4-Wire for the Cirris Easy-Touch™

Four-wire testing measures resistances down to .001 Ohm. It also eliminates the resistance of your interface wiring.

Hardware:

The 4-wire measurement requires two correctly paired test points for every connection.

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

For the purpose of 4-wire testing using the Easy-Touch, test points are considered either Type 1 (T1) or Type 2 (T2) points. Each 4-wire pair from the tester must have one of each point. The tester uses T1 points as either force or sense; it uses T2 points as the compliment.
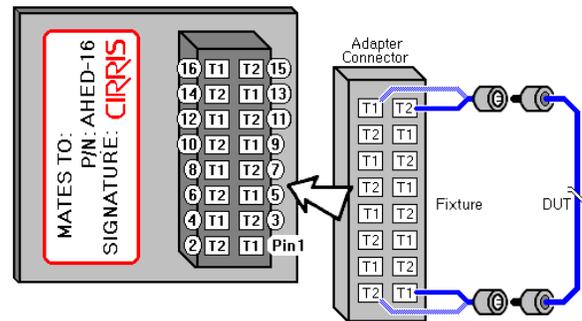

While you can use any standard adapter to run 4-wire fixturing from the tester, Cirris suggests using one of the Cirris AHED series adapters. The AHED adapters map T1 and T2 points in a uniform alternating pattern. The probe can also be used to identify T1 and T2 points as described further in this section.

4-wire fixturing can be constructed in an alternating or separate method.

- **Alternating Method:** The Alternating method is easy to use. With ribbon cable, you solder adjacent wires to join 4- Wire Pairs. While easy, the connector adapter pin numbers won't match the pin numbers of the device-under-test since only the visible point shows in the net list; however, custom test point labels can be used to remedy the pin out numbering.
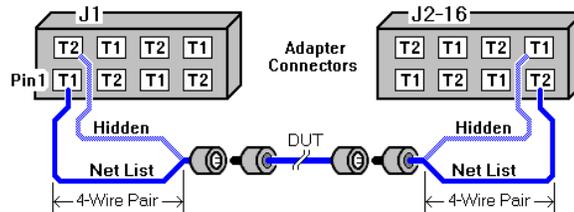

- **Separate Method:** The other way to construct 4-wire fixturing is to use the separate method. Although more difficult to construct, the separate method will create a Net List, which will document correctly without using custom test point Labels. A 2-wire Net List can be preserved when converting to 4-wire.
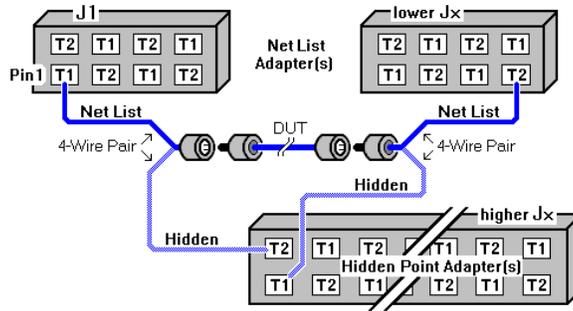
Note: *Because the first scanned point of a 4-wire pair becomes the visible point; make sure hidden point adapter(s) are in a higher-counting "J" position than Net List adapter(s).*

Kelvin Points

The location where the 4-wire pair physically joins the test point connection of the device-under-test is called a Kelvin point.
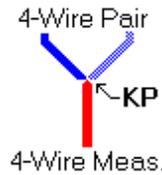
Each 4-wire measurement requires two Kelvin points; one at each end of the tested device. The Kelvin points should be placed as close to the device-under-test as possible. This is because the 4-wire test measures from Kelvin point to Kelvin point, so any contact and lead resistance between the Kelvin points is added to the resistance measurement of the device-under-test.

- **DUT #1:** (Fixturing connects directly to the DUT.) This method only measures the device-under-test. This is ideal, but in real situations it may be nearly impossible.
- **DUT #2:** (Fixturing has connectors that attach to the DUT.) This method measures part of the fixture along with the DUT.

Warning! *If a lot of the fixture is between a Kelvin point and the device-under-test, the 4-Wire Test will be considerably compromised.*

- **DUT #3:** (One wire attaches to the connector, the other wire connects directly to the DUT.) This method measures only part of the device-under-test. For example, by using probe pins you can eliminate the resistance of a connector from the measurement.
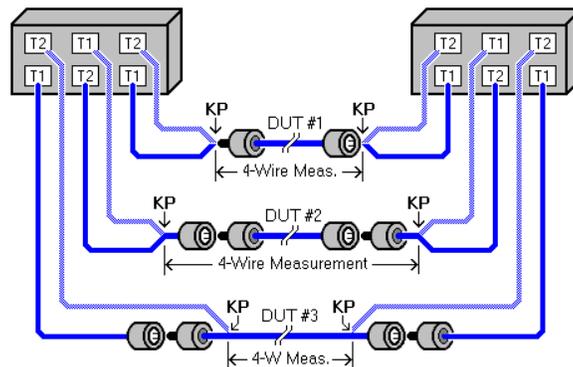
Software

The Easy-Touch uses Easy-Wire™ software to build test programs for 4-wire testing.

Define Connectors for 4-Wire Testing

It is necessary to designate the Visible Points in a 4-wire fixture as 4-wire test points. The Hidden Points should not be represented in the Connector Type used to define the connector. You can designate all the pins in a defined connector as 4-wire or you can designate each pin individually as 4-wire. You can mix normal (2-wire) testing with 4-Wire Testing in the same connector.

1. In the **Define Connectors** folder of the Test Program Editor, select the connector you will be using in the Connector Registry list.
2. Click **Add Selected Connector**.
3. In the reference list click the connector.
4. Click **Edit**.
5. In the connector dialogue box that displays, check the box **Pins in connector are 4-wire pins** to change all the connector pins to 4-wire pins.
   OR
   To select individual pins as 4-wire, double-click on a pin row. Select or deselect the **Four Wire Pin** check box in the pin attribute window.

Attach a Defined Connector

1. Connect the 4-Wire fixturing to the tester.
2. In the **Attach Connectors** folder of the Test Program Editor, click **Attach All Connectors**.
   If the connector chosen has a graphic/imported image, the View Connectors window should open with the first unattached test point in red. All other four wire test points should be in yellow. If the test points that are supposed to be 4-wire are gray, go back and re-do step two.
3. Using the Probe, attach each connector pin to the system points.
   If the Visible point is incorrectly mated to the wrong Hidden point, the message "Points cannot be used to make a four wire pair" will prompt. Either the fixture is incorrectly constructed or you have touched the wrong point.
4. Continue until all connectors are attached, then click **Done**.

Create 4-wire Test Program

You can learn the 4-wire test from a sample.

1. Connect the device-under-test to the 4-wire fixturing made in Step 1.
2. In the **Define Instruction Tab** of the editor click **Learn Attached Wiring Pattern**.
3. Adjust parameters and then click **Learn the Attached Device**.
4. View Instruction List and verify that the device-under-test was learned correctly.
5. Click **Done** and **Save**.

Or, you can manually insert the 4-wire test instructions by inserting them in the **Define Instructions** tab.

1. In the drop-down list in the bottom left corner, select **4WIRE**.
2. Click **Add Instruction**.
3. Select the **From** and **To** connectors and pins in their respective drop-down lists.
4. Adjust the Maximum and Minimum resistance and select **Try It** if desired.
5. Click **OK**.

Note: *If you find that there are no 4-wire points available to add to your test instructions, ensure you have defined 1 or more points in your connector as a 4-wire point (see step 2).*

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