioning properly and performs checks of the measurement circuitry. However, the self-test cannot verify measurements in the same way the 5150 Performance Verification Test does nor detect connector damage or wear that can be found during the Zero Ohm Test.

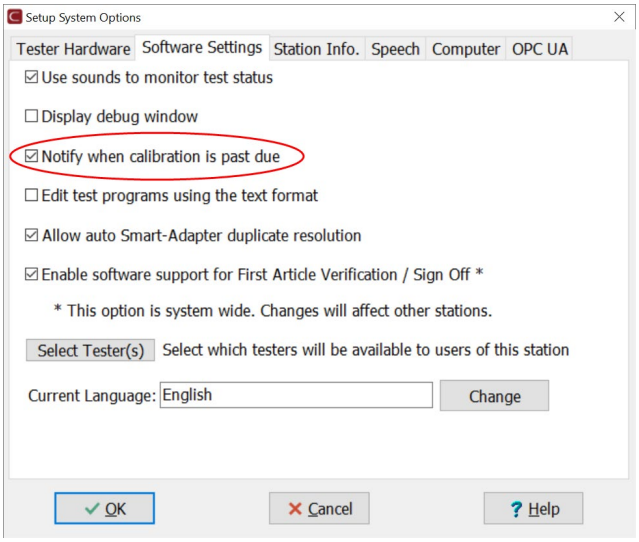
1.2 Verification Interval

Cirris recommends running the performance verification annually at a minimum. However, some organizations may decide to perform the verification more frequently. The performance verification process can also be used when troubleshooting testing or product issues to verify that the tester is measuring accurately.

1.3 Calibration Due Date

5150 Bases store the calibration date internally. The calibration date is the date of the last performance verification test that resulted in a pass condition or the date of the most recent calibration performed at the Cirris factory, whichever occurred last. This date is automatically updated upon the completion of a 5150 Performance Verification test that ends in a pass condition.

Optionally, the Easy-Wire software can notify users at login if the last successful verification occurred longer ago than one year from the current date. To enable this option, from the Easy-Wire **Main Menu** > **Utilities** > **Setup System Options** > under the **Software Settings** tab, select **Notify when calibration is past due**. Click **OK** when finished.



1.4 Calibration Records

Documenting the result of the Performance Verification is good practice and may be required by your quality system. As described in this manual, the user will be prompted to save the results for the 5150 Verification Test in a text file format. This file documents the date and time of the test and includes all the pertinent results. An example of the file can be found in the Appendix (*page 30*).

The results of the 5150 Zero Ohm Test are displayed at the end of the test. The results can also be printed or exported following the instructions in this manual.

Additionally, a suggested format for an 5150 Performance Verification Certificate is included in the Appendix (*page 29*).

1.5 Quality System

Some suggestions for good practice can also be found in the Appendix (*page 28*).

1.6 Symbols

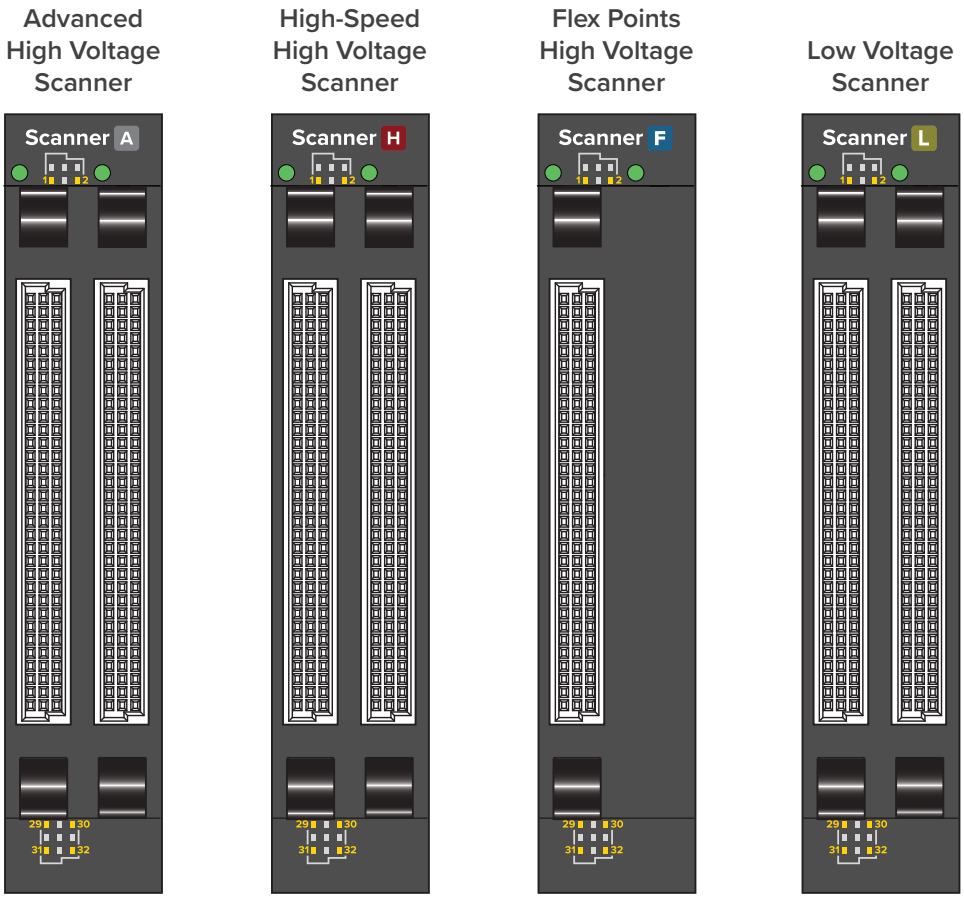
Symbols used in this manual:

Alerts users to a risk of personal injury or damage to the equipment.

Indicates an important note.

2. Scanner Module Types

For those performing the verification who may be unfamiliar with the 5150 tester, there are four types of scanner modules that may be installed in the unit. The differences are thoroughly described in the *5150 User Manual*, but for the purpose of the verification, some general information is useful.



- The Advanced, High Speed, and Low Voltage Scanner modules all provide 64 test points on two connectors.
- The Flex Points Scanner module provides test (measurement) capability and External Energization capability on each of 32 access points on a single connector. The test function of the Flex Scanner modules provides the same capability as the Advanced Scanner modules. External Energization allows the test system to apply the voltage from an external power supply to the Device Under Test (DUT) under program control to actuate relays, run fans, light lights, etc. As a result of the difference in the quantity of points (64 vs. 32), manual revisions must be made to the Zero Ohm test program as described in this manual on *page 34*. These manual changes are only required when running version 2026.1.0 of the Easy-Wire software. Future versions of Easy-Wire will automate this process.
- The only scanner module types that can be combined in a single system are Advanced and Flex Point Scanner modules.
- The performance verification process on systems equipped with Advanced, High-Speed, and Flex Scanner modules include low voltage, high voltage and zero ohm verification steps. **Systems with Low Voltage Scanner modules installed do not include a high voltage verification (see *page 14*).**
- Depending on the installation location of Flex Points Scanner module(s), the Flex Performance Check test program may require revision as described in the section starting on *page 22.*

3. Required Items

The items required to perform the 5150 performance verification include:

- The default 5150 interface may be the Easy Test Interface (ETI) or the Easy-Wire software. If ETI is being used, it communicates with Easy-Wire running in the background using the Cirris Tester Access (CTA) API. In either case, the Easy-Wire software is controlling the tester. The calibration verification must be performed using the Easy-Wire version 2025.1.0.8100 or later. The version can be found on the Easy-Wire Main Menu.
- A calibrated multimeter capable of measuring DC voltage within the range of .1 to 2.0 volts with an accuracy of ± 1%, such as a Fluke 80 Series meter or equivalent. The input impedance of the meter must be 10 Megohms ± 10%. Bench multimeters, such as Keysight units, typically do not meet this impedance requirement.
- A 5150 Performance Check Kit, which includes three calibrated adapters - the 5150 Low Voltage (LV) Adapter, the 5150 High Voltage (HV) Adapter, and the 5150 Zero Ohm Adapter. ***Ensure the calibration validity of the standards by verifying that the "due" dates on the calibration stickers extend beyond the current dat***e.

There are two versions of the 5150 Performance Verification Kit. Most users will require the standard kit, part number PCHK-XHW-3G, which includes a High Voltage Adapter that supports verification of systems capable of measuring high voltage Insulation Resistance (IR) up to 3 GOhms. Systems capable of measuring high voltage IR to 10 GOhm are equipped with the optional 10 GOhm High Voltage Module and require the 10 GOhm High Voltage Verification Adapter included in kit part number PCHK-XHW-10G. The High Voltage adapters can be differentiated by their label - (3G) vs. (10G).
The version of High Voltage Module installed in the test system can be differentiated by the labeling at the bottom of the module front panel. Low Voltage systems do not include a High Voltage Module and either Performance Verification kit is acceptable.

Required Items

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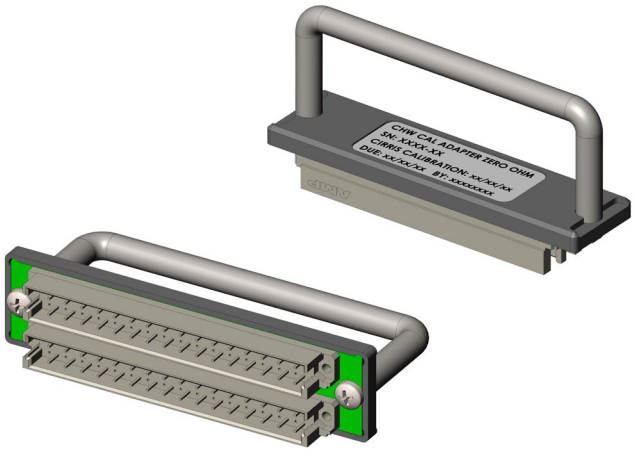
xHW LV Adapter

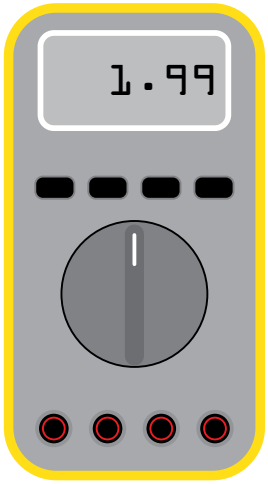
xHW HV Adapter

3 GOhm (3G) or 10 GOhm (10G) version depending on tester high voltage IR capability (see *page 7*)

xHW Zero Ohm Adapter



Calibrated Meter



4. Preparation

The measurement hardware for a 5150 test system is located in the Base. Therefore, during the verification process it is only necessary to attach the 5150 LV Adapter and the 5150 HV Adapter to the Base as instructed in this manual to verify the measurement accuracy of the tester. However, every test point connector on the Base and on any connected Expansion will be checked using the Zero Ohm adapter to verify that very low resistance is measured through each connector.

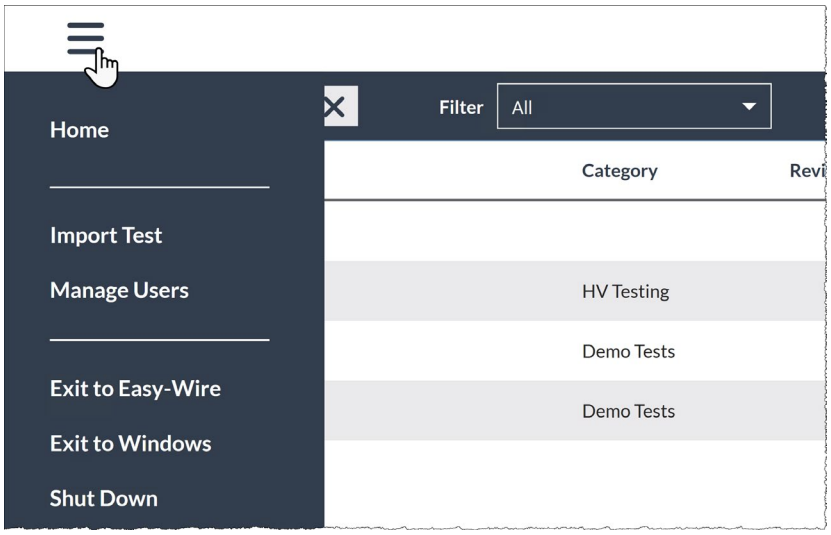
4.1 Test System Setup

See the *5150 Getting Started Guide* or *5150 User Manual* for guidance on setting up the 5150 test system. Either document can be downloaded from the 5150 Product Document & Software page on the Cirris web site.

***Note**: Before adding or removing 5150 Scanner Modules or when connecting an Expansion, shut down the tester. After completing the changes, restart the tester.*

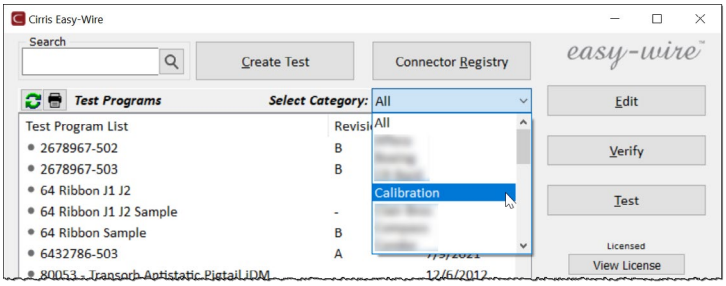
Setup:

1. If an Expansion will be included in the Performance Verification, connect it to the Base as described in the *5150 Getting Started Guide* or *5150 User Manual*.
2. Remove any test cables that are connected to the Base and Expansion.
3. Ensure that the Base and any connected Expansion are connected to power cable(s) as required.
4. Power on the tester.
5. If using the Easy Test Interface, tap / click the Menu icon in the upper left corner and select **Exit to Easy-Wire**.



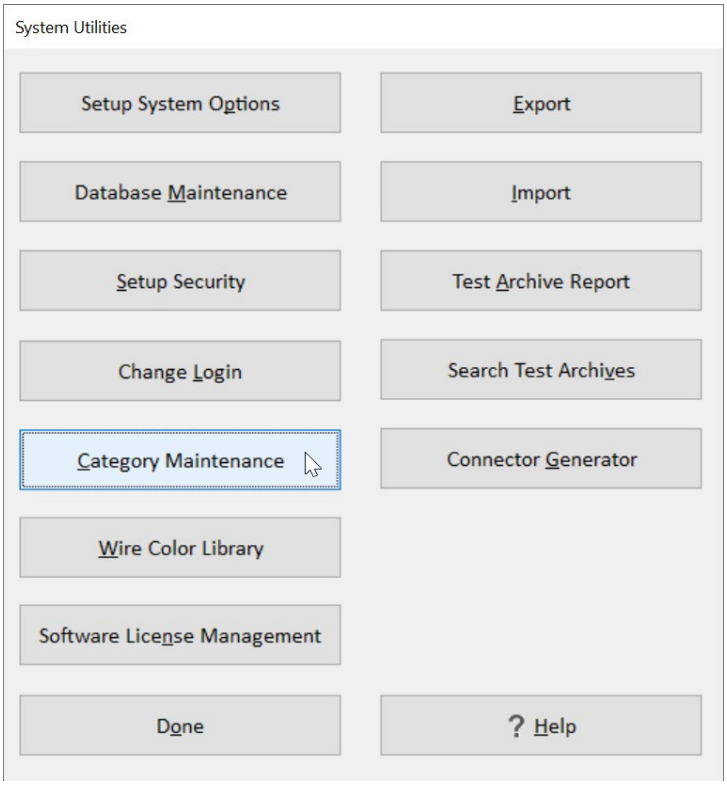
4.2 Create the Calibration Category

On the Easy-Wire **Main Menu**, click the **Select Category** drop-down arrow to see if the **Calibration** category already exists. If it does, skip to this section.



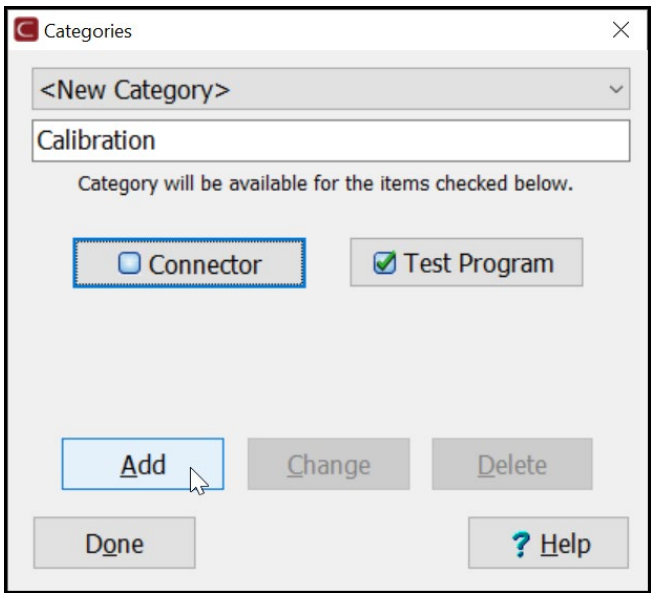
If the Calibration Category does not already exist,

1. From the **Main Menu** > **Utilities > Category Maintenance.**



2. In the Categories dialog, enter **Calibration** as a New Category, select the **Test Program** check box, and click **Add**.

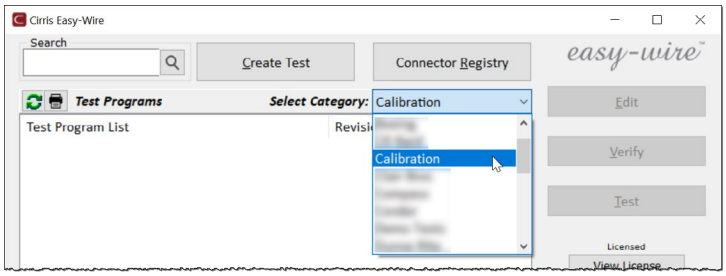
   Return to the Easy-Wire Main Menu.



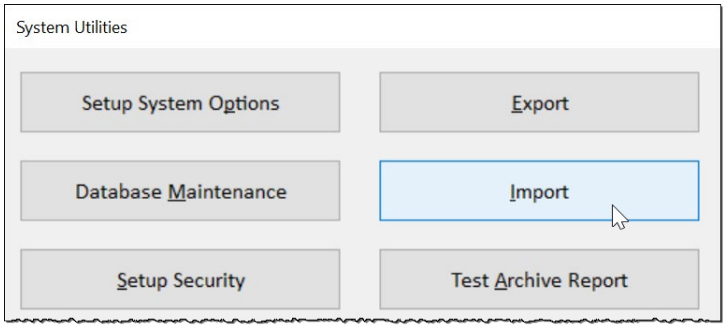
4.3 Import the Calibration Files

To ensure the correct versions of the tests are being used, import / reimport the 5150 Performance Verification test files anytime the Easy-Wire software has been updated to a new version. Reimporting the files every time the performance verification is also acceptable practice.

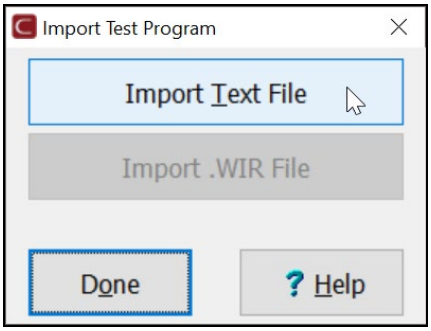
1. On the Easy-Wire Main Menu, select **Calibration** from the **Select Category** drop-down list.



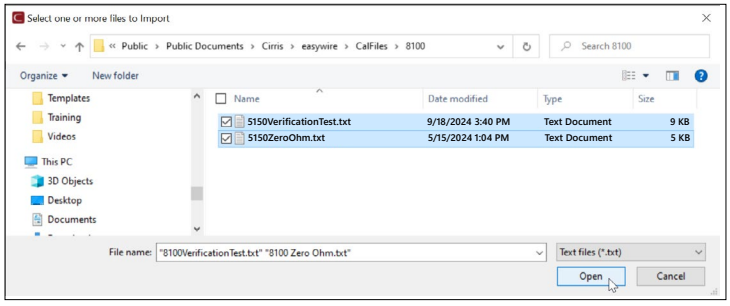
2. From the **Main Menu** > **Utilities** > **Import**.



3. In the Import Test Program dialog, select **Import Text File**.



4. Navigate to folder: C:\Users\Public\Documents\Cirris\easywire\CalFiles\5150. Select the **5150VerificationTest.txt** and **5150ZeroOhm.txt** files and click **Open** to import the files.

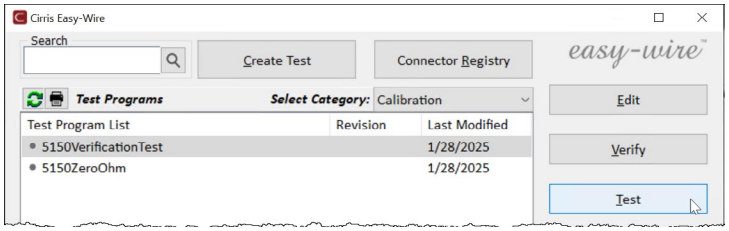


5. Easy-Wire will display a message indicating the files were successfully imported. Click **OK** to return to the **Utilities** menu and then **Done** to return to the **Main Menu**.

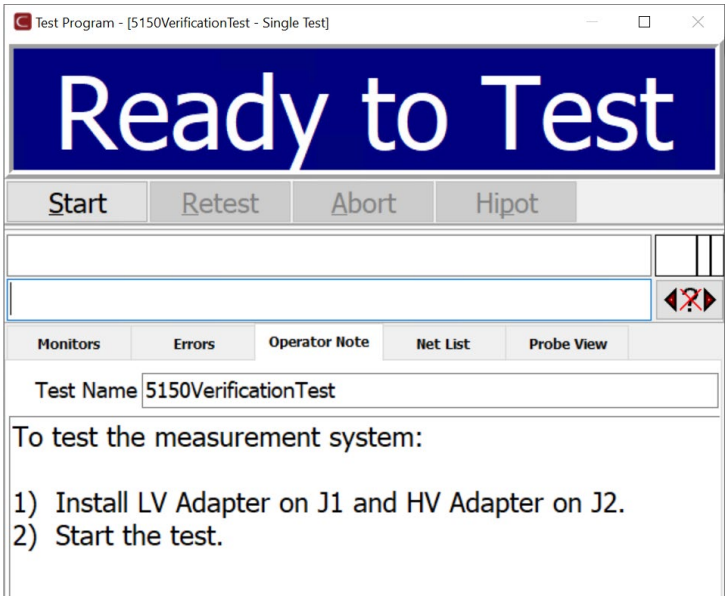
   As the **Calibration** category was selected in Step 1, the test program files will now be located in this category.

5. The Verification Test

1. From the Easy-Wire **Main Menu**, with the **Calibration** category still selected, highlight **5150VerficationTest** and click **Test**.



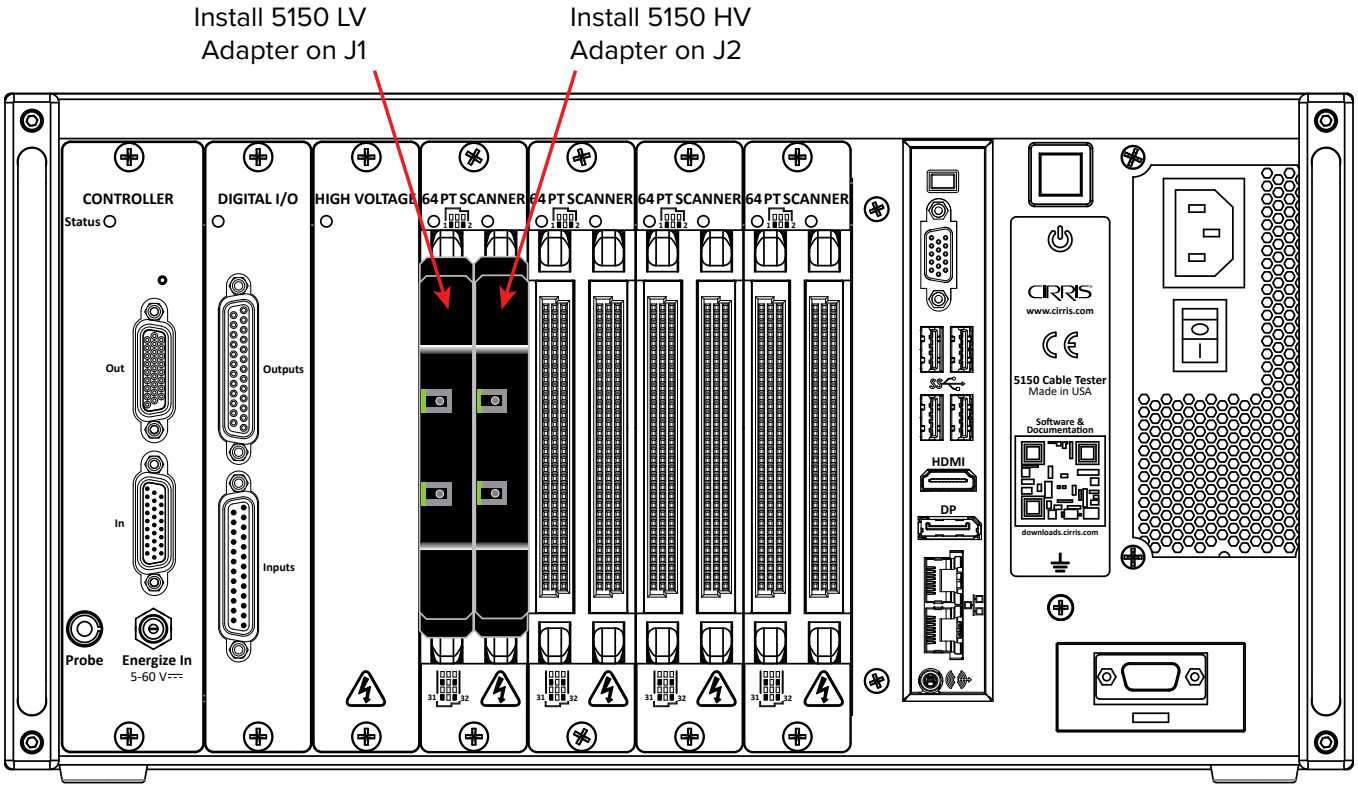
2. Follow the instructions in the Test Window and install the LV Adapter on Base connector J1 and the HV Adapter on connector J2. J1 is the left most test points connector on the Base and J2 is immediately to the right of J1.



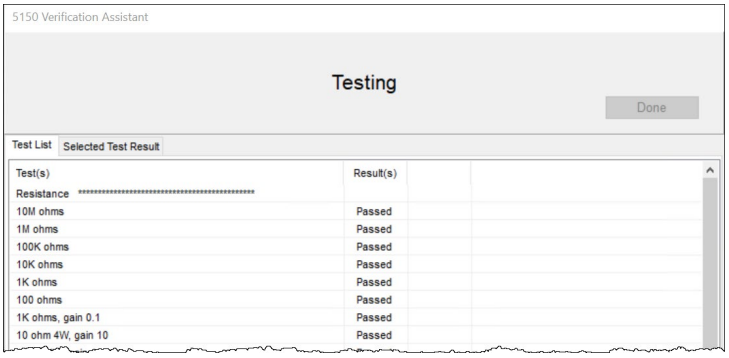
***Note**: Flex Points modules include only 32 points in a single connector. If a Flex Points module is installed in the first position, J1 and J2 are still the first and second connectors in the system despite the fact they are on different modules.*

The connectors are keyed so they can only be installed in one orientation with the jack marked "+" in the upper position and the jack marked "-" in the lower position. The markings for the jacks are engraved in both sides of the adapters. The top and bottom latches on the tester should be used to secure the adapters in place.

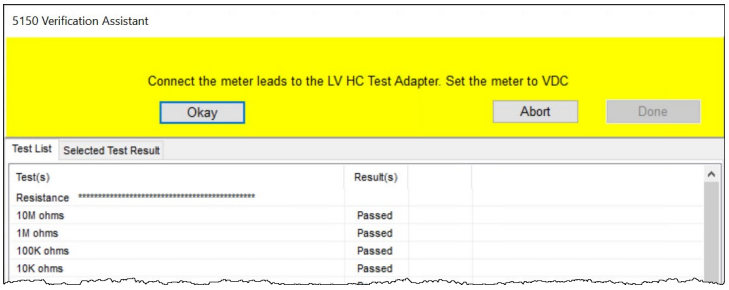
Click **Start** to begin the verification test when ready.



3. The Test Window will display a Testing status and the 5150 Verification Assistant Window will open. The Verification Assistant Window displays results as they are logged, which can take several minutes, and it will display further instructions.

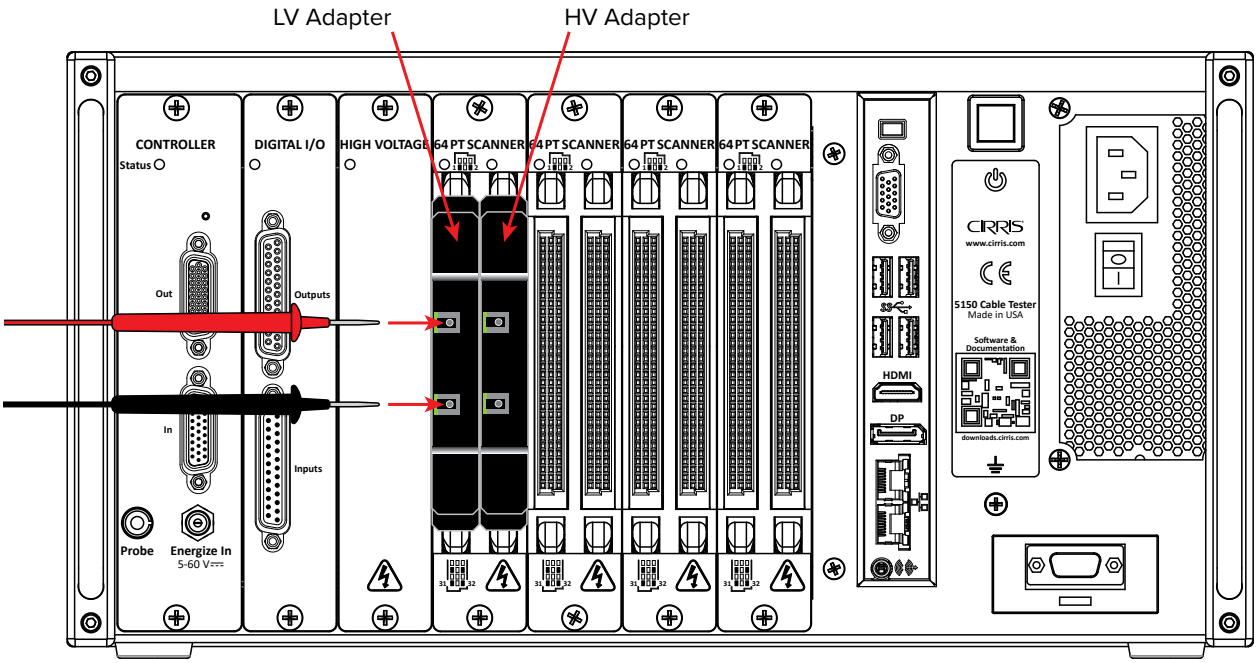


4. When instructed in the 5150 Verification Assistant Window, set the meter to measure DC voltage and connect the positive (red) meter lead to the upper jack marked "+" on the adapter and the negative (black) meter lead to the lower position marked "-" on the adapter The meter should remain set to measure DC voltage.

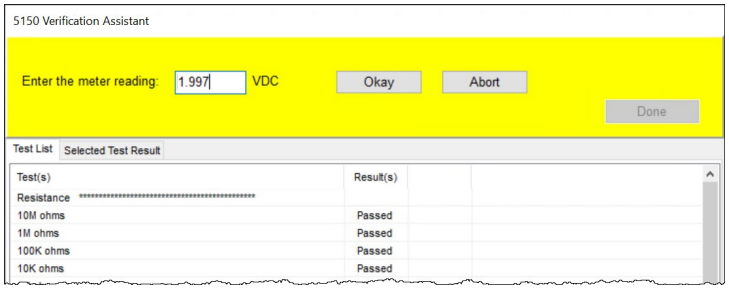


All meter inputs are expected in volts. Ensure the meter range is set to measure volts, or if the meter is allowed to auto-range, when necessary convert the measurements to volts before entering the values.

Click **Okay** after the meter is connected and when ready to proceed.



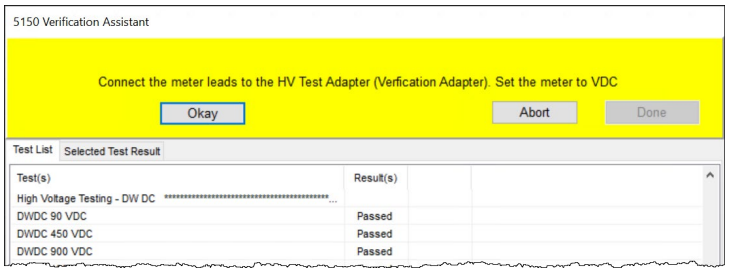
5. As instructed in the 5150 Verification Assistant Window, enter the meter reading in the text box and click **Okay**. Results will continue to be logged.

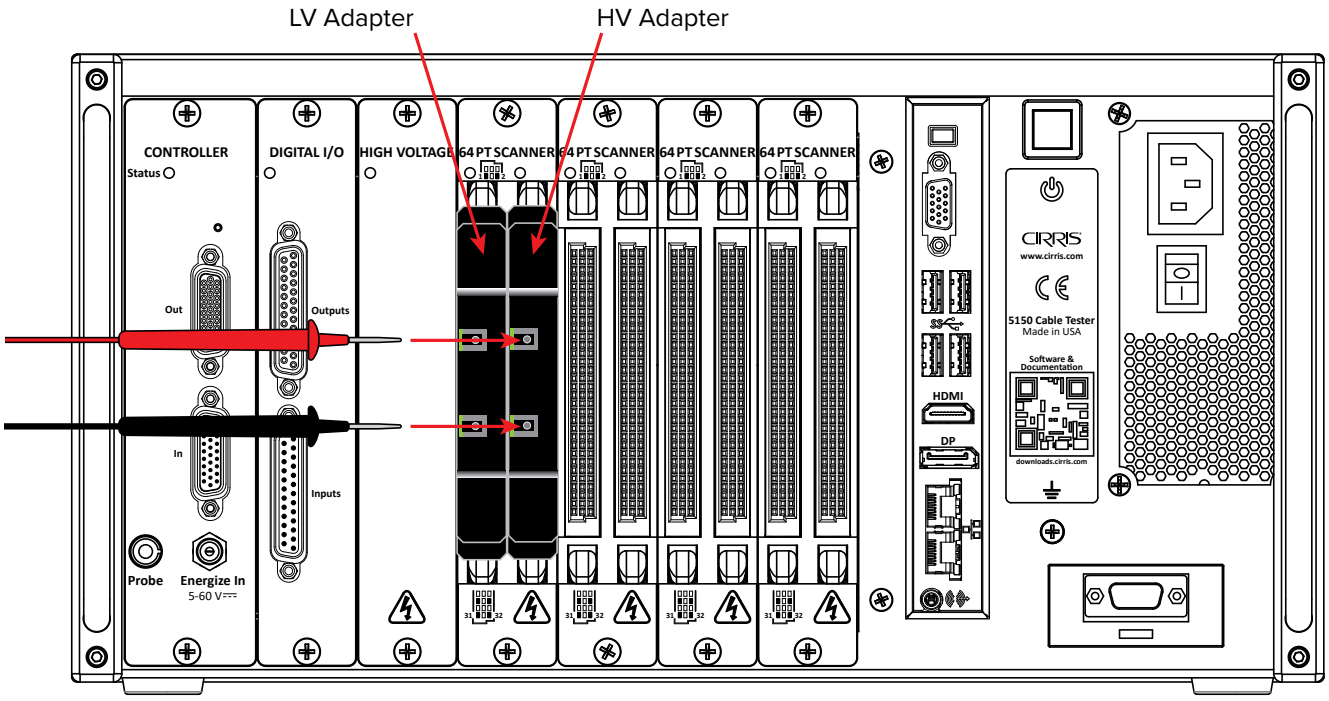


If the tester is NOT equipped with a High Voltage module, the test will end in a Pass or Fail condition at this point (before continuing to the high voltage portion of the test). If this is the case, continue to Step 10 below (page 16).

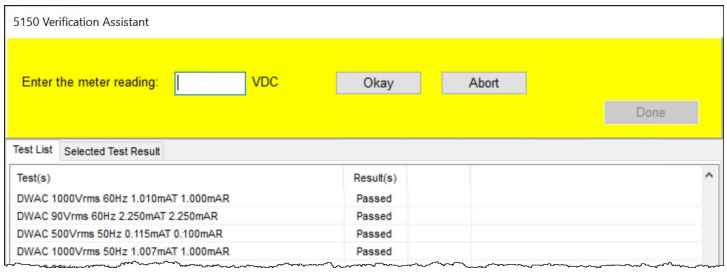
6. The 5150 Verification Assistant will prompt the user to connect the meter to the HV Test Adapter. Again, connect the positive (red) meter lead to the upper jack marked "+" on the adapter and the negative (black) meter lead to the lower position marked "**-**" on the adapter The meter should remain set to measure DC voltage.

Click **Okay** after the meter is connected and when ready to proceed.

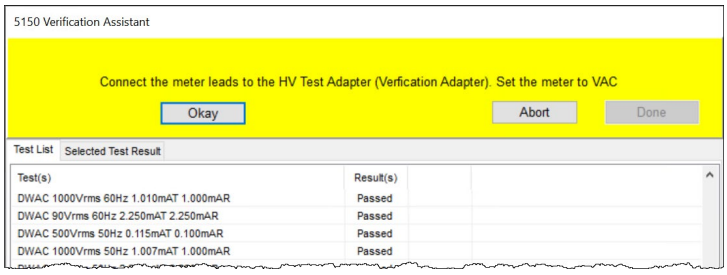




7. The user will be prompted to enter three DC voltage meter measurements in sequence. Enter each measurement as prompted and click **Okay** to continue.



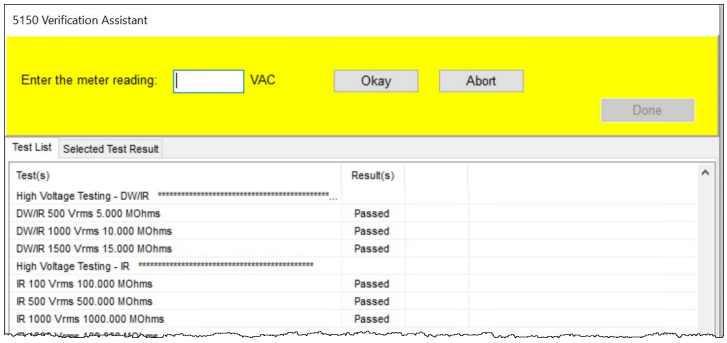
8. The 5150 Verification Assistant will prompt the user to set the meter to measure AC voltage.



All meter inputs are expected in volts. Ensure the meter range is set to measure volts, or if the meter is allowed to auto-range, when necessary convert the measurements to volts before entering the values.

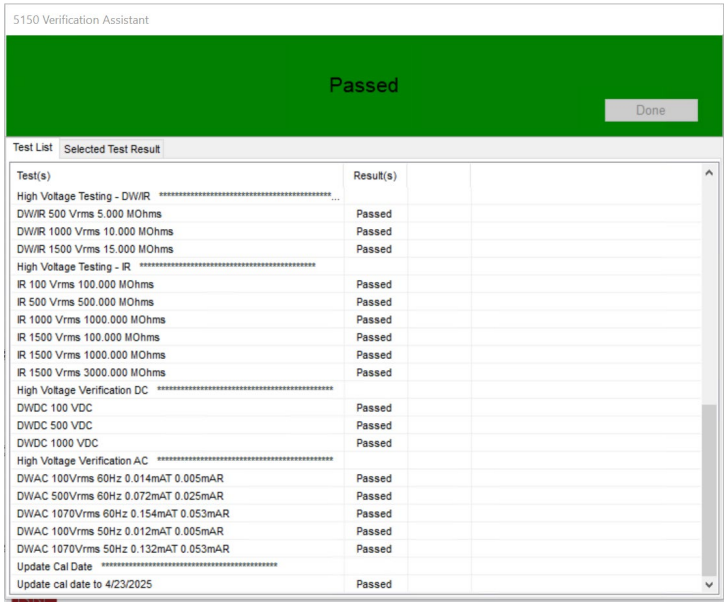
Click **Okay** when ready to proceed.

9. The user will be prompted to enter several AC voltage meter measurements in sequence. Enter each measurement as prompted then click **Okay** to continue.

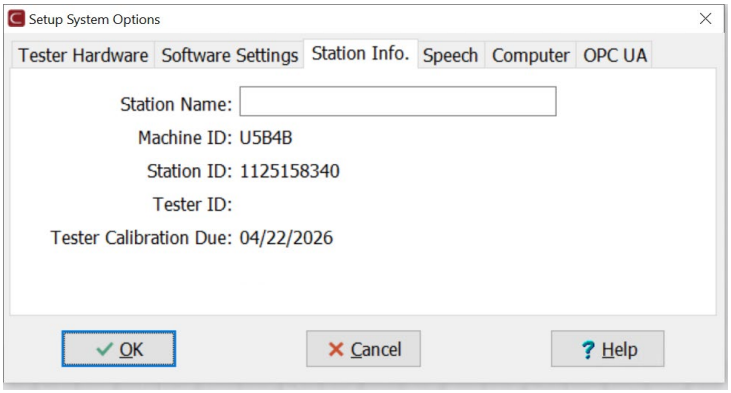


10. If all the measurements and the meter measurement inputs are within acceptable limits, the verification test will pass and the 5150 Verification Assistant Window will display a **Passed** condition.

If the test passes the calibration date is automatically updated and the **Tester Calibration Due** date is set to one year from the date the test passes.

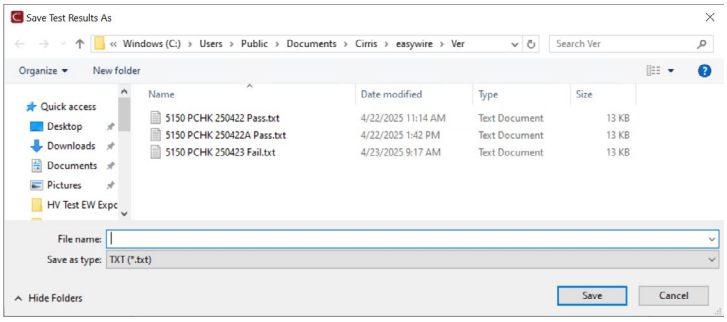


The **Tester Calibration Due** date can be viewed in the Easy-Wire software from the **Main Menu** > **Utilities** > **Setup System Options** > **Station Info** Tab.

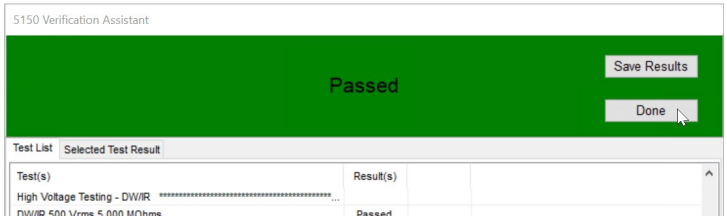


The user will be prompted to save the 5150 Verification Data Report in a text (.TXT) formatted file. Navigate to the preferred location and enter the desired name before saving the file.

An example report can be found in the appendix of this manual (*page 30*).

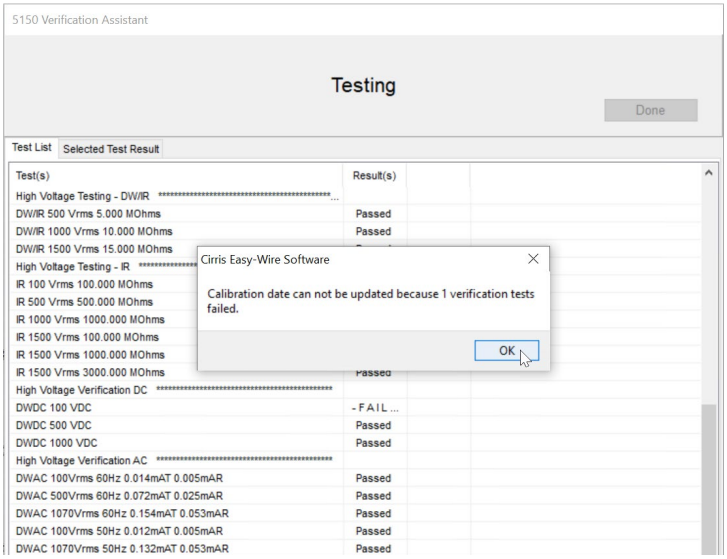


Click **Done** when finished to close the 5150 Verification Assistant Window finish the test.



11. If any measurements or meter measurement inputs are outside acceptable limits, the verification test will fail. If this occurs, results are displayed in the Verification Assistant that identify the error(s) and a separate pop-up window informs the user that the tester's calibration date cannot be updated.

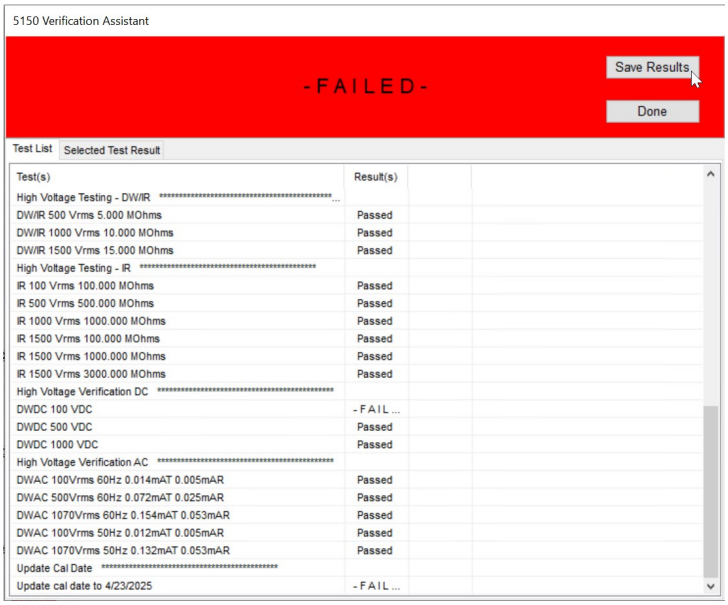
Click **OK** in to close the pop-up message.



If the meter measurements were entered correctly, a failed result indicates that the Base Unit requires service.

Select **Save Results** to save the failure details for reference and contact your Cirris representative for assistance.

Click **Done** when finished.

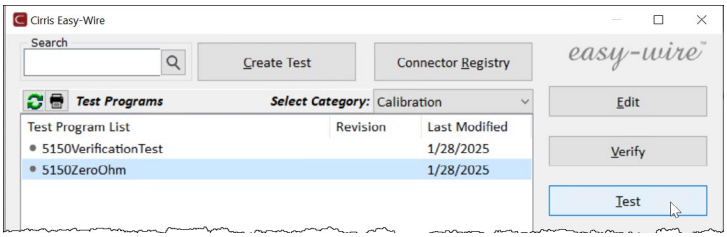


12. Click **Done** in the Test Window to return to the Easy-Wire **Main Menu**.

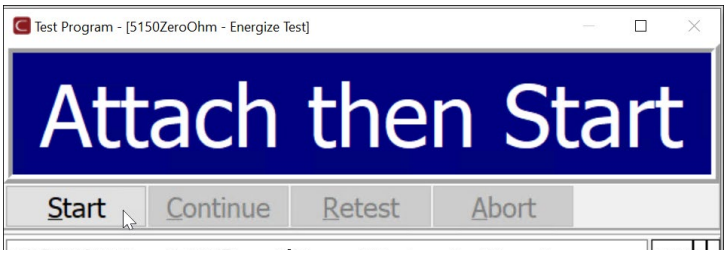
6. The Zero Ohm Test

*If the system includes Flex Points modules, and Easy-Wire version **2026.1.0** is controlling the tester, the Zero Ohm test must be modified as described in the Appendix (page 34). For quick reference, the Easy-Wire version is displayed on the Main Menu.*

1. From the Easy-Wire **Main Menu**, with the **Calibration** category still selected, highlight the **5150ZeroOhm** Test and click **Test** to open the Test Window.



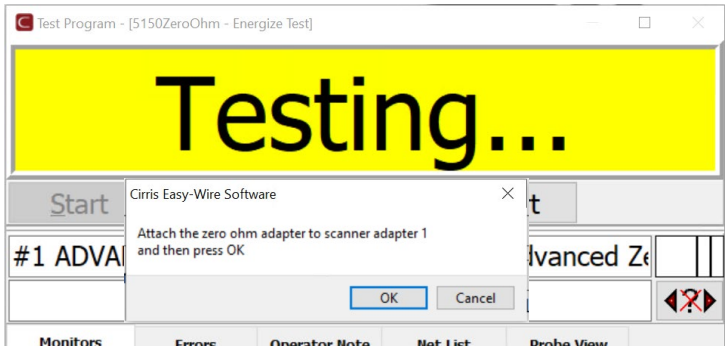
2. When the Test Window opens, click **Start** to begin the test.

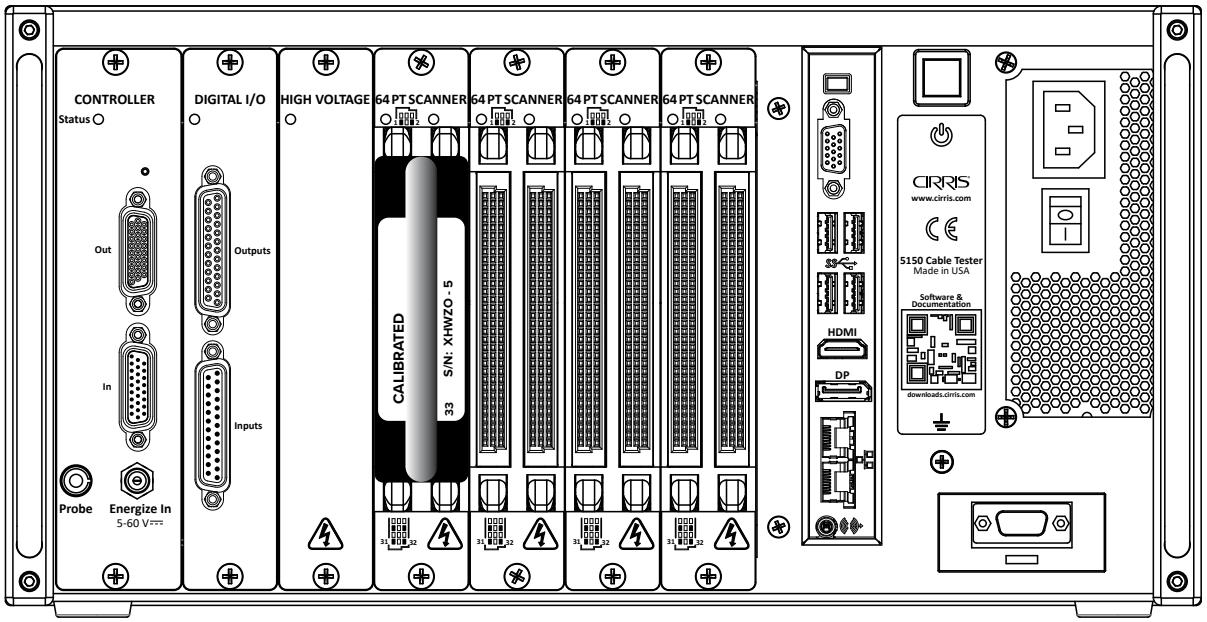


3. Follow the instructions in the pop-up window and install the Zero Ohm Adapter on Scanner Module 1. Scanner Module 1 is the left most scanner in the Base. *(See note on next page regarding Flex Modules).*

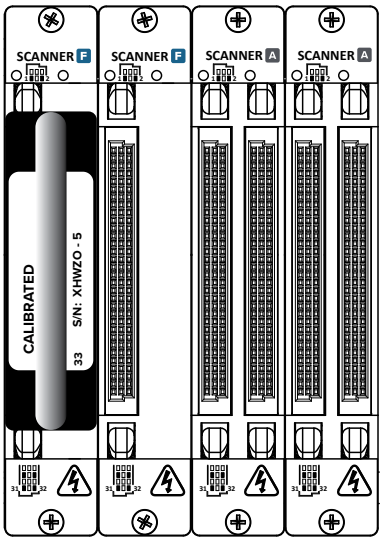
   The connectors are keyed which only allows the adapter to be installed in one orientation.

   Click **OK** when ready to proceed.





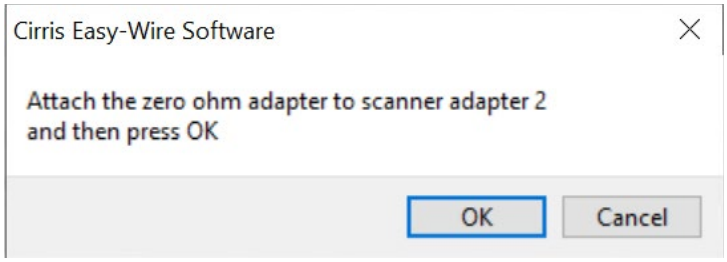
Flex Points modules include only 32 points in a single connector. If Flex Points modules are installed in the system, the Zero Ohm adapter will plug onto the single connector as shown.

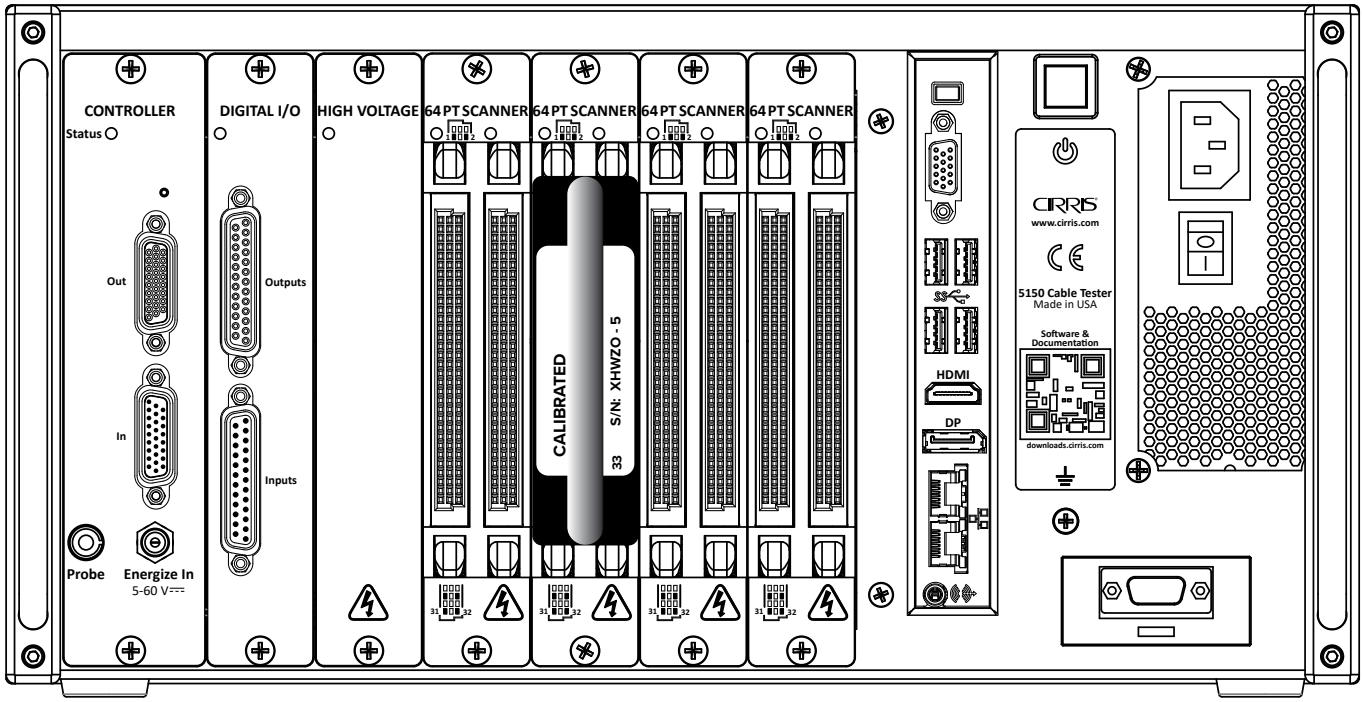


4. As each scanner module is tested, the user is prompted to advance the Zero Ohm Adapter to the next scanner module in the test system working left to right on the tester.

After attaching the Zero Ohm Adapter as instructed, click **OK** to continue.

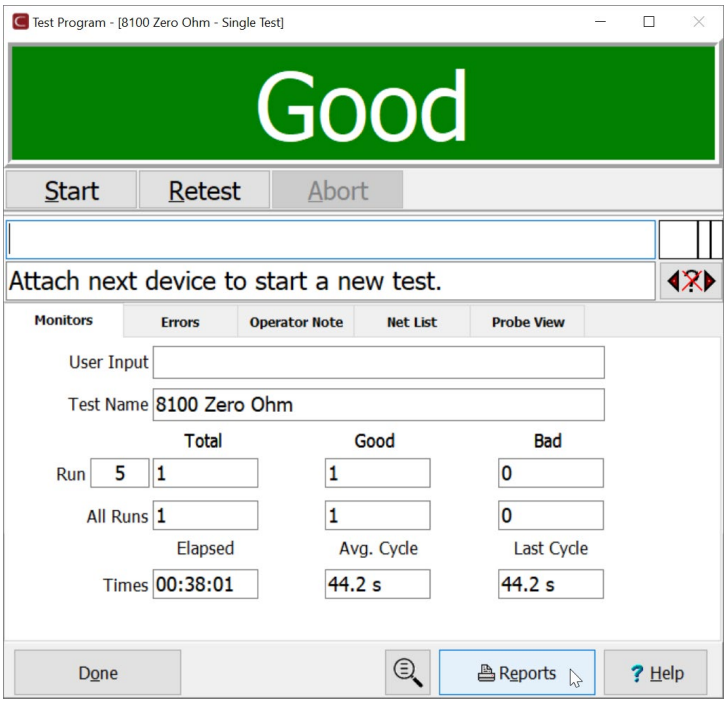
This process will continue until all the Scanner Modules have been tested.





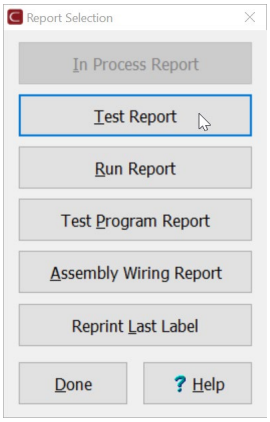
). For quick reference, the Easy-Wire version is displayed on the Main Menu.

5. If all the Scanner Modules pass the test, the Test Window will display a green **Good** header when the test is complete.

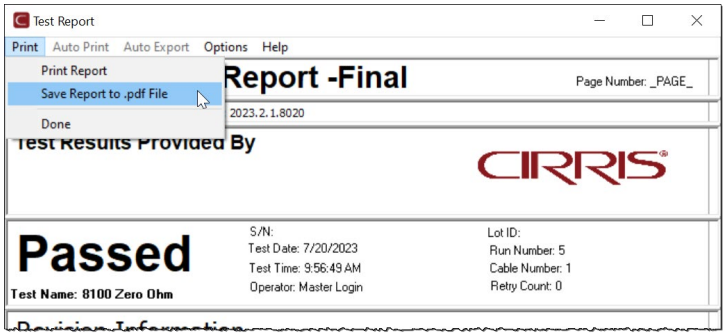


To print or export a copy of the results, click **Reports** and select **Test Report** in the **Report Selection** dialog that opens. Follow the on-screen instructions to save the results before viewing.

Note: *The Zero Ohm Test Program can also be revised to automatically print or export the Test Report at the end of the test. See the video referenced at the bottom of this section for additional information about editing reports. The section on Report Outputs starts at 9:32 of the video.*



When the report opens, select **Print** from the Menu Bar to print a hard copy or save the report to a PDF file.

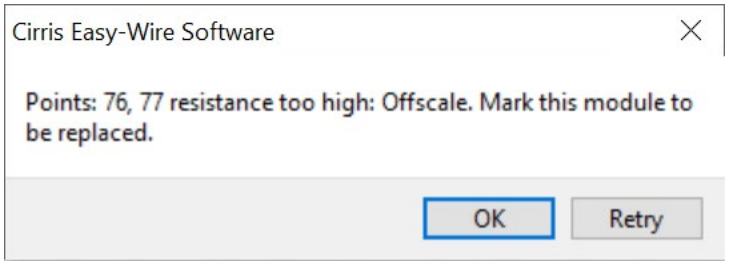


Close the report and select **Done** in the Test Window to return to the **Main Menu**.

The Test Report can also be accessed from the Easy-Wire database **Main Menu** > **Utilities** > **Search Test Archives** to open the **Report View Options** dialog. The results can be searched here by test date or test name. Click the **Help** button in the dialog window for assistance.

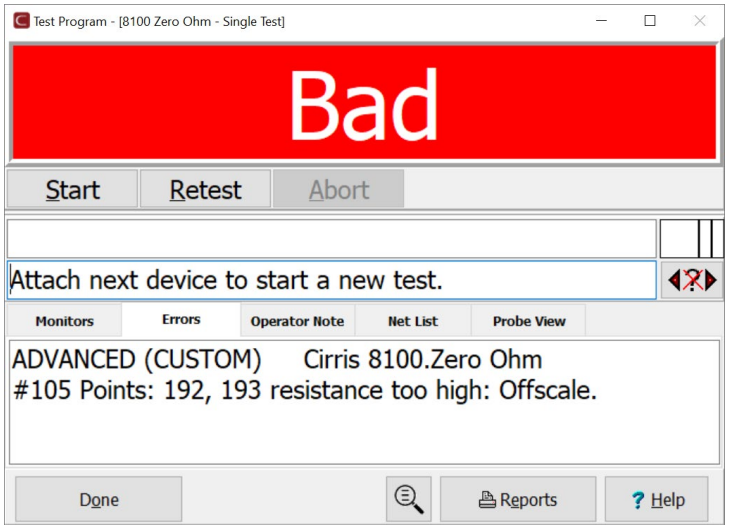
A video that describes editing the Test Report format can be found on the Cirris YouTube channel here.

6. If any points fail the Zero Ohm Test, a message will be displayed showing the point(s) involved and giving the user the option to select **OK** to accept the errors, or **Retry** to try again. Retrying gives the user an opportunity to ensure that the Zero Ohm adapter is properly positioned and securely attached before continuing.



7. If the final condition is a failure, the Test Window will display a red **Bad** header and the Errors tab will display a list of the failures.

Scanner Modules that include points which fail the Zero Ohm Test should be serviced to resolve the issue. Contact your Cirris representative for assistance.



). For quick reference, the Easy-Wire version is displayed on the Main Menu.

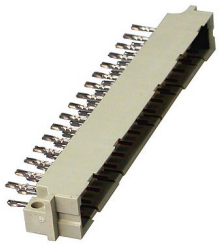
7. Optional Flex Points Functional Test

If one or more Flex Points Scanner modules are installed in the system, an optional Energization functional test can be performed.

Flex Point Scanner modules combine test (measurement) and External Energization in each Flex Point. Each module provides 32 Flex Points. Test points provide access to the tester's standard measurement capability. External Energization, or simply Energization, points provide the capability to apply voltage from an external power supply to the DUT under program control. Used for testing relays and for powering devices such as lights, fans, etc.

The Zero Ohm test described previously in this manual verifies that very low resistance is measured through the test / measurement function of Flex Scanner modules. ***The optional test described here does not verify any measurement functions of the tester, it simply verifies that the Flex Points are supplying the correct voltage and that the over current circuit is working properly. The test exercises the Flex Points at one-half their power rating and again at twice their power rating using power resistors.***

7.1 Required Items



Mating Connector ACCH-DO
(Purchase from Cirris)

Two Power Resistors
(see below)

Calibrated Voltmeter

Selecting Power Resistors

The E-Box power test uses specific load resistors. The correct value (Ohms) and power rating (Watts) of the resistors depends on the maximum voltage supplied by the E-Box power supply. Use the table below to select the appropriate resistors. Ensure the selected resistor's power rating is at least as high as the value specified in the table. Cirris recommends using power resistors from the TMC series manufactured by Vishay Huntington, which are available in the United States from digikey.com.

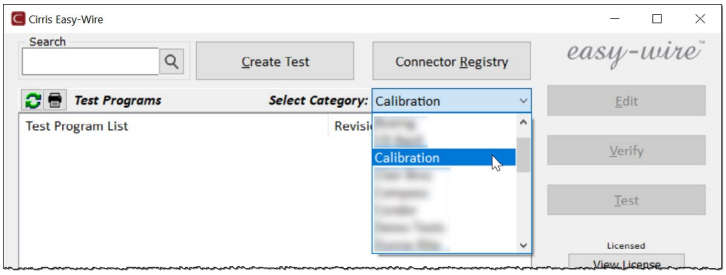
Power Resistor Selection Table				
	2*V Ohm Power Resistor		V/2 Ohm Power Resistor	
E-Box Power Supply Max Voltage	Ohms	Watts	Ohms	Watts
5	10	2.5	2.5	10
12	24	6	6	24
24	48	12	12	48
28	56	14	14	56
48	96	24	24	96
Variable (set power supply to 5V)	10	2.5	2.5	10

7.2 Import the Test Program

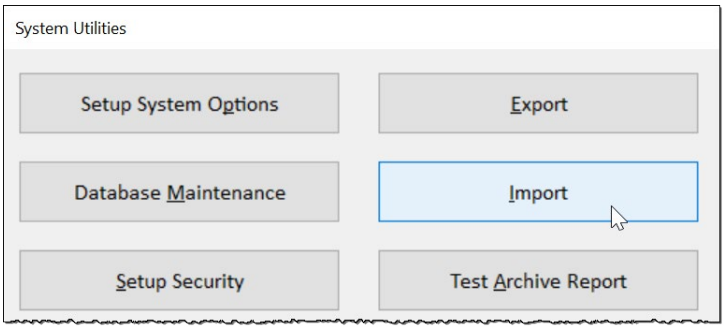
To import the Flex Points Verification test:

.

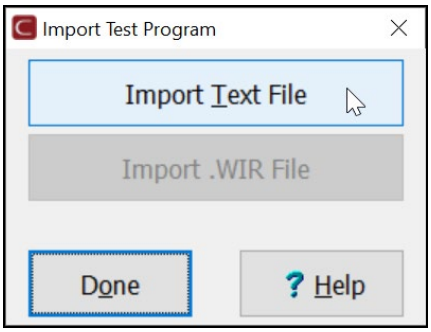
1. On the Easy-Wire Main Menu, select **Calibration** from the **Select Category** drop-down list.



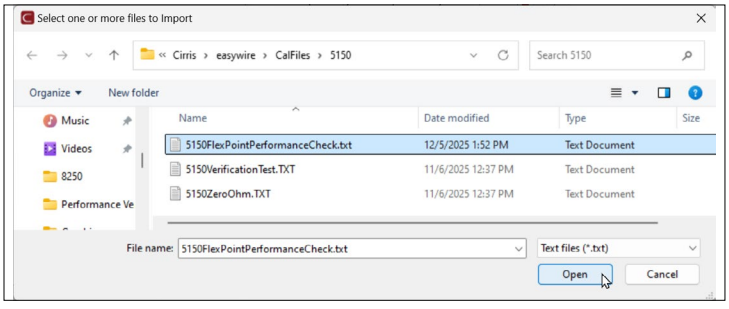
2. From the **Main Menu** > **Utilities** > **Import**.



3. In the Import Test Program dialog, select **Import Text File**.



4. Navigate to folder: C:\Users\Public\Documents\Cirris\easywire\CalFiles\5150. Select the **5150FlexPointPerfromanceCheck.txt** and click **Open** to import the file.



5. Easy-Wire will display a message indicating the files were successfully imported. Click **OK** to return to the **Utilities** menu and then **Done** to return to the **Main Menu**.

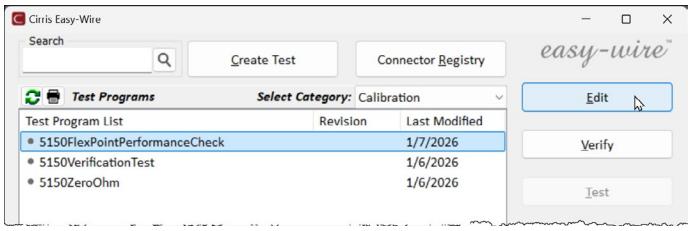
   As the **Calibration** category was selected in Step 1, the test program files will now be located in this category.

7.3 Revise the Test Program

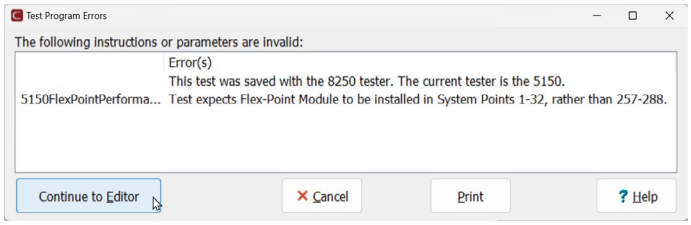
The default 5150 Flex Point Performance Check test assumes that a Flex Points Scanner module is installed in system position 1. If this is the case, no modifications to the program are required and this section can be skipped. If this is not the case, the test program must be revised to reflect the position of one Flex Points Scanner module.

To edit the program:

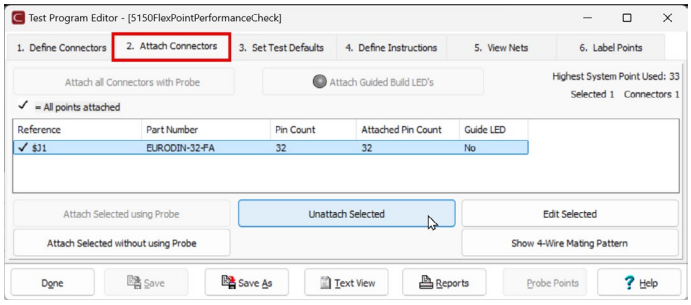
1. From the Easy-Wire **Main Menu**, with the **Calibration** category still selected, highlight the **5150FlexPointPerfromanceCheck** Test and click **Edit** to open the Test Program Editor.



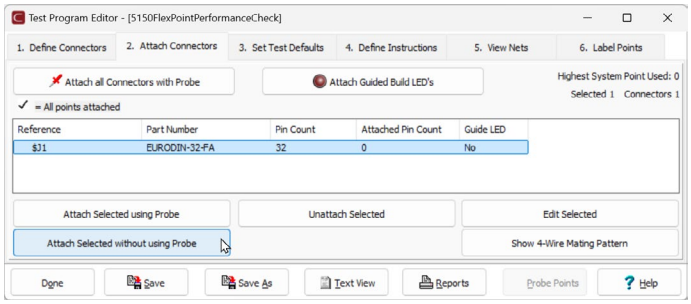
2. As the test program opens, an Error Message is displayed that indicates the discrepancy in the position of the Flex Points Scanner module noting the expected system point range (1-32) and the actual system point range (257-288 in the example shown). Note the actual point range before selecting **Continue to Editor**



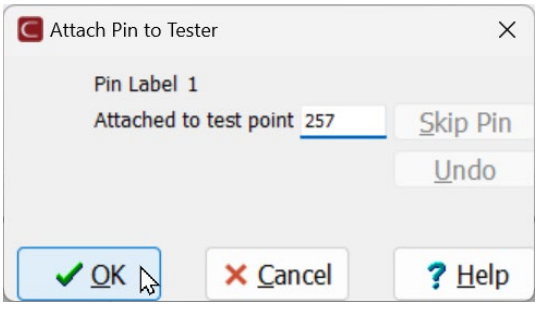
3. When the Editor opens, select Tab 2, **Attach Connectors**. Highlight the connector and click **Unattach Selected**.



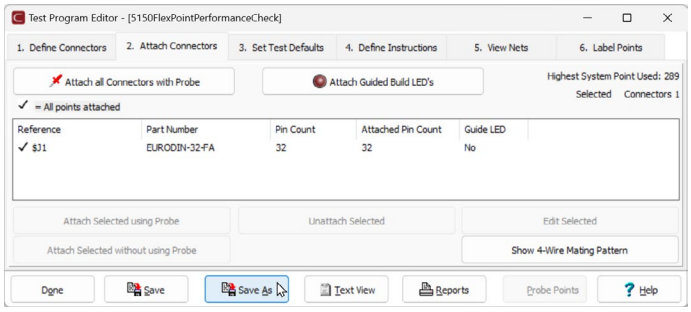
4. With the connector still highlighted, click **Attach Selected without using Probe**.



5. A graphic of the connector opens with the first pin highlighted in red. The **Attach Pin to Tester** dialog box will also open. In the dialog box, enter the first actual system point shown in the Error Message described in step 2 above (257 in the example shown). This will attach the connector matching its actual location.

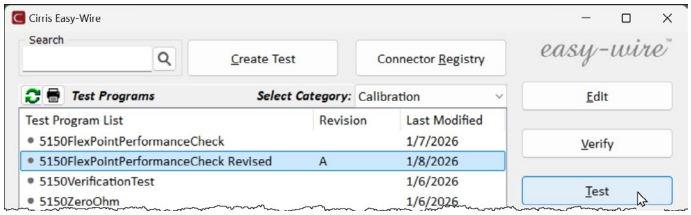


6. Save the revised program. It may be helpful to use the Save As function to save the revised program with a new, recognizable name to preserve the original program.

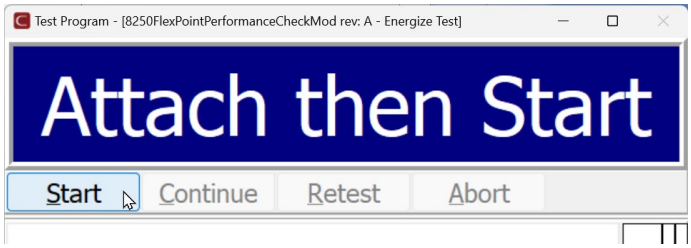


7.4 Run the Performance Check

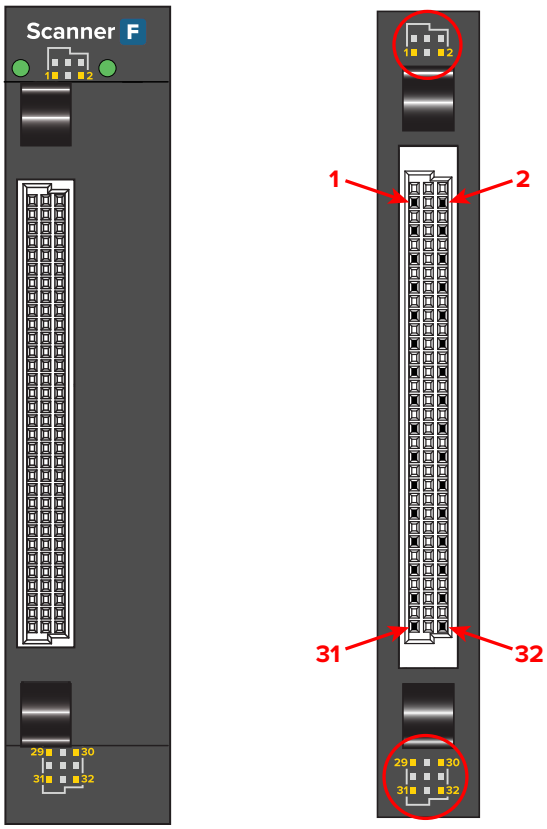
1. On the Easy-Wire Main Menu, highlight the test program (either the original **5150FlexPointPerformanceCheck** test or the modified version, as required) and click **Test**.



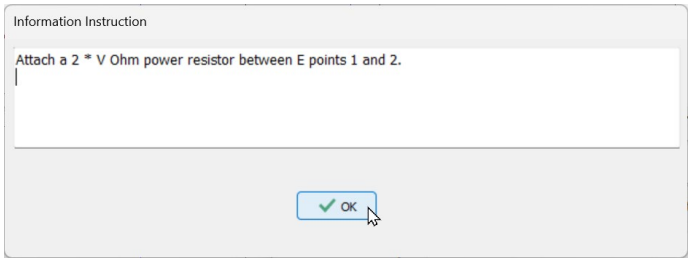
2. When the Test Window opens, connect the mating connector to the Flex Point Scanner module and click **Start**.



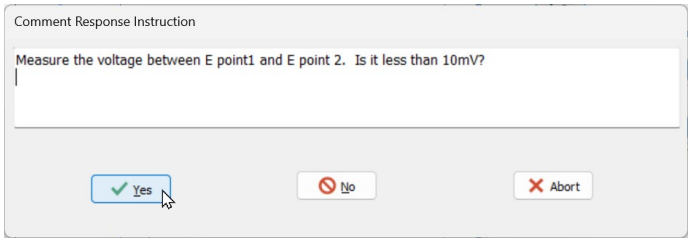
3. Follow the instructions in each window as it is displayed in succession. Reference the marking at the top of Flex Point Scanner module front panel to identify the Energization (E) Points specified in the instructions.



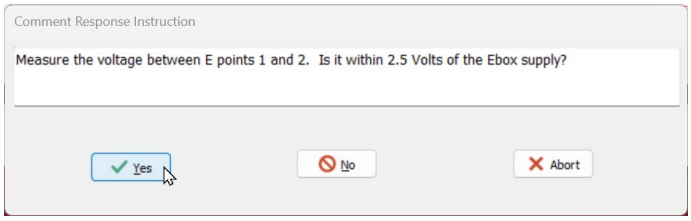
4. When the first instruction is displayed, attach the power resistor that has an ohm value equal to two times the Energization voltage between Energization (E)points 1 and 2. Click **OK**



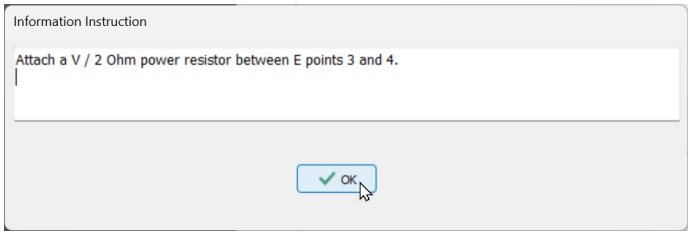
5. Use the voltmeter to measure the voltage between Energization (E) points 1 and 2. If the voltage is less than 10mV, click **Yes**, otherwise click **No**.



6. Use the voltmeter to measure the voltage between the same two points. If the voltage is within 2.5V of the Energization supply, click **Yes**, otherwise click **No**.



7. Attach the second power resistor that has an Ohm value equal to the power supply voltage divided by 2 between Energization (E) points 3 and 4. Click **OK**.



8. If the test passes, the Energization function of the Flex Points is working properly. If the test fails, contact Cirris for support.

8. Help / Support

For assistance with any of the topics covered in this manual:

- Contact our Technical Support staff by email at TechSupport@cirris.com
- In the United States, contact our technical support team by telephone at 801-973-4600, extension 666 (or ask for Tech Support)
- Outside the United States, visit www.cirris.com to find the Cirris representative that supports your local territory.
- Visit www.cirris.com/learning-center to access articles on Cirris products and other testing subjects.

9. Appendix

9.1 Quality Assurance Principles

The following references and suggestions may be useful to those new to formal calibration and quality practices.

Quality Standards

The ANSI/NCSL Z540.3 and ISO 17025 standards document requirements for the calibration of measuring and test equipment. The Z540.3 standard can be acquired from the National Conference of Standards Laboratories International (NCSL) at www.ncsli.org. The ISO standard can be acquired from the International Standards Organization (ISO) on their web site www.iso.net. Both standards provide valuable insight into calibration best practices.

Foundational Calibration Principles

Recall System
Use a tickler card file or computerized database recall system to ensure that measurement equipment is calibrated on schedule. This system should include calibration dates, due dates, calibration sources, and any other pertinent information.

Verification Labels
After calibration / verification, the quality standards require that a label indicating the calibration status be affixed to the instrument. This ensures that users will have ready access to the calibration status and helps avoid the inadvertent use of uncalibrated, or out-of-calibration, measurement equipment. The labels should include the instrument serial number, the calibration date, the calibration due date, and the name of the individual that performed the calibration. A good source of inexpensive labels is United Ad Label (www.unitedadlabel.com).

Measurement Uncertainty
Older standards referenced TUR (test uncertainty ratio) or TAR (test accuracy ratio) and suggested a 4:1 ratio between the accuracy of the measurement instrument and the accuracy of the instrument being calibrated. However, current standards emphasize the calculated measurement uncertainty. Many resources addressing the topic are available on the Internet.

Performance Verification Certificate
The Performance Verification Certificate is a record of who, when, and with what equipment the instrument was calibrated / verified. A suggested 5150 Performance Verification Certificate is provided in this Appendix (*page 29*).

Data Reports
The 5150 Verification Data Report and the Zero Ohm Test Report described previously in this manual record the values measured during the verification process relative to the tester's published specifications. This format is designed to satisfy the data requirements of the standards.

Traceability
Traceability refers to each unbroken link of valid verifications going back to national standards such as those maintained by the NIST in the United States. To maintain traceability, qualified personnel must perform the performance verification under controlled conditions, using correctly calibrated instruments with acceptable accuracy.

5150 Performance Verification Certificate

Name and Address of Organization:			
Certificate Number:		Performed by:	
Calibration Date:		Due Date:	
Applicable Quality Standard(s):		Procedure: 5150 Performance Verification Manual, Version	
Temperature:		Relative Humidity:	
Tester Serial Number:			
Instrument Used	Serial Number	Calibration Date	Calibration Due Date
5150 LV Cal Adapter			
5150 HV Cal Adapter			
5150 Zero Ohm Adapter			
Meter			
Statement of Traceability:			
Certified by:			

9.3 Sample Verification Data Report

```
easy-wire 5150 Verification Data Report

Cirris, Inc.
401 North 5600 West
Salt Lake City UT 84116

Verification Passed Date: 4/22/2025 11:14:59 AM
easy-wire 2025.1.1.8120 measurement system ID 0 with 256 points.  Unit ID: 5150 PCHK 250422 Pass

**********************************************************
Test Group: Resistance -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
10M ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,10.006,10.000,11.000,9.000,20,10.020,9.987,0.010,MOhms,
1M ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,1.000,1.000,1.020,0.980,20,1.001,1.000,0.000,MOhms,
100K ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,100.0,100.0,102.0,98.0,20,100.0,100.0,0.0,kOhms,
10K ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,10.01,10.00,10.20,9.80,20,10.01,10.01,0.00,kOhms,
1K ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,1.000,1.000,1.020,0.980,20,1.000,0.999,0.000,kOhms,
100 ohms ,Passed,,,,,,,,,,
    -Resistance,Passed,100.0,100.0,102.1,97.9,20,100.0,99.9,0.0,Ohms,
1K ohms, gain 0.1 ,Passed,,,,,,,,,,
    -Resistance,Passed,1.000,1.000,1.020,0.980,20,1.000,0.999,0.000,kOhms,
10 ohm 4W, gain 10,Passed,,,,,,,,,,
    -4WResistance,Passed,9.989,10.000,10.201,9.799,20,9.992,9.985,0.002,Ohms,
1 ohm 4W, gain 100,Passed,,,,,,,,,,
    -4WResistance,Passed,0.9988,1.0000,1.0210,0.9790,20,0.9991,0.9986,0.0002,Ohms,

**********************************************************
Test Group: 4W Resistance -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
1.0 ohm,Passed,,,,,,,,,,
    -4WResistance,Passed,0.9988,1.0000,1.0210,0.9790,20,0.9993,0.9984,0.0002,Ohms,
10.0 ohm,Passed,,,,,,,,,,
    -4WResistance,Passed,9.989,10.000,10.201,9.799,20,9.992,9.986,0.002,Ohms,

**********************************************************
Test Group: Capacitance -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
1.8 nF,Passed,,,,,,,,,,
    -Capacitance,Passed,1.790,1.800,2.030,1.570,20,1.802,1.772,0.009,nF,

**********************************************************
Test Group: LV Voltage -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
```

```
2 Volts,Passed,,,,,,,,,
    -Voltage,Passed,1.9982,2.0000,2.1100,1.8900,1,1.9982,1.9982,0.0000,V,
    -Meter Voltage,Passed,1.9970,2.0000,2.1100,1.8900,1,1.9970,1.9970,0.0000,V,

**********************************************************
Test Group: High Voltage Testing - DW DC -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
DWDC 90 VDC,Passed,,,,,,,,,
    -DWV,Passed,90,90,95,85,5,90,89,1,Vrms,
    -DWT,Passed,2.206,2.250,2.500,2.000,5,2.217,2.190,0.010,mA,
    -DWR,Passed,2.206,2.250,2.500,2.000,5,2.217,2.190,0.010,mA,
DWDC 450 VDC,Passed,,,,,,,,,
    -DWV,Passed,450,450,473,428,5,451,449,1,Vrms,
    -DWT,Passed,2.198,2.250,2.500,2.000,5,2.201,2.195,0.002,mA,
    -DWR,Passed,2.198,2.250,2.500,2.000,5,2.201,2.195,0.002,mA,
DWDC 900 VDC,Passed,,,,,,,,,
    -DWV,Passed,899,900,945,855,5,900,899,0,Vrms,
    -DWT,Passed,2.211,2.250,2.500,2.000,5,2.214,2.208,0.003,mA,
    -DWR,Passed,2.211,2.250,2.500,2.000,5,2.214,2.208,0.003,mA,
DWDC 1350 VDC,Passed,,,,,,,,,
    -DWV,Passed,1349,1350,1418,1283,5,1350,1349,1,Vrms,
    -DWT,Passed,2.217,2.250,2.500,2.000,5,2.219,2.214,0.003,mA,
    -DWR,Passed,2.217,2.250,2.500,2.000,5,2.219,2.214,0.003,mA,

**********************************************************
Test Group: High Voltage Testing - DW AC -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
DWAC 500Vrms 60Hz 0.121mAT 0.100mAR ,Passed,,,,,,,,,
    -DWV,Passed,500,500,525,475,5,500,499,0,Vrms,
    -DWT,Passed,0.117,0.121,0.158,0.084,5,0.117,0.116,0.000,mA,
    -DWR,Passed,0.102,0.100,0.135,0.065,5,0.103,0.102,0.001,mA,
DWAC 1000Vrms 60Hz 1.010mAT 1.000mAR ,Passed,,,,,,,,,
    -DWV,Passed,1000,1000,1050,950,5,1001,999,1,Vrms,
    -DWT,Passed,0.992,1.010,1.136,0.884,5,0.992,0.992,0.000,mA,
    -DWR,Passed,0.981,1.000,1.125,0.875,5,0.981,0.980,0.000,mA,
DWAC 90Vrms 60Hz 2.250mAT 2.250mAR ,Passed,,,,,,,,,
    -DWV,Passed,89,90,95,85,5,90,88,1,Vrms,
    -DWT,Passed,2.298,2.250,2.500,2.000,5,2.320,2.285,0.014,mA,
    -DWR,Passed,2.295,2.250,2.500,2.000,5,2.318,2.281,0.017,mA,
DWAC 500Vrms 50Hz 0.115mAT 0.100mAR ,Passed,,,,,,,,,
    -DWV,Passed,500,500,525,475,5,500,499,0,Vrms,
    -DWT,Passed,0.112,0.115,0.152,0.079,5,0.112,0.112,0.000,mA,
    -DWR,Passed,0.103,0.100,0.135,0.065,5,0.103,0.103,0.000,mA,
DWAC 1000Vrms 50Hz 1.007mAT 1.000mAR ,Passed,,,,,,,,,
    -DWV,Passed,1000,1000,1050,950,5,1000,1000,0,Vrms,
    -DWT,Passed,0.986,1.007,1.133,0.882,5,0.986,0.986,0.000,mA,
    -DWR,Passed,0.969,1.000,1.125,0.875,5,0.970,0.969,0.000,mA,
DWAC 90Vrms 50Hz 2.250mAT 2.250mAR ,Passed,,,,,,,,,
    -DWV,Passed,90,90,95,85,5,90,90,0,Vrms,
    -DWT,Passed,2.299,2.250,2.500,2.000,5,2.308,2.291,0.008,mA,
    -DWR,Passed,2.262,2.250,2.500,2.000,5,2.274,2.248,0.013,mA,

**********************************************************
Test Group: High Voltage Testing - DW/IR -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
```

```
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
DW/IR 500 Vrms 5.000 MOhms,Passed,,,,,,,,,
    -DWV,Passed,499,500,525,475,5,500,498,1,Vrms,
    -DWT,Passed,0.102,0.100,0.135,0.065,5,0.102,0.102,0.000,mA,
    -DWR,Passed,0.102,0.100,0.135,0.065,5,0.102,0.102,0.000,mA,
    -IRV,Passed,500,500,525,475,5,500,499,1,Vrms,
    -IR,Passed,5.000,5.000,5.500,4.500,5,5.000,5.000,0.000,MOhms,
DW/IR 1000 Vrms 10.000 MOhms,Passed,,,,,,,,,
    -DWV,Passed,1000,1000,1050,950,5,1000,999,1,Vrms,
    -DWT,Passed,0.103,0.100,0.135,0.065,5,0.103,0.102,0.000,mA,
    -DWR,Passed,0.103,0.100,0.135,0.065,5,0.103,0.102,0.000,mA,
    -IRV,Passed,1000,1000,1050,950,5,1000,999,1,Vrms,
    -IR,Passed,9.922,10.000,11.000,9.000,5,9.936,9.909,0.013,MOhms,
DW/IR 1500 Vrms 15.000 MOhms,Passed,,,,,,,,,
    -DWV,Passed,1500,1500,1575,1425,5,1500,1499,1,Vrms,
    -DWT,Passed,0.104,0.100,0.135,0.065,5,0.104,0.104,0.000,mA,
    -DWR,Passed,0.104,0.100,0.135,0.065,5,0.104,0.104,0.000,mA,
    -IRV,Passed,1500,1500,1575,1425,5,1501,1499,1,Vrms,
    -IR,Passed,14.872,15.000,16.500,13.500,5,14.881,14.860,0.009,MOhms,

**********************************************************
Test Group: High Voltage Testing - IR -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
IR 100 Vrms 100.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,100,100,105,95,5,100,100,0,Vrms,
    -IR,Passed,99.504,100.000,110.000,90.000,5,100.200,98.912,0.460,MOhms,
IR 500 Vrms 500.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,500,500,525,475,5,500,500,0,Vrms,
    -IR,Passed,498.505,500.000,550.000,450.000,5,499.500,497.512,0.703,MOhms,
IR 1000 Vrms 1000.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,1000,1000,1050,950,5,1000,999,0,Vrms,
    -IR,Passed,1001.604,1000.000,1100.000,900.000,5,1003.009,1000.000,1.143,MOhms,
IR 1500 Vrms 100.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,1500,1500,1575,1425,5,1501,1499,1,Vrms,
    -IR,Passed,98.611,100.000,110.000,90.000,5,98.666,98.476,0.077,MOhms,
IR 1500 Vrms 1000.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,1500,1500,1575,1425,5,1500,1499,1,Vrms,
    -IR,Passed,1003.481,1000.000,1100.000,900.000,5,1005.366,1002.004,1.293,MOhms,
IR 1500 Vrms 3000.000 MOhms,Passed,,,,,,,,,
    -IRV,Passed,1499,1500,1575,1425,5,1500,1499,1,Vrms,
    -IR,Passed,3032.982,3000.000,3300.000,2700.000,5,3073.770,3010.040,28.776,MOhms,

**********************************************************
Test Group: High Voltage Verification DC -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
DWDC 100 VDC,Passed,,,,,,,,,
    -DWV,Passed,100,100,105,95,1,100,100,0,Vrms,
    -DWT,Passed,0.006,0.005,0.105,-0.196,1,0.006,0.006,0.000,mA,
    -DWR,Passed,0.006,0.005,0.105,-0.196,1,0.006,0.006,0.000,mA,
    -Meter,Passed,100.3,100.0,105.0,95.0,1,100.3,100.3,0.0,Vrms,
DWDC 500 VDC,Passed,,,,,,,,,
    -DWV,Passed,500,500,525,475,1,500,500,0,Vrms,
    -DWT,Passed,0.026,0.025,0.127,-0.178,1,0.026,0.026,0.000,mA,
    -DWR,Passed,0.026,0.025,0.127,-0.178,1,0.026,0.026,0.000,mA,

    -Meter,Passed,501.5,500.0,525.0,475.0,1,501.5,501.5,0.0,Vrms,

DWDC 1000 VDC,Passed,,,,,,,,,
```

```
    -DWV,Passed,999,1000,1050,950,1,999,999,0,Vrms,
    -DWT,Passed,0.052,0.050,0.155,-0.155,1,0.052,0.052,0.000,mA,
    -DWR,Passed,0.052,0.050,0.155,-0.155,1,0.052,0.052,0.000,mA,
    -Meter,Passed,1003.0,1000.0,1050.0,950.0,1,1003.0,1003.0,0.0,Vrms,

**********************************************************
Test Group: High Voltage Verification AC -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
DWAC 100Vrms 60Hz 0.014mAT 0.005mAR ,Passed,,,,,,,,,
    -DWV,Passed,101,100,105,95,1,101,101,0,Vrms,
    -DWT,Passed,0.013,0.014,0.116,-0.187,1,0.013,0.013,0.000,mA,
    -DWR,Passed,0.000,0.005,0.105,-0.196,1,0.000,0.000,0.000,mA,
    -Meter,Passed,100.3,100.0,105.0,95.0,1,100.3,100.3,0.0,Vrms,
DWAC 500Vrms 60Hz 0.072mAT 0.025mAR ,Passed,,,,,,,,,
    -DWV,Passed,500,500,525,475,1,500,500,0,Vrms,
    -DWT,Passed,0.065,0.072,0.179,-0.135,1,0.065,0.065,0.000,mA,
    -DWR,Passed,0.026,0.025,0.127,-0.178,1,0.026,0.026,0.000,mA,
    -Meter,Passed,501.5,500.0,525.0,475.0,1,501.5,501.5,0.0,Vrms,
DWAC 1070Vrms 60Hz 0.154mAT 0.053mAR ,Passed,,,,,,,,,
    -DWV,Passed,1036,1070,1124,1017,1,1036,1036,0,Vrms,
    -DWT,Passed,0.133,0.154,0.270,-0.061,1,0.133,0.133,0.000,mA,
    -DWR,Passed,0.055,0.053,0.159,-0.152,1,0.055,0.055,0.000,mA,
    -Meter,Passed,1073.2,1070.0,1123.5,1016.5,1,1073.2,1073.2,0.0,Vrms,
DWAC 100Vrms 50Hz 0.012mAT 0.005mAR ,Passed,,,,,,,,,
    -DWV,Passed,102,100,105,95,1,102,102,0,Vrms,
    -DWT,Passed,0.012,0.012,0.114,-0.189,1,0.012,0.012,0.000,mA,
    -DWR,Passed,0.000,0.005,0.105,-0.196,1,0.000,0.000,0.000,mA,
    -Meter,Passed,100.3,100.0,105.0,95.0,1,100.3,100.3,0.0,Vrms,
DWAC 1070Vrms 50Hz 0.132mAT 0.053mAR ,Passed,,,,,,,,,
    -DWV,Passed,1039,1070,1124,1017,1,1039,1039,0,Vrms,
    -DWT,Passed,0.117,0.132,0.245,-0.081,1,0.117,0.117,0.000,mA,
    -DWR,Passed,0.054,0.053,0.159,-0.152,1,0.054,0.054,0.000,mA,
    -Meter,Passed,1073.2,1070.0,1123.5,1016.5,1,1073.2,1073.2,0.0,Vrms,

**********************************************************
Test Group: Update Cal Date -- Passed
**********************************************************
Test,Test  ,Average ,Expected,Exp.,Exp.,Number ,Meas.,Meas.,Std.
Name,Result,Measured,Value   ,Max ,Min ,Samples,Max  ,Min  ,Dev.,Units,Trouble
====,======,========,========,====,====,=======,=====,=====,====,=====,=======
Update cal date to 4/22/2025,Passed,,,,,,,,,
```

9.4 Programming Zero Ohm Tests for Flex Points

When running Easy-Wire version **2026.1.0** on systems that include Flex Points modules, it will be necessary to revise the Zero Ohm test to address the fact that Flex Points modules include 32 points while other scanner modules include 64 points. Later versions of the Easy-Wire software will automatically adjust for the differences.

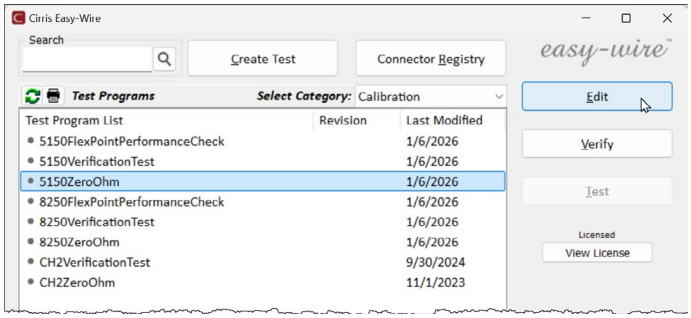
9.4.1 Editing the Zero Ohm Test

The default Zero Ohm Test includes only one instruction - a single **Advanced Zero Ohm** instruction that accommodates all types of 64-point scanners (Advanced, High-Speed, and Low Voltage). However, because the instruction expects a 64-point increment for each scanner module, Flex Points modules will fail the test as they include only 32 points.

The signed-in user must have test program editing rights in order to revise the Zero Ohm Test. If the signed-in user does not have the privilege, the Edit button on the Easy-Wire Main Menu will be inactive. See the **Setup Security** Easy-Wire Help topic for more information.

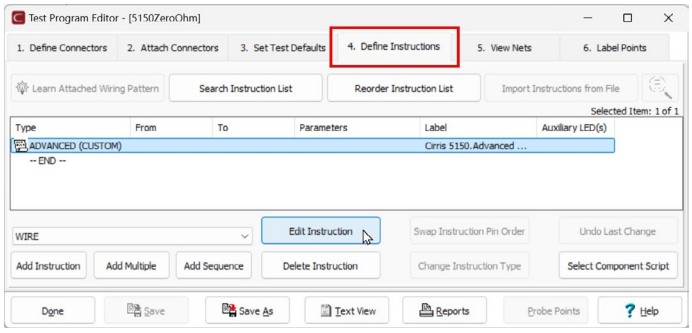
To edit the program:

1. From the Easy-Wire **Main Menu**, with the **Calibration** category still selected, highlight the **5150ZeroOhm** Test and click **Edit** to open the Test Program Editor.

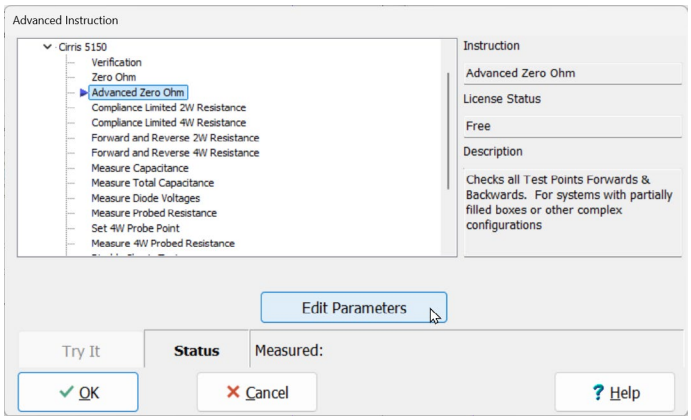


2. In the Test Program Editor, select Tab 4, **Define Instructions**.

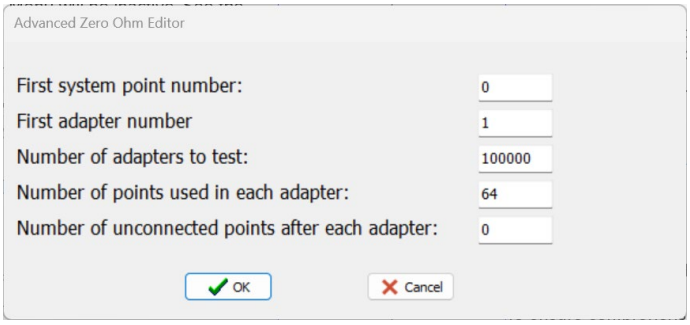
   Select the single Advanced (Custom) instruction and click **Edit Instruction**.



3. In the **Advanced Instruction** window, with **Advanced Zero Ohm** highlighted, click **Edit Parameters**.



4. In the **Advanced Zero Ohm Editor** window, the following options are presented.



First system point number: Specifies the zero-based point number (system point numbers start counting at zero) where the instruction starts testing. Zero indicates the first position

First adapter number: Specifies the starting position for the adapter and is used to send a message to the screen advising the user where to connect the adapter. Each Scanner module counts as one position, starting at the left most position in the system Base and continuing through the entire system.

Number of adapters to test: Specifies the number of positions to be tested test by the instruction. The default of 100,000 is used because a single instruction was being used to test the entire system.

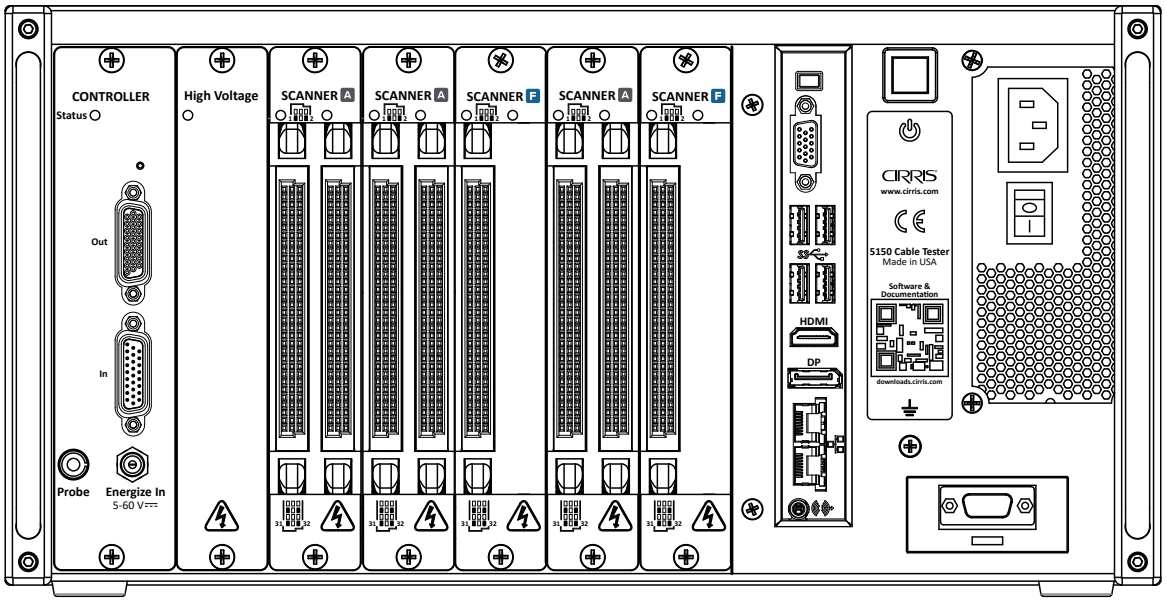
Number of points in each adapter: Specifies the number of points being tested by the Zero Ohm adapter for each position (64 points if testing Advanced Scanner module and 32 for if testing Flex Scanner modules). As shown in the example below, if a system includes both Advanced and Flex Scanner modules, separate instructions will be required scanner type.

Number of unconnected points after each adapter: As this application uses the 64-point Zero Ohm adapter supplied with the Performance Check Kit, this entry will always be zero.

9.4.2 Mixed Flex and Advanced Scanners

Systems with Flex Scanner Modules are typically also equipped with Advanced Scanner modules. Most often such systems separate the two types of scanners in groups, in which case two Advanced Zero Ohm instructions would be required. However, to show a more complex case our example configuration includes:

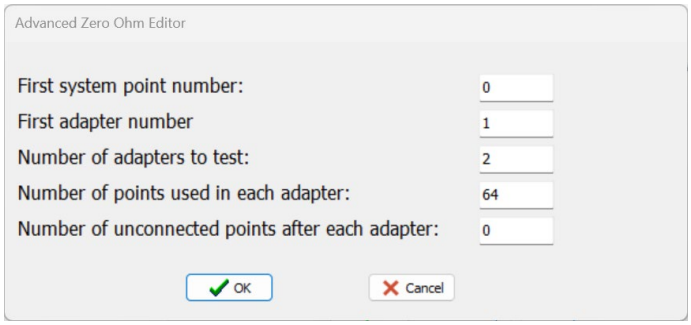
Example: Two Advanced Scanners in positions 1 and 2; one Flex Scanner in position 3; one Advanced Scanner in position 4; one Flex Scanner in position 5



In this example, four separate instruction would be required, as shown below.

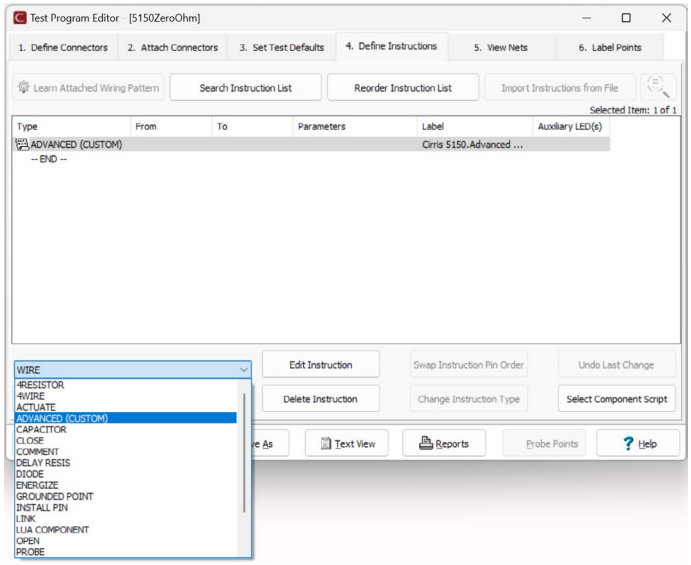
1. Follow the directions above to open the Zero Ohm test in the Test Program Editor and begin by editing the parameters for the existing Advanced Zero Ohm instruction as shown.

   This instructions will test the two Advanced Scanner modules in positions 1 and 2.

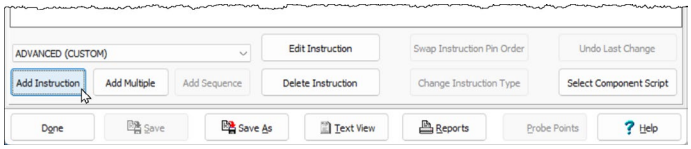


2. Add a new instruction by first selecting **ADVANCED (CUSTOM)** from the Instruction Type drop-down list.

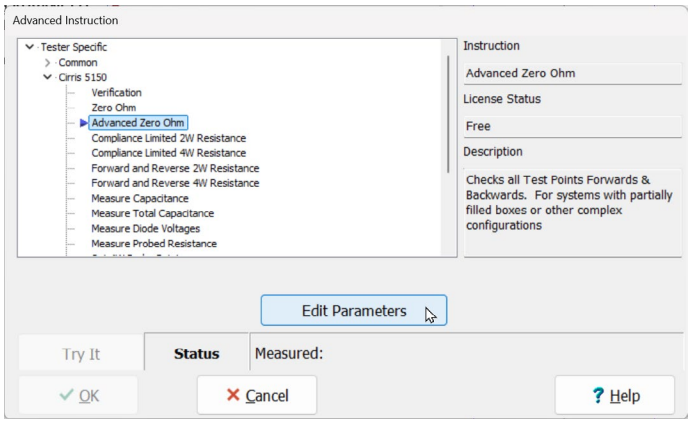
   Note that it will be necessary to scroll up in the list to find the **ADVANCED (CUSTOM)** instruction.



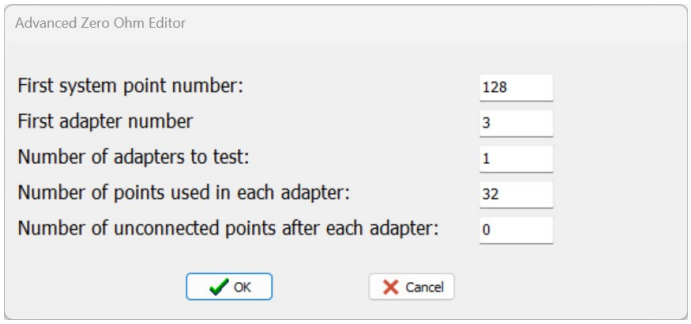
3. Click **Add Instruction** to add a new Advanced Instruction.



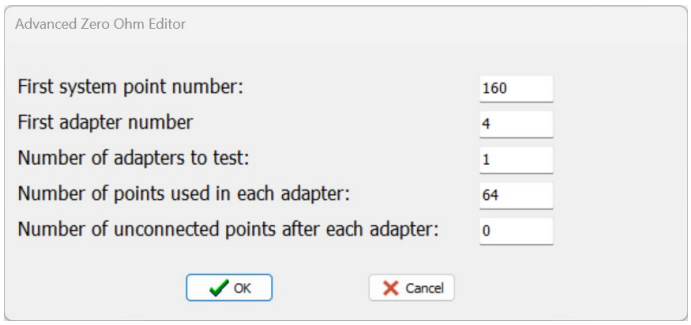
4. In the **Advanced Instructions** window, drill down to the **Cirris 5150**, category, select **Advanced Zero Ohm** and click **Edit Parameters**.



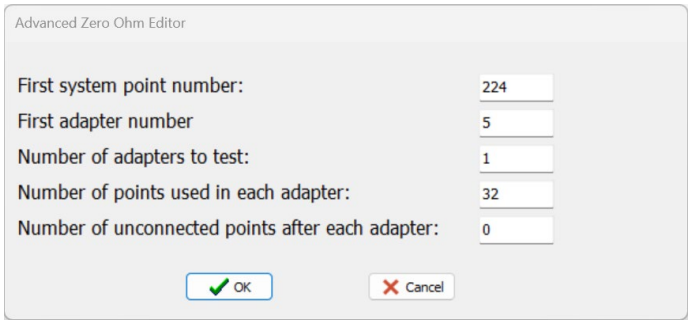
5. In the **Advanced Zero Ohm Editor**, revise the options as shown. This instruction will test the Flex Points Scanner module in position 3.



6. Follow steps 2 through 4 to add a third **Advanced Zero Ohm** instruction. In the **Advanced Zero Ohm Editor**, revise the options as shown. This instruction will test the Advanced Scanner module in position 4.



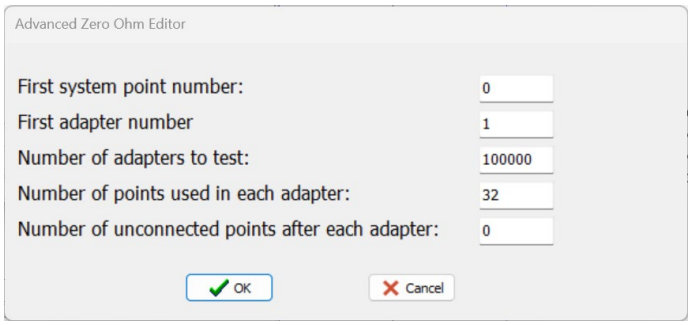
7. Follow steps 2 through 4 to add a fourth **Advanced Zero Ohm** instruction. In the **Advanced Zero Ohm Editor**, revise the options as shown. This instruction will test the Advanced Scanner module in position 4.



9.4.3 Flex Scanners Only

A system equipped with only Flex Scanner modules (with no Advanced Scanner modules installed), will require only a single, modified **Advanced Zero Ohm** Instruction.

1. Follow the steps 1 through 4 in section 7.4.1 above (*page 34*) to access the **Advanced Zero Ohm Parameters Editor**.
2. Change the **Number of points in each adapter** from **64** to **32**, Click **OK** and save the revised test program.



5150 Performance Verification Manual
Version 2026.1.0

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