# CR

User Manual

CIRRIS®

# Table of Contents

This page intentionally left blank.

# 1. Introduction

## 1.1 Purpose

This manual conveys important information about the setup and safe operation of the CR test system. It also includes guidance on other key topics such as building test fixtures, developing test programs, testing, and maintenance.

The CR, and the Easy-Wire software that controls it, provide users with an extremely flexible and capable test system. However, the flexibility of the software makes it difficult to document all the possible programming and testing options in detail while describing foundational processes for new users. With that in mind, this manual strives to provide accessible descriptions in sufficient detail to give users the information necessary to become proficient in the tester's basic operation. It is not intended to be an all-inclusive reference.

Expanded, in-depth descriptions of all the features of the test system are available in the Easy-Wire Help, which is installed with the software. The Help's contextual assistance is accessible throughout the software. Therefore, it's expected that users will consult this resource for additional detail as the need arises and will more readily digest the information as the context becomes more clearly understood with experience. To underscore its value on specific topics, this manual references the Help as an additional resource throughout.

## 1.2 Additional Resources

Additional resources are available. Unless otherwise noted, the documents referenced can be downloaded from the Cirris web site at www.downloads.crris.com.

- **Easy-Wire Help** - As referenced above, contextual assistance is accessible from any point within the Easy-Wire software. The Help provides detailed documentation of CR options and usage (*page 21*).
- ***CR Getting Started Guide*** - Provided with a new tester, it includes a subset of the material found in this manual focusing on safety and the essential information needed to set up the tester and install the Easy-Wire software.
- ***Cirris Server Installation Guide*** - The Cirris Server Software allows multiple Easy-Wire testers to share a single database located on a network Server (*page 15*). The installation guide describes how to install the server software and how to attach Easy-Wire test stations to the network database.
- ***Cirris Hub User Manual*** - The Cirris Hub provides the status of Easy-Wire testers at a central location and provides other supporting features for Cirris bench-top testers.
- ***CR Performance Verification Manual*** - Documents the process for verifying the CR calibration using a CR Performance Verification Kit (see *page 6*).
- Instructive videos can be found on the Cirris YouTube Channel.
- Helpful articles on Cirris testers and electrical testing can be found on the Learning Center of the Cirris Web Site.

## 1.3 Help/Support

For assistance:

- Visit the Learning Center of the Cirris Web Site (www.cirris.com/learning-center) to view articles about Cirris products and other testing subjects.
- Visit the Cirris YouTube Channel to find instructive videos.
- In the United States, contact our technical support team by email at techsupport@cirris.com, by telephone at 801 973 4600, ext. 666 (or ask for Tech Support).
- Outside the United States, visit the Contact page of the Cirris Web Site to find your local Cirris Representative

## 1.4 Format

To clearly communicate actions in the Easy-Wire software with a minimum of redundancy, the following conventions are used in this manual.

### 1.4.1 Navigating Menus

This manual uses the " > " symbol to show a progression of clicks through various Easy-Wire software menus.

For example,

**Main Menu** > **Utilities** > **Setup System Options** > **Software Settings Tab**

has the same meaning as,

On the **Main Menu** click **Utilities**, then on the window that opens click **Setup System Options**. In the Setup System Option window, select the **Software Settings Tab**.

### 1.4.2 Bold Font

Easy-Wire buttons and menus are shown in bold face font to display their distinctive character without using quotation marks.

# 2. Safety

Please read and understand the following safety-related information before using the CR test system. Cirris, Inc. is not liable for injuries suffered if the tester is not properly maintained or if safety guidelines are not followed.

## 2.1 Symbols

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

## 2.2 Intended Use 

CR 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%.

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.*

## 2.3 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.

## 2.4 Moving the Tester 

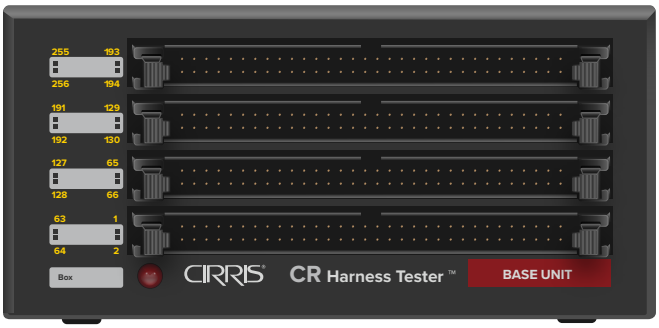
Before lifting or carrying the tester, close the Easy-Wire software, disconnect the system from power and remove all wires, cables and fixtures from the unit. If placing the system on a mobile base, ensure that the base does not introduce a tipping hazard.

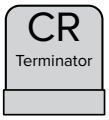
# 3. System Components

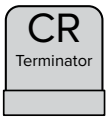
The components supplied with a CR test system depend on its size (the number of test points) and the accessories ordered. The PC controller is typically supplied by the user, but some systems may include a PC with the Easy-Wire software pre-installed.

## 3.1 Base System

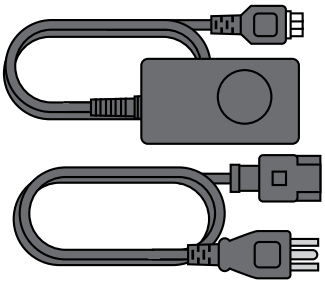
The most basic CR system includes a Base Unit with 256 test points.



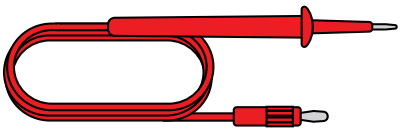



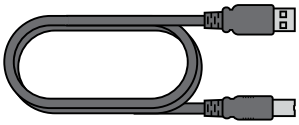

Terminators



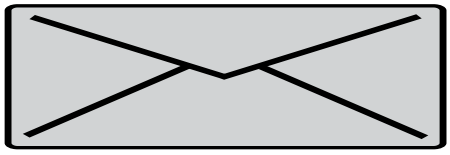
Power Supply & Cord



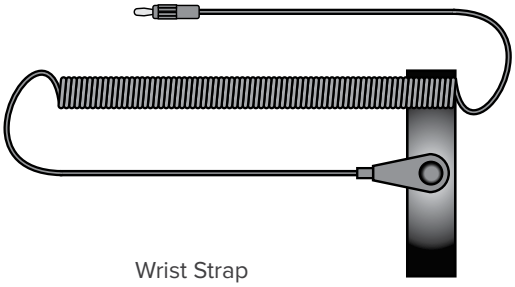
Probe



USB Cable



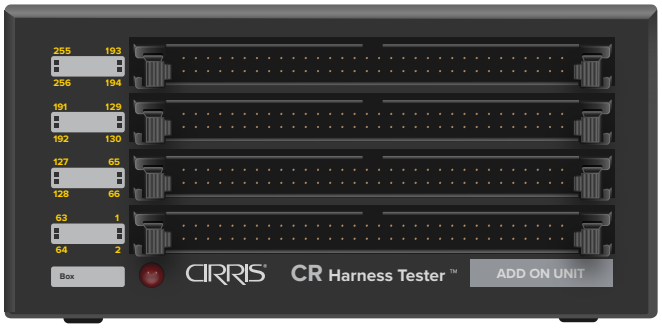
Certificate of Calibration



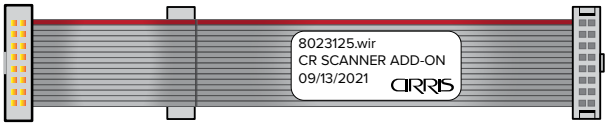
Wrist Strap

## 3.2 Optional Expansion Hardware

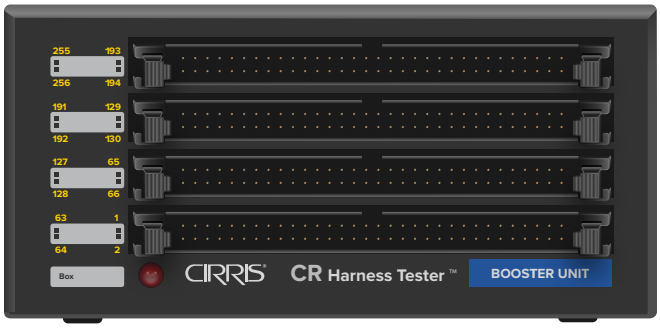
CR systems can be expanded up to 32,000 test points. The Base Unit, Expansion Scanners, and Booster Units each provide 256 test points and share the same form factor. The Base Unit and Booster Units require AC (Mains) power input and each can support up to seven (7) Expansion Scanners.



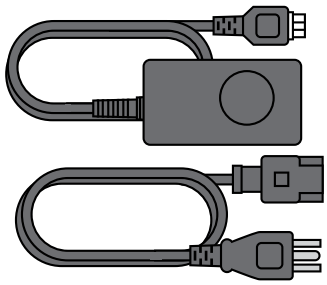

Expansion Scanner



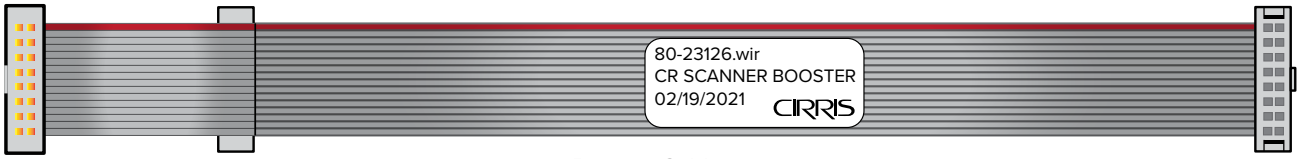

Expansion Cable




Booster Scanner



Power Supply & Cord




Booster Cable

## 3.3 Optional Accessories

Optional accessories may have been included or can be purchased separately, such as:

- **Printer:** For printing reports.
- **Label Printer:** For printing test labels.
- **Barcode Scanner:** For data input from barcodes such as serial numbers and lot numbers, loading a test program or starting test by scanning a barcode, etc.

## 3.4 Software

The Easy-Wire Station Software required to control the system can be downloaded from the Cirris web site at www.downloads.cirris.com. See *page 11* for Software Installation and *page 17* for Activating the Software License.

## 3.5 PC Requirements

- 2.0 GHz min. processor speed
- Windows 10® operating system
- 15 GB free hard drive space min.
- 4 GB RAM min.
- 256 MB min. video memory
- 1024 x 768 min. display resolution
- Sound (for audible feedback)
- USB 2.0 or 3.0 port
- Internet connection - Not required, but if available it can facilitate technical support

The PC controller on which the Easy-Wire Station Software is installed must meet the following requirements:

If using the optional Cirris Server Software to share a network database with multiple Easy-Wire stations, the PC on which the server software is installed must meet the same requirements, except:

- Windows 10 or Windows Server 2019 operating system
- An available USB port is not required
- Sound is not required

# 4. **Calibration**

New CR systems ship with a Certificate of Calibration valid for one year. Cirris recommends that the calibration be verified annually at a minimum thereafter by either, (a) sending the system to the Cirris factory for the service or (b) using a CR Performance Verification Kit and running the verification process described in its included documentation.

The CR Performance Verification Manual can be downloaded from the Cirris web site at www.downloads.cirris.com. Contact your Cirris representative to purchase a CR Performance Check Kit.

***Note**: If the CR tester fails the Performance Verification, it indicates that the system requires service. No adjustments are made to the tester hardware or software during the verification process.*

# 5. Hardware Setup

## 5.1 Configurations

The most basic CR system includes only a Base Unit with 256 test points. One Base Unit is required per system, regardless its size. The Base Unit can support up to seven (7) Expansion Scanners. Larger systems require Booster Units with each supporting up to seven (7) additional Expansion Scanners. Only the Base Unit and Booster Units require AC power.

### Stacked

Systems that include Expansion Scanners are designed to be stacked with the Base Unit and Booster Units on the bottom. Standard length Expansion Cables and Booster Cables support the stacked configuration.

### Rack-Mounted

In addition to the stacked configuration, CR systems can be rack mounted. Custom length Expansion Cables are required in rack or cabinet installations. Cirris can supply mounting panels that attach to the front rails of a 19” (482.6 mm) cabinet.

### Distributed

In a distributed configuration the Base Unit, Expansion Scanners, and Booster Units can be separated from each other using custom length Expansion Cables. This is most often done when testing large products to reduce the length of the tester/product interface cables. In distributed systems the connecting Expansion Cables cannot exceed 200 feet (60 m) in total length.

Proper precautions must be taken to avoid a tipping hazard.

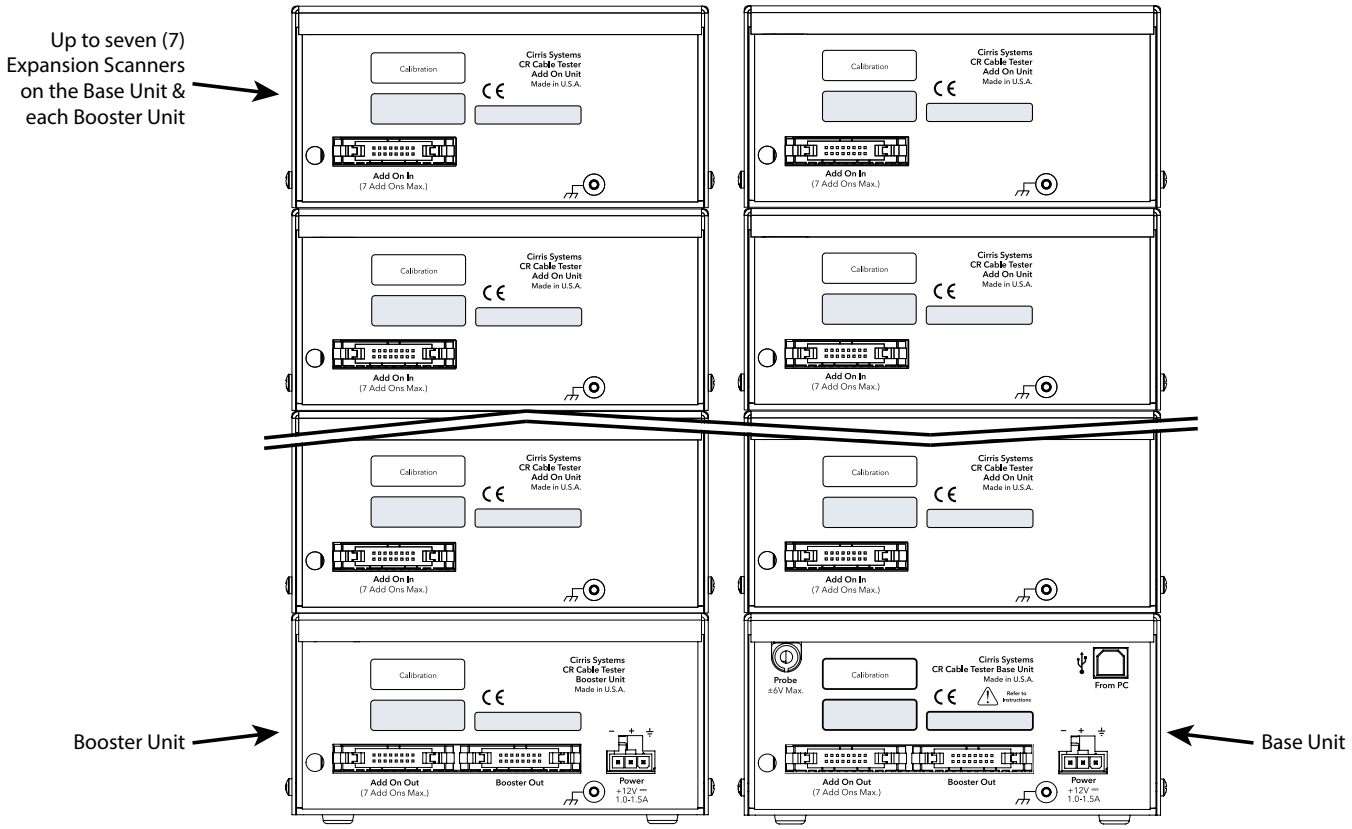

Stacked CR System with 4096 Test Points
(Base Unit, Booster Unit and 14 Expansion Scanners)

# 5.2 Assembling the System

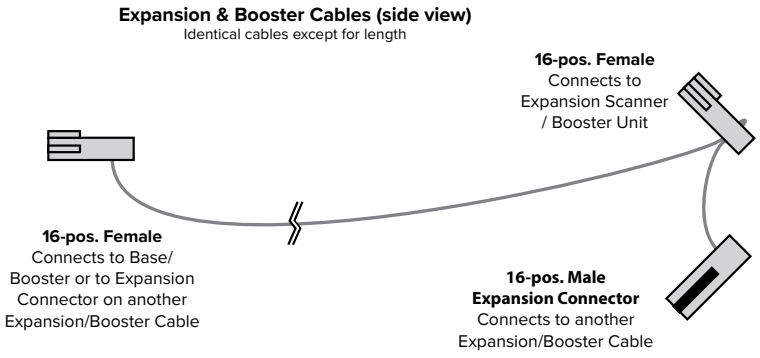
If the system consists of only a Base Unit, skip to Step 6.

***Configuring the Hardware***

**1.** For the standard, stacked configuration, place up to seven (7) Expansion Scanners on the Base Unit and on each Booster Unit. The Base Unit and each Booster Unit also support up to seven (7) Expansion Scanners in rack-mounted or distributed systems.




***Connecting the Units -*** The same interconnections described apply to stacked, rack-mounted, or distributed systems except the Expansion Cables and Booster Cables may need to be longer than the standard cables in rack-mounted or distributed systems. The Expansion Cables and Booster Cables are identical except for length and are clearly labeled.



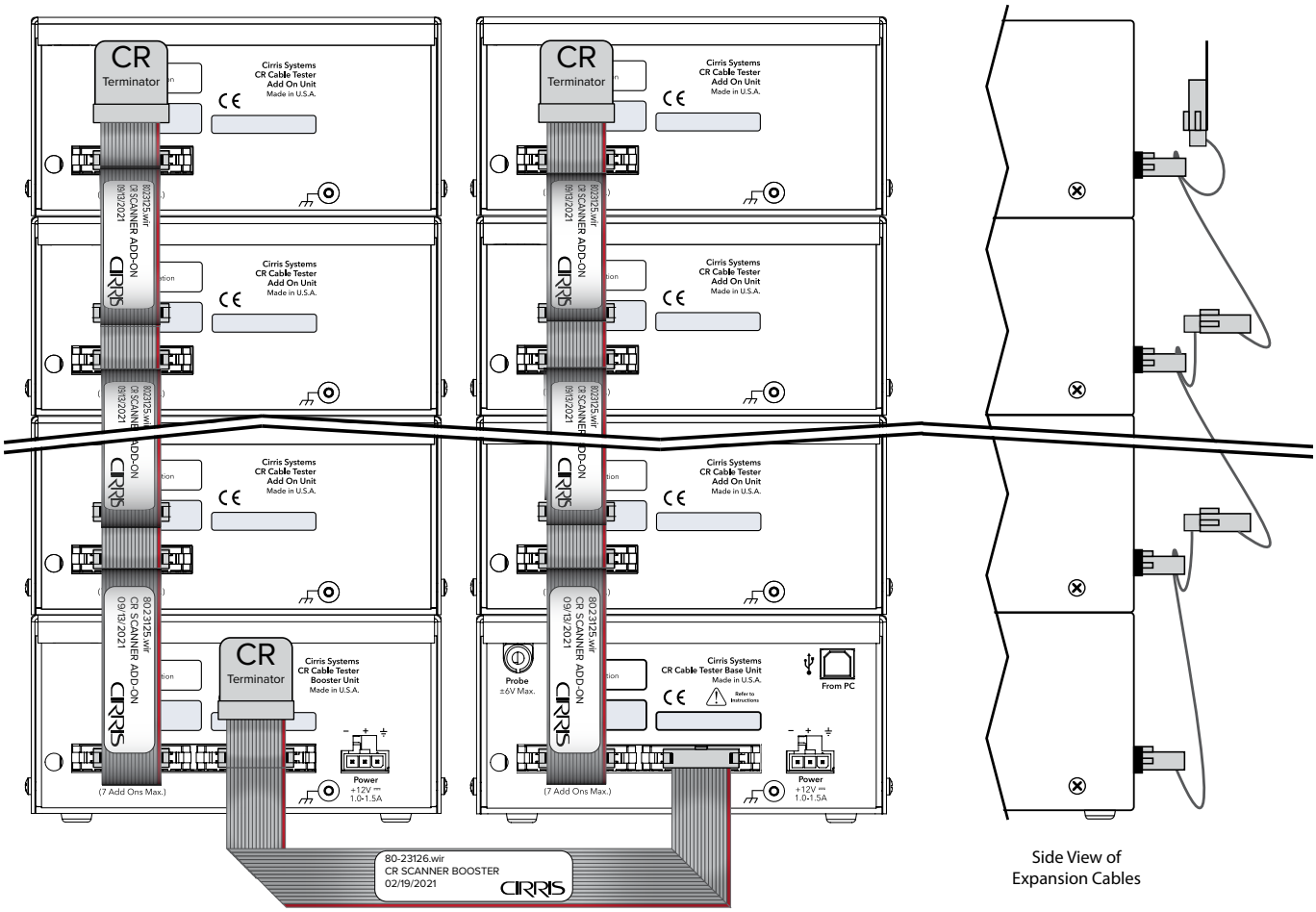
2. Connect an Expansion Cable from the **Add On Out** connector on the Base Unit to the **Add On In** connector on the first Expansion Scanner.

3. To connect additional Expansion Scanners, continue the daisy-chain by connecting an Expansion Cable to the Expansion Connector on the preceding cable and repeat the process for a maximum of seven (7) Expansion Scanners.

4. For larger systems, connect a Booster Cable from the **Booster Out** connector on the Base Unit to the **Booster Out** connector on the Booster Unit. Continue the Booster daisy-chain to connect each Booster Unit in the system. Connect Expansion Scanners to the Booster Unit(s) as described above for the Base Unit.

5. After all the Expansion Cables are installed, place a Terminator on the open connector at the end of the Expansion daisy-chain(s) and the Booster daisy-chain.

6. Place a terminator on the Base Unit **Add On Out** and /or **Booster Out** if the either or both is unused - for example if the system consists of only a Base Unit.




To avoid damage to the hardware, do not connect or disconnect CR units while the Easy-Wire software is running.

***On the back panel of the Base Unit:***

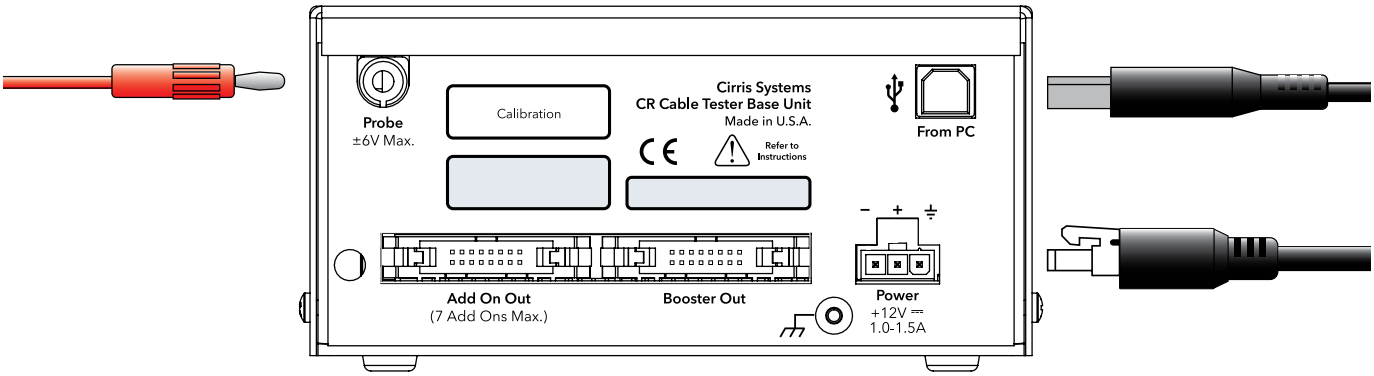
**7.** Connect the Probe to the **Probe** receptacle on the Base Unit.

**8.** Insert the USB Type B connector of the supplied USB cable in the **From PC** (USB) port on the Base Unit and connect the other end to a USB port on the PC controller.

***On the back panel of the Base Unit and any Booster Unit(s):***

**9.** Connect the Power Supply to the **Power** receptacle on the Base Unit and to all Booster Units included in the system. Plug the power cord(s) into a surge-protected power strip and plug the poser strip into a ground power outlet.  The CR Power supply will accept AC power input from 100-240 volts AC, 50-60 Hz.

The power outlet must provide a properly wired, low impedance earth ground. The ground for the test system is integral to the power cord(s).

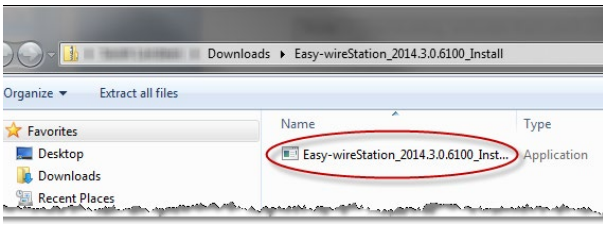


# 6. Easy-Wire Software

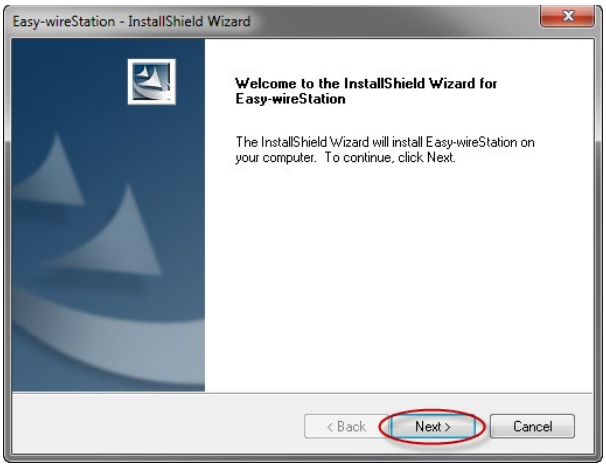
The Easy-Wire software controls the CR test system, provides the user interface for testing operations, and includes the test program editor in which test programs are created and revised. The contents of the Connector Registry, test programs and test results are all stored in the Easy-Wire database. The database can be located on the hard drive of the test station PC-controller, the typical configuration for stand-alone stations, or the database can be located on a network drive and shared with other Easy-Wire test stations using the Cirris Server Software.

## 6.1 Installation

1. The Easy-Wire Station Software installation file can be downloaded for the Cirris web site at www.downloads.cirris.com.
2. If upgrading an existing Easy-Wire installation, back up the database before proceeding. Instructions for the back-up process can be found at www.backup.easy-wire.com or in the Easy-Wire Help.
3. Exit all open applications.
4. Navigate to the location of the installation file and open the application to begin the installation.

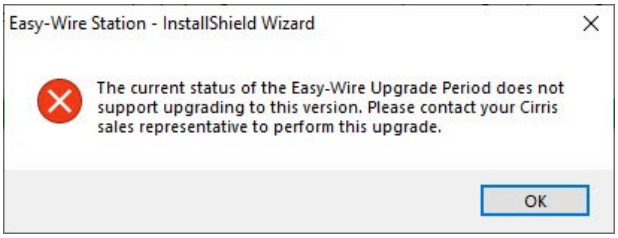



5. Continue through the installation by clicking **Next**.



6. Depending on the circumstances, several messages may be displayed during the installation process, including an upgrade notification if a previous installation is detected and an associated warning to back up the existing database (as mentioned under step 2 above). A notice of licensing requirements will also be displayed. Click **OK** on each window to proceed.

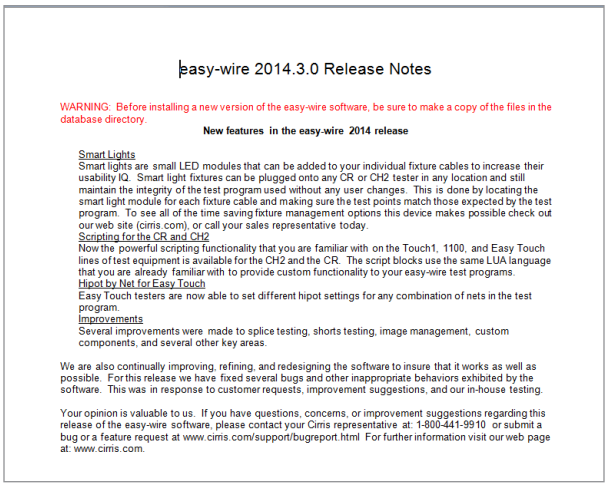
   If an existing installation is being upgraded, and the upgrade eligibility period supported by the software license has expired, a message will be displayed notifying the user that the upgrade is not supported by the software license and to contact a Cirris sales representative to update the license before continuing with the installation. Click **OK** to close the message window.




7. Read the terms and conditions before accepting the terms of the license agreement. When prompted to choose an installation location, accept the default.

   ***Note**: The installation may prompt the user to install separate, required applications which may necessitate a Windows restart. If/when prompted, install these applications.*


8. A readme file will automatically open as the installation nears completion. It describes new features and release notes for the current version of the Easy-Wire software. When ready to continue, close the window to complete the installation.


easy-wire 2014.3.0 Release Notes

WARNING: Before installing a new version of the easy-wire software, be sure to make a copy of the files in the database directory.

**New features in the easy-wire 2014 release**

Smart Lights
Smart lights are small LED modules that can be added to your individual fixture cables to increase their usability IQ. Smart light fixtures can be plugged onto any CR or CH2 tester in any location and still maintain the integrity of the test program used without any user changes. This is done by locating the smart light module for each fixture cable and making sure the test points match those expected by the test program. To see all of the time saving fixture management options this device makes possible check out our web site (cirris.com), or call your sales representative today.
Scripting for the CR and CH2
Now the powerful scripting functionality that you are familiar with on the Touch1, 1100, and Easy Touch lines of test equipment is available for the CH2 and the CR. The script blocks use the same LUA language that you are already familiar with to provide custom functionality to your easy-wire test programs.
Hipot by Net for Easy Touch
Easy Touch testers are now able to set different hipot settings for any combination of nets in the test program.
Improvements
Several improvements were made to splice testing, shorts testing, image management, custom components, and several other key areas.

We are also continually improving, refining, and redesigning the software to insure that it works as well as possible. For this release we have fixed several bugs and other inappropriate behaviors exhibited by the software. This was in response to customer requests, improvement suggestions, and our in-house testing.

Your opinion is valuable to us. If you have questions, concerns, or improvement suggestions regarding this release of the easy-wire software, please contact your Cirris representative at: 1-800-441-9910 or submit a bug or a feature request at www.cirris.com/support/bugreport.html For further information visit our web page at: www.cirris.com.

9. A final message window stating that the installation is complete is displayed at the conclusion of the process. Click **Finish** to close the window. An **Easy-Wire** shortcut is automatically placed on the desktop.

# 6.2 Starting Easy-Wire

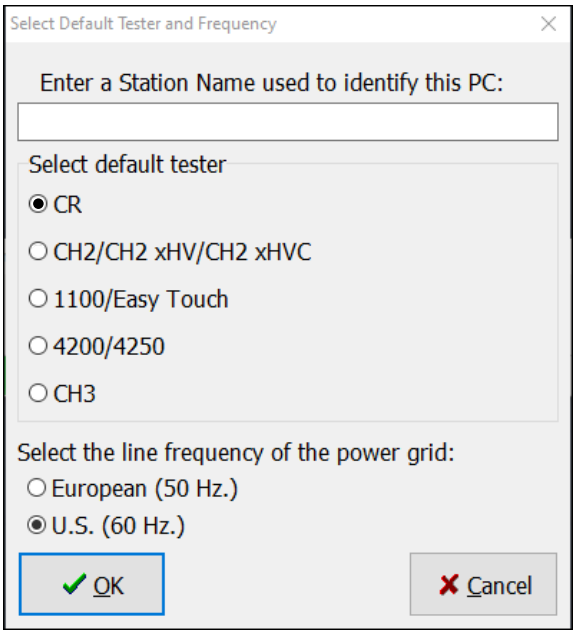
1. Double-click the **Easy-Wire** shortcut to open the software.

***Note**: If the **Easy-Wire** shortcut isn't visible on the desktop, from the Windows task bar, click **Start > Cirris Systems Corporation > Easy-Wire**.*

2. The **Select Default Tester and Frequency** window is displayed the first time a new installation is opened:

   - Click the text box and enter a station name used to identify this PC.
   - Select **CR** as the default tester.
   - Select the frequency of the AC power (Mains) input to the system.
   - Click **OK**.

   ***Note**: You must select a tester when opening Easy-Wire for the first time. However, if using the software on multiple tester types, from the **Main Menu** > **Utilities** > **Setup System Options** > **Software Setting Tab** and check the box for **Allow user to change Tester Type at Login**.*

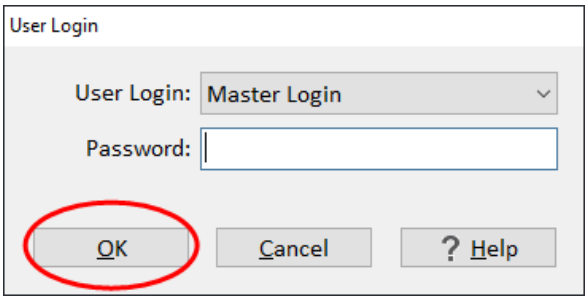



3. In the **User Login** window, accept the default **Master Login** in the **User Login** field.

   Do not enter a password initially.

   Click **OK**.

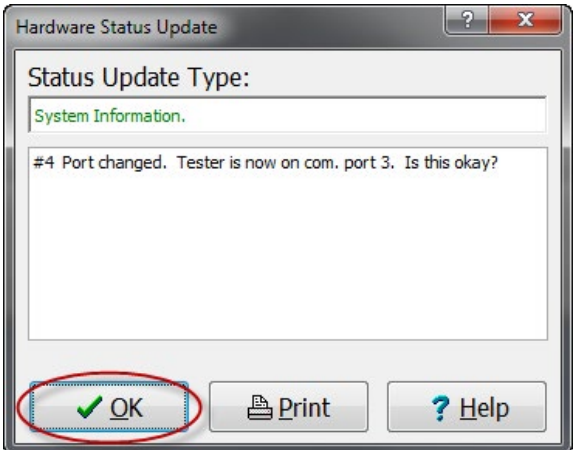
   ***Note**: To setup user passwords, after logging in, from the Easy-Wire **Main Menu** > **Utilities** > **Setup Security** and see the Easy-Wire Help for assistance.*



**4.** If the **Hardware Status Update** window opens, click **OK**.

This window is normally displayed when opening Easy-Wire after a new installation or when changes have been made to the system hardware or software.

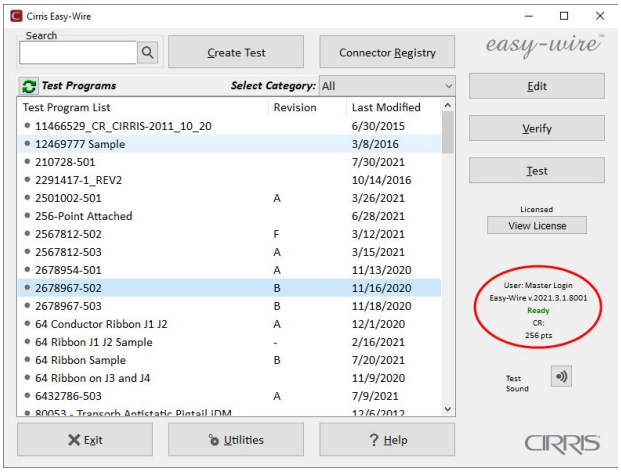
***Note**: This window can display two update types - **System Information** or **System Problems**. For more information on Hardware Status Updates, see the Easy-Wire Help.*




**5.** The Easy-Wire Main Menu opens at the end of the startup process.

The tester goes through a series of self-tests during initialization. These tests ensure that the hardware and software are working properly. If the self-test passes, the **Main Menu** will open with a **Ready** status indicator.

See *page 97* for troubleshooting tips if a red **Error** indicator appears instead.



## 6.3 Cirris Server Software

The Cirris Server Software allows multiple Easy-Wire test stations to share a single database located on a network server. In this configuration, all the stations load test programs from the network database and write test results to the same database. If a user has the security privileges to do so, they can also edit test programs on any test station and update the network database with the changes. This provides two key benefits:

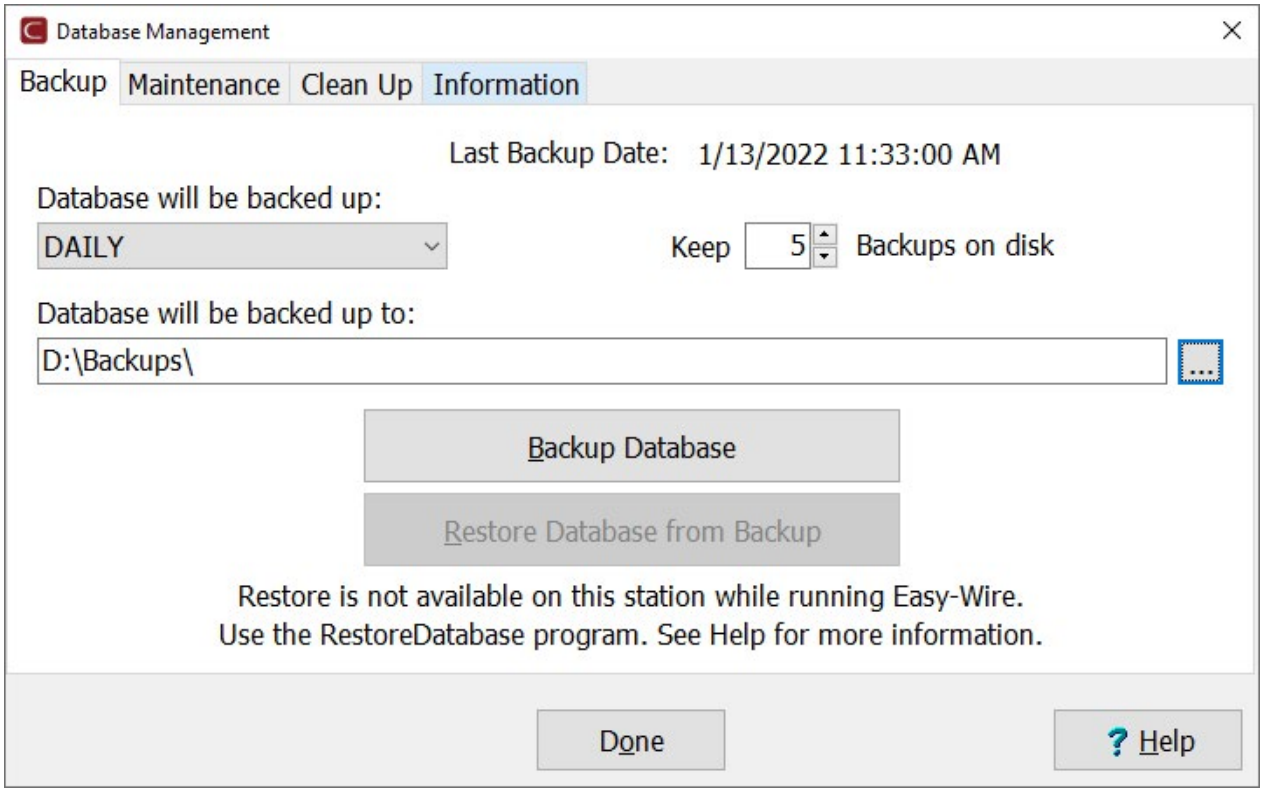
- Revision Control - As all test stations access the same database, each uses the latest versions of test programs, eliminating the risk of human error found in the manual test program export and import process.
- Database Backup - As much critical data, including all the test programs and the test results history, is stored in the Easy-Wire database, having a single database located on a network server simplifies the backup process and makes the database more secure.

Instructions for installing the Cirris Server Software and attaching test stations to the network database are provided in the *Cirris Server Installation Guide* available at www.downloads.cirris.com.

## 6.4 Database Backup

Regardless of whether the test station shares a network database using the Cirris Server Software, or is a stand-alone test station, the database should be backed up regularly. This can be managed externally, but the Easy-Wire software provides the capability for users to automatically back up the database on a defined schedule.

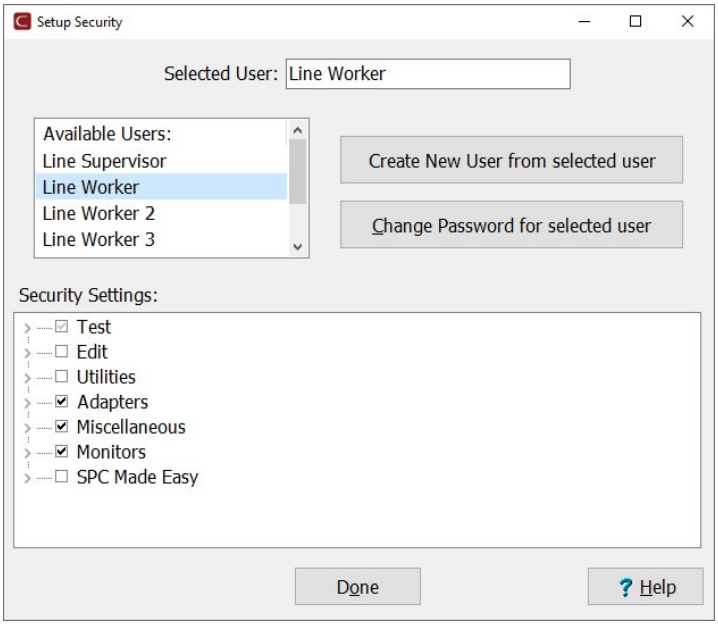
From the **Main Menu** > **Utilities** > **Database Maintenance** to open the **Database Management** window. On the Backup tab, select the frequency for the backup and the number of backup files to keep before the earliest version is overwritten, and navigate to location in which the backup files should be stored. Good practice dictates that the backup should not be kept on the same drive as the database.



## 6.5 Security

Initially, there are no restricted levels of access or password protection in the Easy-Wire software. To set up user profiles, set up passwords, and establish levels of access for different users, from the **Main Menu** > **Utilities** > **Setup Security** to open the **Setup Security** window. See the Easy-Wire Help for additional information.

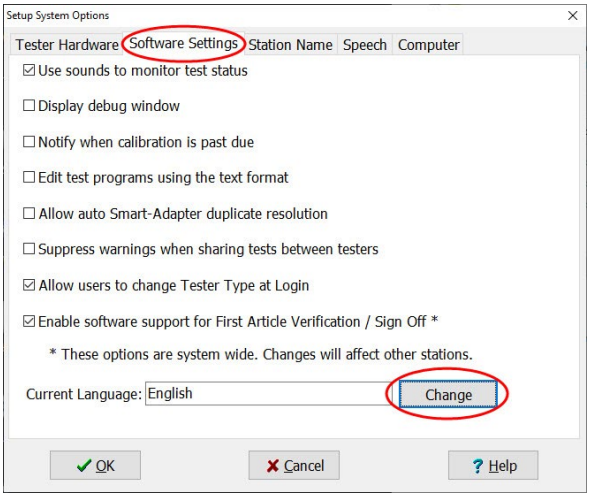
***Note:*** *The name of the logged-in user is captured and is available to include in reports.*



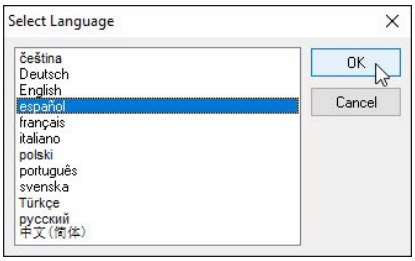

## 6.6 Changing the Interface Language

The language used in the Easy-Wire interface can be changed to one of the available options.

1. From the **Main Menu** > **Utilities** > **Setup System Options.**
2. Under the **Software Settings** tab, select **Change**.

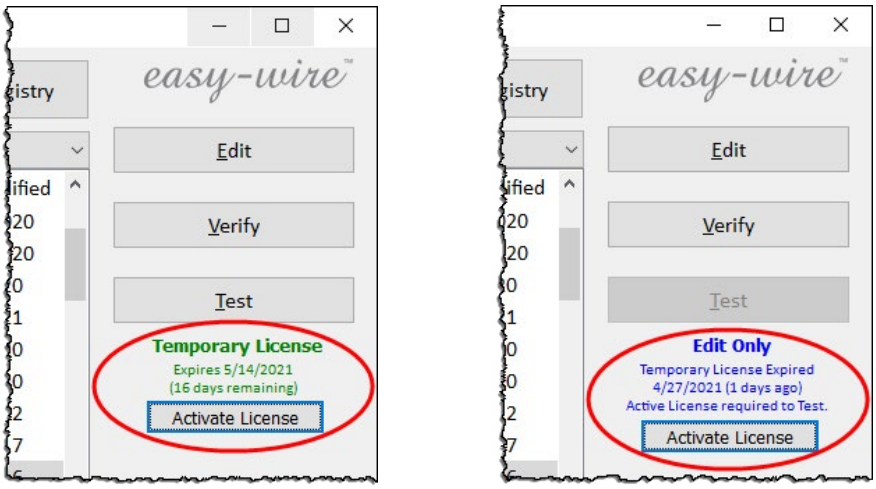



3. Select an alternate language from the list of options and click **OK**.
4. Click **OK** on the **Setup System Options** window to return to the **Main Menu**.



# 6.7 Software License

After performing a new installation (not an upgrade) or after upgrading versions 2020.4.0 or earlier, the Easy-Wire software will be fully functional for 21 days. During this period, the **Main Menu** displays the license status **Temporary License**. If the software license is not activated before the end of this time, the software will enter an **Edit Only** mode, which supports editing functions, but which does not support tester control. The software will operate in this mode indefinitely if the license is not activated.




To maintain full functionality, the software license must be activated. The purchase of Easy-Wire with a tester, or the purchase of an Easy-Wire upgrade separately, includes the activation of the associated license and software upgrades for the station on which the software is installed for one year. Once activated, the version of software installed, and any versions installed during the upgrade eligibility period, will remain fully functional indefinitely. Contact your Cirris sales representative for information about upgrading additional stations or about extending the upgrade eligibility period.

## 6.7.1 Activating the Software License

***Note:*** *A short video describing the License Activation Process is available at* activate.easy-wire.com.

The process of activating an Easy-Wire software license includes, (a) creating a license request file, (b) sending the license request file to your Cirris sales representative, and (c) importing the license activation file provided by Cirris in response. The license is associated with the PC on which the software is installed.

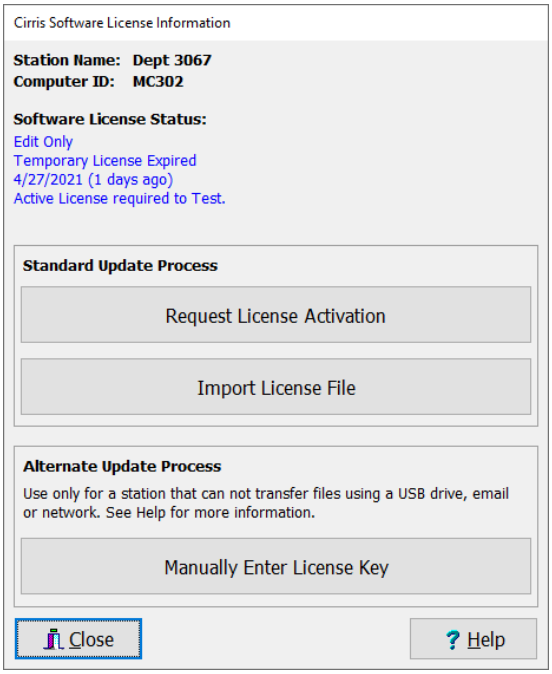
If the test station PC controller on which the software is installed cannot transfer files using a USB flash drive, email or a network, follow the Alternate (Manual) License Activation Process described in the Easy-Wire Help.

1. **Important:** If upgrading an existing installation with a new version of Easy-Wire, back up the database before performing the upgrade. See either **Database Maintenance (Network Database)** or **Database Maintenance (Stand-Alone Testers)** in the Easy-Wire Help for additional information.

2. On test stations that share a network database, all the stations and the Cirris Server must be running the same software version. Install the Easy-Wire software on all the networked test stations. If necessary, contact your Cirris salesperson for software upgrade pricing. Stand-alone testers (testers not sharing a network database) can run different Easy-Wire versions, but in this case, it may not be possible to use test programs created under newer versions on stations running older versions.

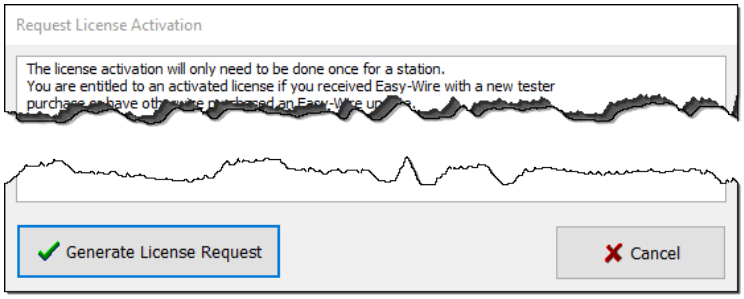
3. The license status is displayed on the **Main Menu**. If the status is **Temporary License** or **Edit Only**, click/tap **Activate License** to open the **Cirris Software License Information** window.

4. Click/tap **Request License Activation**.



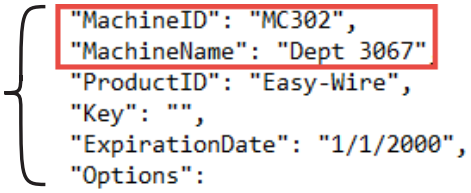
5. On the Request License Activation window:

**Test Stations Sharing a Network Database**: After ensuring that the correct version of the Easy-Wire software has been installed on all stations sharing the network, click/tap **Generate License Request** to create a License Request file. The request includes all stations that have previously logged into the Easy-Wire server as clients. File Explorer will open to the location where the file was saved (C:\Users\Public\Documents\Cirris\LicenseRequest). Open the License Request File in a text editor to ensure that the Machine ID and Machine Name for each station are included.




**Test Stations NOT Sharing a Network Database (Stand-Alone stations)**: Click/tap **Generate License Request** to create a License Request file. File Explorer will open to the location where the file was saved (C:\Users\Public\Documents\Cirris\LicenseRequest). If upgrading multiple test stations, save the file to a USB flash drive and repeat the process for each station on which the software is being installed/upgraded. This will generate a separate license request file for each station.

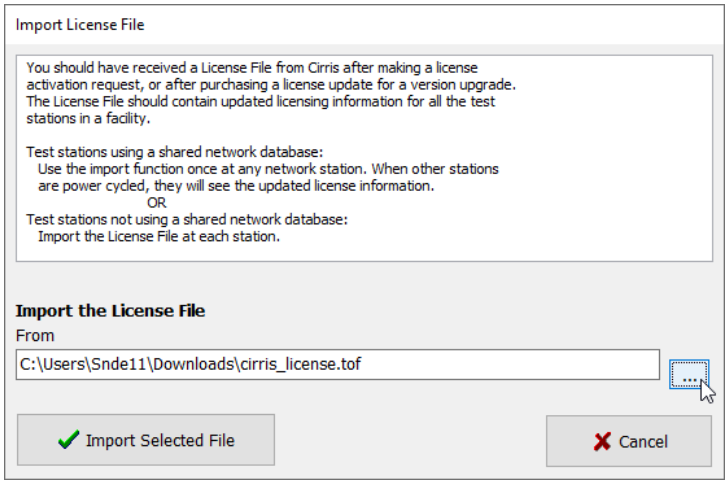
The License Activation Request file includes a separate section for each test station sharing a network database.




6. Email the License Request File(s) to your Cirris sales representative. Regardless of the number of test stations included in the request, Cirris will provide a single license file in response that will provides the current license information for the facility.

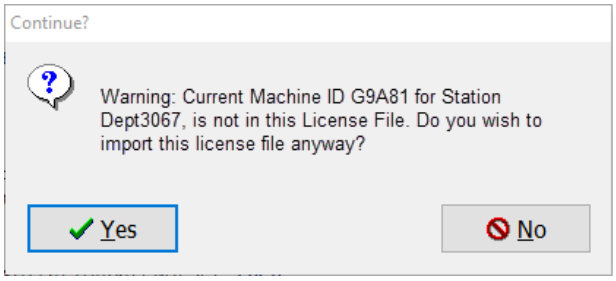
7. After receiving the License File save it to a location that will be accessible to the PC on which Easy-Wire is installed:

**On Test Stations Sharing a Network Database**, the License File can be imported from any test station sharing the database. On the Cirris Software License Information window (see graphic on facing page), select **Import License File**. On the window that opens, click/tap the "3 dots" navigation button to select the license file, which has a ".tof" filename extension. Click/tap **Import Selected File**.



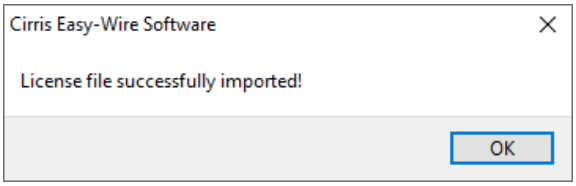

**On Test Stations NOT Sharing a Network Database (Stand-Alone Stations)**, the License File must be imported on each station. On the Cirris Software License Information screen, select **Import License File**. On the window that opens, click/tap the "3 dots" navigation button to select the license file, which has a ".tof" filename extension. Click/tap **Import Selected File**.

8. If the Machine ID in the License File does not match the Machine ID for the station on which it's being imported, a warning message will be displayed. Selecting **Yes** in the message window will import the license file anyway, but the station's license will not be updated. Select **No** to abort the import process.



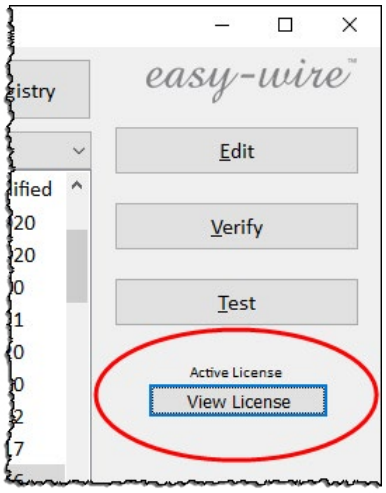

9. A message indicating that the License File was successfully imported is displayed at the end of the process. Click/tap **OK**. The status on the **Main Menu** will display **Active License**.

   Other stations sharing a network database can be manually prompted to recognize the new license status by clicking **Activate License** on the **Main Menu** or by restarting the Easy-Wire software.

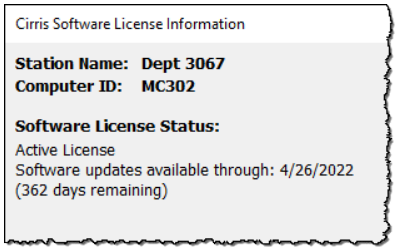



## 6.7.2 Viewing the Software License

After the license has been activated, the **Main Menu** will display the status as **Active License**. Click/tap **View License** or select **Software License Management** under the **Utilities Menu** to open the Cirris Software License Information window and view the current license status.



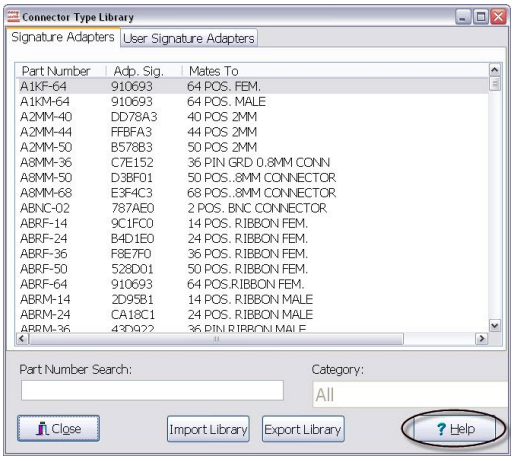

Contact your Cirris sales representative to extend the upgrade eligibility period or to purchase software upgrades after the upgrade period has expired.



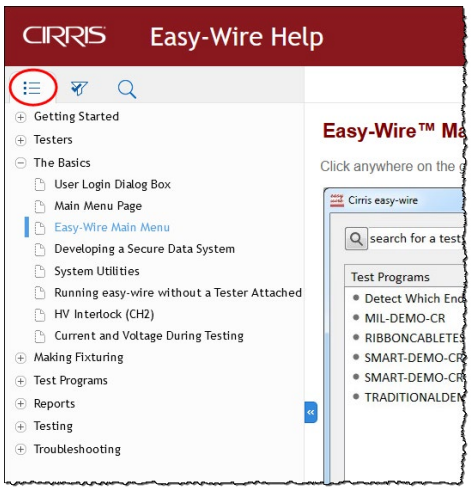
# 6.8 The Easy-Wire Help

The Easy-Wire Help provides readily accessible contextual assistance from any Easy-Wire window.

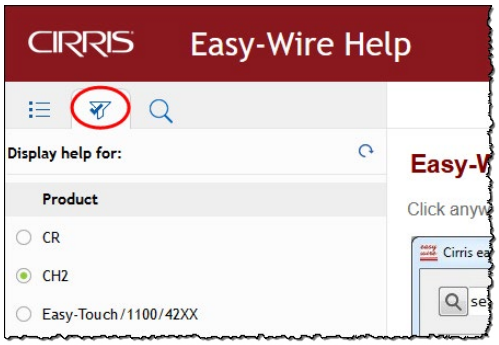
**1.** In the Easy-Wire software, click the **Help** button at the bottom of any window to display context-sensitive Help in a browser.



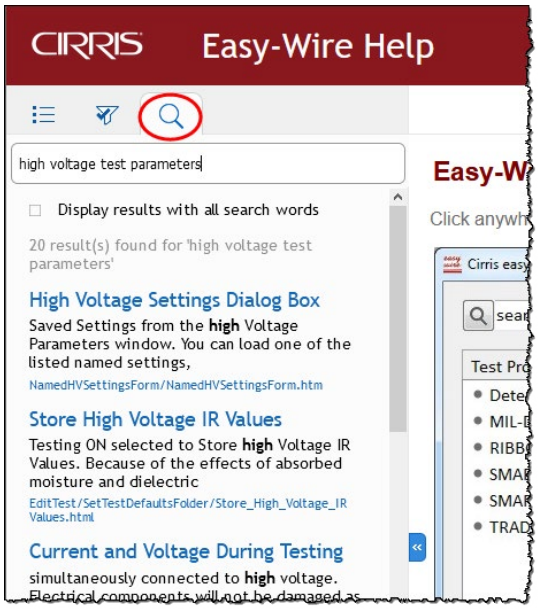

**2.** In the Help system, to view the contents, click the Table of Contents icon.




**3.** The Easy-Wire Help is automatically filtered by tester type. To change the default filter, select the Filter icon.



**4.** To search the Help, click the Search icon.



This page intentionally left blank.

# 7. Test Fixtures

The CR tester is connected to the Device-Under-Test (DUT) using test fixtures, sometimes also referred to as test cables, interface cables, or test hardware. The concept is straightforward as the purpose of test fixturing is simply to connect an individual test point to each termination in the DUT. However, the requirements of the application can complicate the execution. Therefore, the best solutions often require some thought and consideration of future implications.

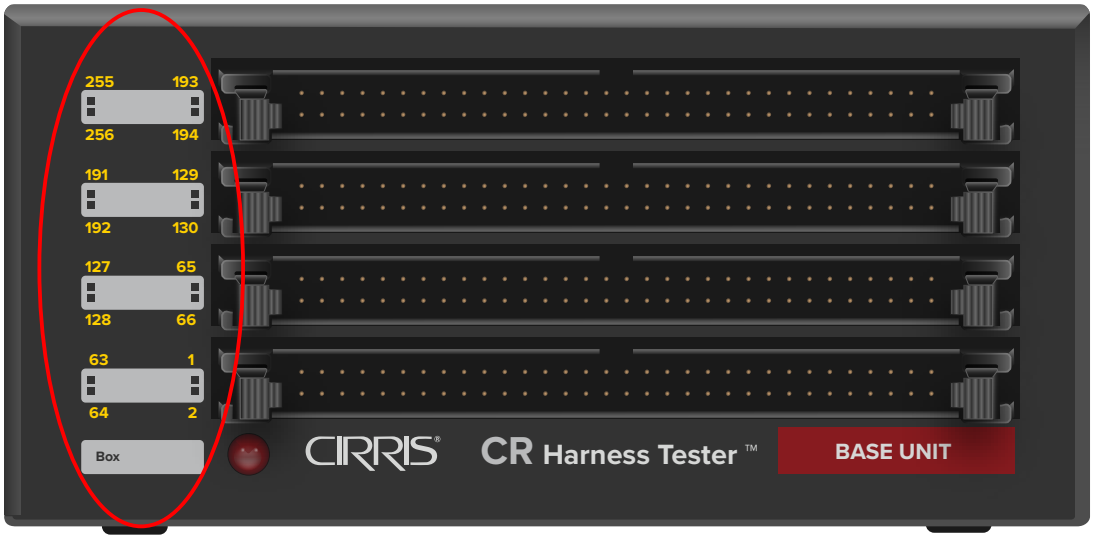
Key terms used in this section:

- **Test Points** provide access to the tester's measurement capabilities through the connectors on the front panel of the tester. Fixturing connects test points to terminations in the DUT.
- **Traditional Fixturing and Smart-Adapters** - The term Traditional Fixturing is used to differentiate standard test fixtures from those equipped with Smart-Lights. Smart-Lights allow the Easy-Wire software to identify connected Smart-Adapters and automatically associate their connector type and wiring pattern. This capability simplifies programming and speeds test changeover as test cables with Smart-Lights can be connected to the tester in random order when setting up for a new test session.
- **Standard (2-wire) Fixtures and Kelvin (4-wire) Fixtures** - Two-wire fixtures connect a single test point to each side of a test measurement and include the resistance of the test fixtures in measurements. Kelvin, 4-wire, fixtures connect two test points to each side of a test measurement. Kelvin testing expands the low end of the resistance measurement range down to .005 Ohm and, properly configured, can remove the resistance of the test fixture from the measurement.

## 7.1 Tester Interface

The CR Base Unit, each Expansion Scanner, and each Booster Unit provides 256 test points interfaced through four 64-position header connectors. Test points are numbered starting with 1 in the bottom connector of the Base Unit and continue sequentially through each connector on the Base Unit and through each Expansion Scanner / Booster Unit in the same pattern to the end of the test point matrix. The system test point number can be confirmed while in the Test Program Editor by using the probe.

The label on each unit displays the numbering pattern. The system point numbers on each subsequent expansion scanner would be incremented by an additional 256 test points. For example, test point 1 on the first expansion scanner would be system point 257. The first test point on the second expansion scanner would be system point 513.



# 7.2 Optional Interface Hardware

Cirris stocks hardware for use in building test fixtures including:

## 7.2.1 Mating Connectors

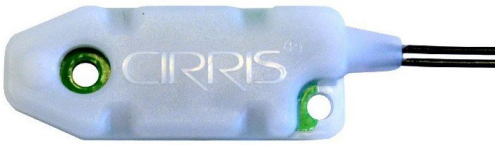
Tester mating connectors are available for ribbon cable and for discrete wires.

## 7.2.2 Mating Cables

Ribbon and discrete wire cables that mate with the CR tester are available in various lengths. Versions with the same connector on both ends are often used to connect the tester to fixtures such as Transitions Boards. Versions with a connector on one end can be wired to product mating connectors in test cables or in other test fixtures.

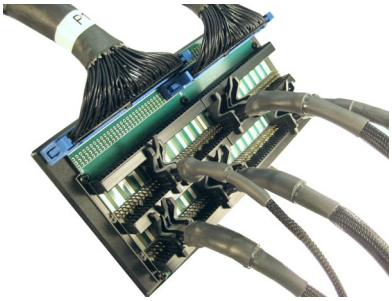
## 7.2.3 Smart-Lights

Smart-Lights are small devices that attach to test cables and store a unique ID that allows the Easy-Wire software to associate the connector profile and its wiring pattern. This stored data is automatically retrieved by the Easy-Wire software, which provides two key benefits. First, it speeds test program development because the connector information (the Define step) and test point mapping process (the Attach step) are completed automatically. Second, it simplifies and speeds test setup changeover as Smart-Lights allow test cables to be attached to the tester in random order.




## 7.2.4 Transition Boards

Transition Boards offer a convenient way to transition from a block of 64 test points to discrete wires or smaller break-out cables. This practice helps to make efficient use of test points with a minimum of complexity.



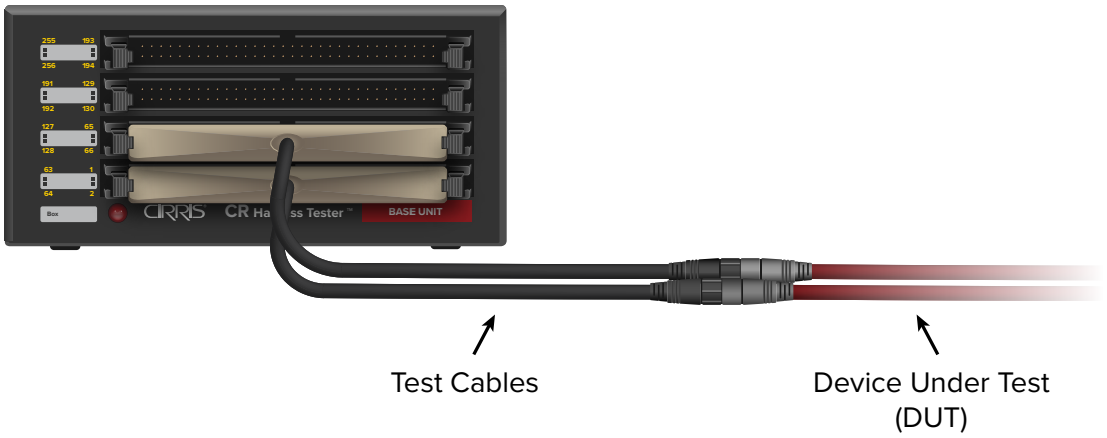
## 7.2.5 Bi-Color Guidance LEDs

The Easy-Wire software can associate LEDs with specified connectors or instructions to provide build guidance or to help identify components associated with error messages (see *page 50*). They also can be used to associate operator instructions with parts bins, wiring paths, and other items. Smart-Lights include an integral, bi-color (red/green) LED.

# 7.3 Fixture Overview

Due to the flexible testing capabilities of the CR, the system is used for guided assembly and test on a wide array of products in many different production scenarios. Therefore, there's also extreme variety in the form of test fixtures used. The best choice depends on the application, production quantity, budget, and available assembly skills. Some common approaches include:

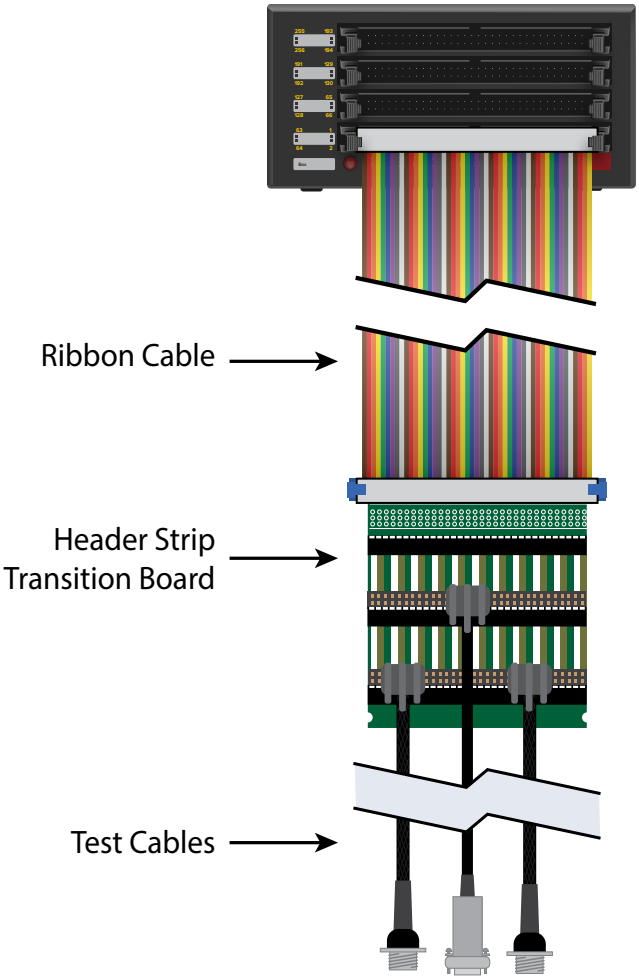
- **Direct Connection** - Test cables can be connected directly to the tester using mating connectors. The test cables can use ribbon cable or discrete wire conductors. This setup is straightforward and works well for simple products or for setups that don't change frequently. It can be used with Traditional Fixtures or Smart-Adapters.



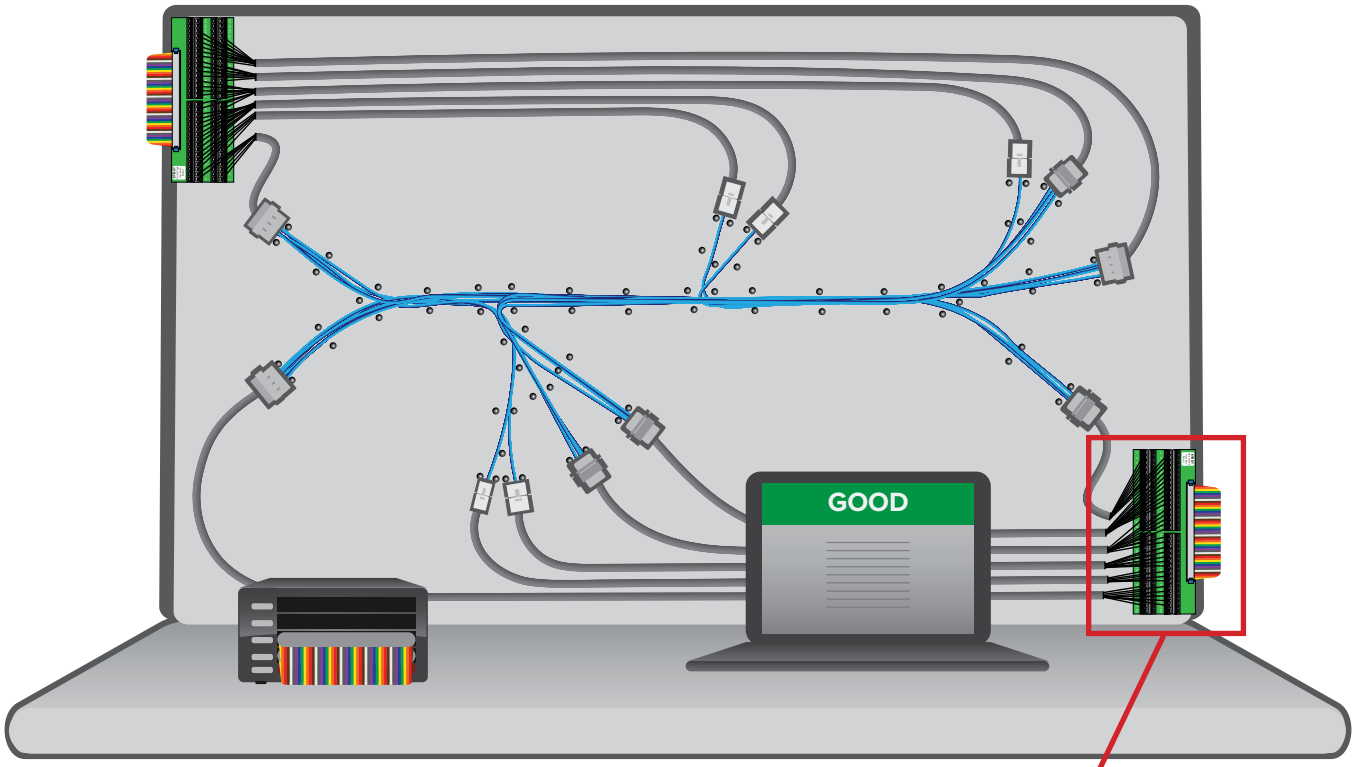

- **Header Strip Transition Boards (ETB-HS)** - The Header Strip Transition Boards are typically connected to the Tester using 64-conductor ribbon cable and the test cables are connected to the product through the transition boards. This setup is very flexible, keeps the product mating cable simple while reducing wasted test points, and supports frequent changeover. The set-up works especially well with Smart-Adapters because test cables can be placed randomly when setting up for a test session.

  Header Strip Transition Boards can be aligned side-by-side for continuous header strips. The boards can be installed on harness boards, at test stations, or in various other configurations.

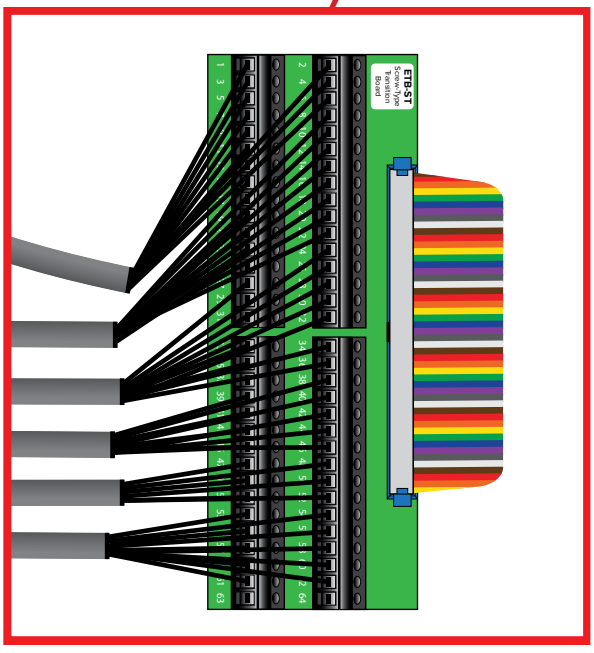
  See the Cirris web site for more information.



- **Transition Boards for Fixed Setups** - Screw Terminal (ETB-ST) and Spring Terminal (ETB-SLT) Transition Boards are often used for fixed applications, such as harness boards, where they can be permanently mounted. The transition boards can be connected to the tester using 64-conductor ribbon cable and break out to up to 64 discrete wires connected separately to the terminals. Breaking down the setup is done by disconnecting the ribbon cable.




***Note***: The test interface wiring in similar applications is often routed underneath the harness board. The wiring is shown here on the top side for clarity.



# 7.4 Test Fixture Assembly

**The programming process**

It's helpful to understand a few details about the Easy-Wire software and its programming process when considering how and when to build test fixtures. First, connector profiles are defined and stored in the **Connector Registry**, which can be thought of as a library of connectors. This only needs to be done once for each connector type. The first step in the programming process is to **Define Connectors** by selecting connector types from the Connector Registry and placing them in the test program. A connector type can be used in the program as many times as needed. The second step is to **Attach** positions in each defined connector to their associated test points, also referred to as test point mapping. The Easy-Wire software allows the Attach process to be performed on the physical test fixtures using the tester's probe or by manual keyboard entry, which doesn't require the physical test fixtures. Finally, it's helpful to recognize that the tester can create test program instructions by learning a sample product. Of course, in addition to a sample product, it's also necessary to have the test fixtures available to perform this function.

**When to build fixtures**

It's often best to build test cables / fixtures early in the production cycle as having them available during program development can simply the process by (a) allowing test fixtures to be probed to map the test points (the Attach step) and (b) providing the means to create test instructions by learning a sample product. These advantages are compounded when using Smart-Lights as the Define and Attach steps in the programming process are then completed automatically. Of course, It's not always possible to have access to the test fixtures when developing test programs, therefore, alternate methods are available.

**Wiring order**

The terminations in test fixtures can be wired to the tester's test points in any order. However, wiring the fixture terminations in the system test point order can save time in the long run. When using the manual keyboard method of performing the Attach process described above, if the positions in the fixture are wired in test point sequence, the software interface allows the process to proceed very quickly. Wiring fixtures in test point order also simplifies documentation and future maintenance.

**Unused Connector Positions**

It's recommended that all positions in product mating connectors be wired to test points, even if some positions in the product connector are unused. This has two key benefits. First, it allows the tester to provide additional information about some types of errors. For example, if all positions are wired, the tester can discover if an open error was miswired instead to an unused position. Likewise, the tester will be able to identify shorts to unused positions. Second, wiring all positions in the test fixture accommodates future product design revisions that change the connector pin-out. It also makes the fixture more versatile for use with other products that use the same connector type.

**Complexity**

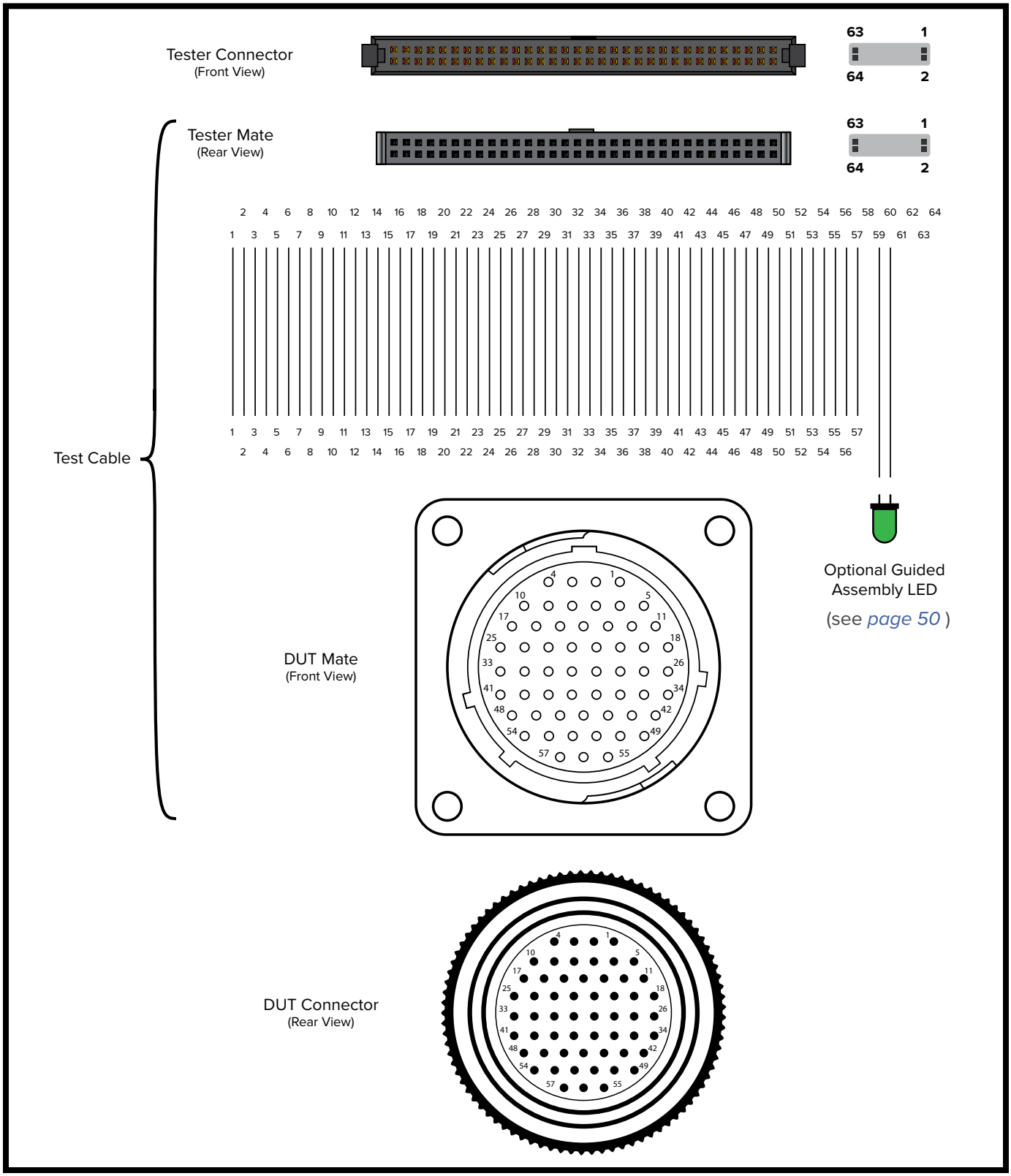
Keeping test fixture complexity, and the number of product mating connectors in a fixture, to a minimum reduces maintenance time and expense. It also increases the probability that a fixture can be used in multiple applications.

**Special Requirements**

- Fast Attach Connector Types - all connectors using the same Fast Attach Connector Type must be wired in the same relative pattern to the tester mating connector.
- Which-end testing (error location) - wires on either side of a connection must be the same length and preferably as short as possible.
- 4-wire (Kelvin) testing - requires two test points for each position in the mating connector. 4-wire adapters must be wired in a specific order. See *page 34* for more information.

## 7.4.1 Traditional Fixtures

A schematic for a traditional, standard 2-wire fixture may look something like the example below. The example test cable is wired in test point sequence, which is not required, but as noted above it may simplify the Attach process during programming. Note that the rear view of the DUT connector, the typical view used in Easy-Wire graphics, has the same pin pattern as the front view of the product mating connector. This fact allows the DUT connector to be Attached by probing the front face of the DUT mate in the test cable (see **Attach Connectors** *page 49*).



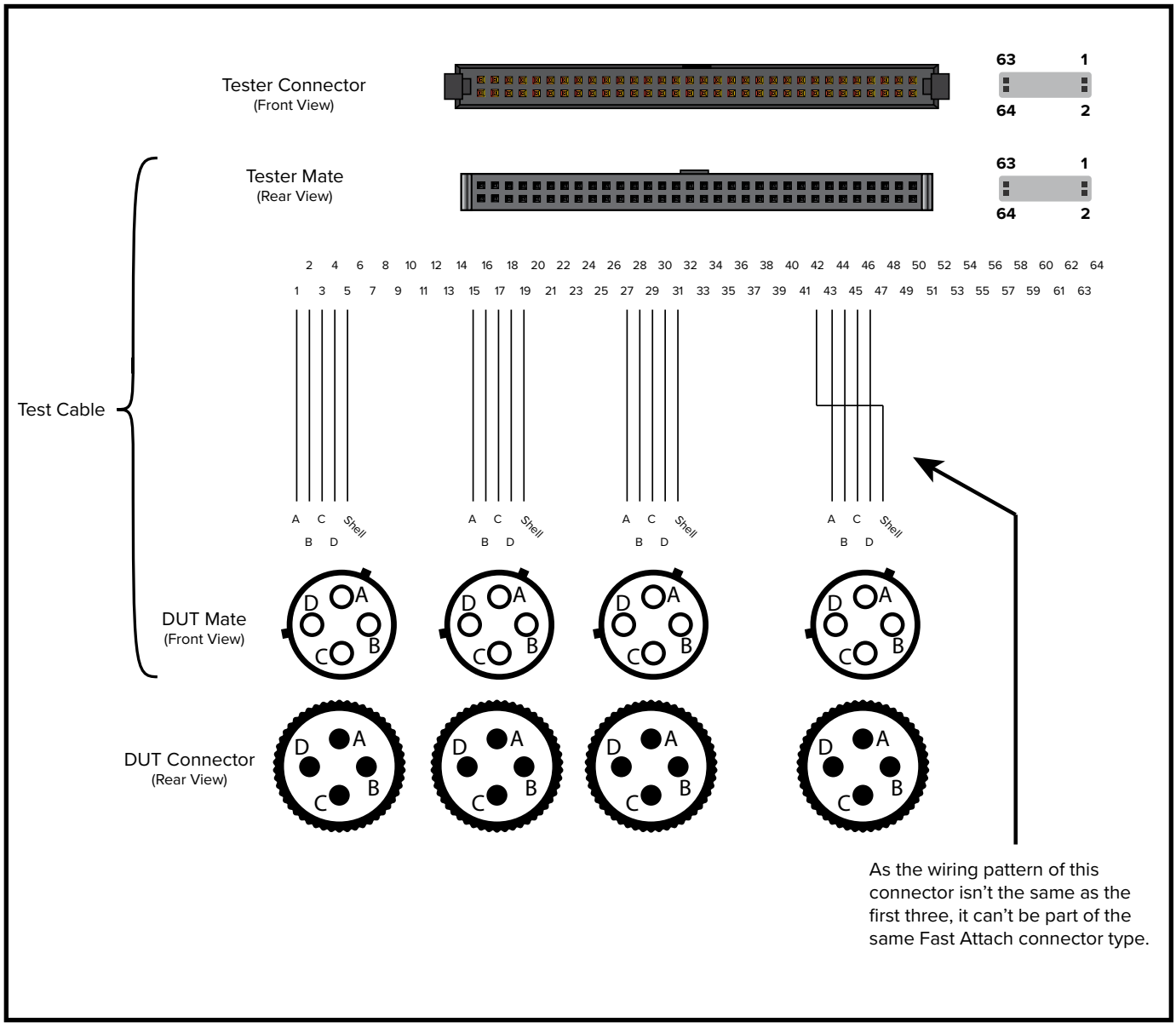
## Fast Attach Connectors

When creating a test program using Traditional Fixturing, the standard Attach process requires that each position in a connector be mapped to test points manually or by individually probing the positions in the test cable/fixture. When using the Fast Attach method, mapping the wiring pattern is done once and stored in the Connector Registry. Then, when creating a test program, the connector can be attached by simply probing its first position. This tells the Easy-Wire software where in the test point matrix the test fixture is connected and then the complete wiring pattern (all the subsequent positions) are attached automatically using the wiring pattern stored in the Connector Registry.

**Requirements for using Fast Attach**

Fast Attach can only be used with traditional, 2-wire fixtures and each DUT mating connector of a Fast Attach type must be wired in the same sequence to the CR test points. The pattern doesn't necessarily have to be sequential, as shown in the example below, and it doesn't have to be to wired to the same tester mating connector. The sequence just has to be the same for each of the connectors.

In the schematic shown below, the first three connectors are wired in the same pattern. Therefore, all would qualify to be the same Fast Attach connector type. However, the fourth connector is wired in a different pattern and would not qualify to be the same Fast Attach connector type as the others.



**Creating a Fast Attach connector:**

1. Build a fixture using the desired connector. Fast Attach connectors can only be traditional, 2-wire test cables/fixtures. Connect the test cable/fixture to the tester.

2. From the Easy-Wire **Main Menu** > **Connector Registry**. Find the connector type that matches the one to be configured for Fast Attach or create a new one if necessary. If using an existing connector type, it can be copied before setting it up for Fast Attach by right-clicking on the connector and selecting **Copy** from the fly-out menu. Setting up the copy for Fast Attach allows the Connector Registry to retain both a standard version of the connector and a Fast Attach version.

3. In the Connector Registry, right-click on the connector type and select **Wiring Pattern** > **Set**. Follow the instructions on the screen by probing the designated positions in the connector to set the wiring pattern. Select **Done** after all the positions have been probed.

4. Verify that the learned pattern is correct by right-clicking on the same Fast Attach connector type and select **Wiring Pattern** > **Verify** from the fly-out menu. Follow the instructions on the screen to use the probe to verify the wiring pattern. A successful verification results in a **Passed** result.

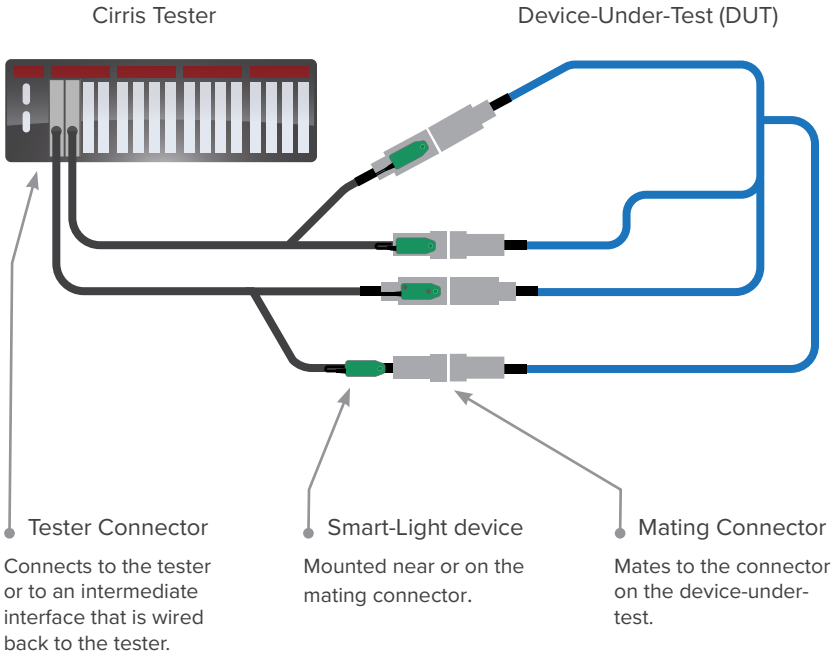
## 7.4.2 Smart-Lights®

Cirris Smart-Lights® are compatible with CR and CH2 testers. A Smart-Adapter utilizes a Cirris Smart-Lights device, which is typically mounted on or near the Smart-Adapter's DUT mating connector. Once registered on a tester's station or on a network database, the Smart-Adapter is automatically recognized by the tester. This capability provides several key benefits.

- **Creating Test Programs is Faster** - When creating new test programs, test fixtures equipped with Smart-Lights are recognized and the connectors are automatically defined and attached (Tab 1, Define Connectors, and Tab 2, Attach Connectors, are completed automatically).
- **Test Changeover is Faster** - Test fixtures equipped with Smart-Lights can be connected to the tester in any sequence / location for the initial program creation and for all subsequent test sessions. The Smart-Adapters are automatically recognized and mapped to the appropriate test points for each test session.
- **Built-in Bi-color LED** - The operator's attention is directed to error locations and assembly details by the green/red LED.

**Mounting Smart-Lights**

A Smart-Lights device is typically mounted near or on the product-mating connector of the test fixturing..



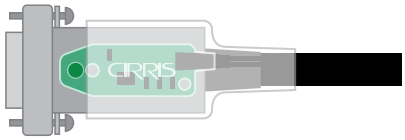

There are various ways to mount a Smart-Light device on or near the mating connector. Some common ways include:

Screw Mounted

The Smart-Lights device is mounted to the mating connector with the screws provided.

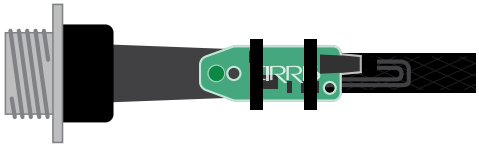

Clear Heat Shrink

If mounting the Smart-Lights device to the mating connector with heat shrink or self-fusing silicone tape, be sure that the material is clear as to maximize visibility of the Smart-Lights device LED.



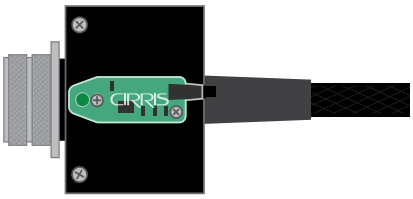
Tie Wrap

A Smart-Lights device can be securely mounted to a connector or cable using tie wraps.



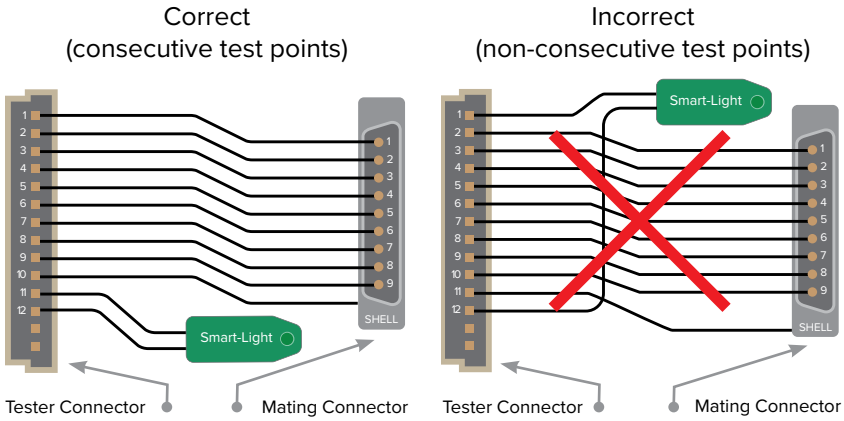
Easy-Wire® Block

Mounting the mating connector and Smart-Lights device on an Easy-Wire harness table block allows the mating connector to be easily placed and removed from a grid tile surface, such as the Cirris Grid Tile System or the Panduit Quick-Build™ grid tiles.

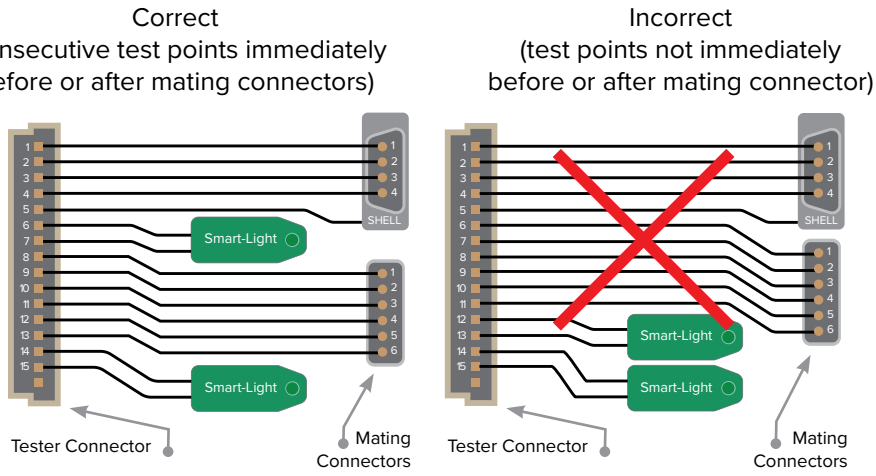



**Wiring Smart-Lights**

Two extra test points are required to make a smart adapter. The two test points must be located immediately before or after the associated mating connector and they must be consecutive test points. Each of the two test points can be connected to either termination on the Smart-Lights device. Note that the order in which test points are wired to the mating connector can be random and need not be sequential as shown.




If multiple mating connectors are wired to one tester connector, it is possible to have one Smart-Lights device for each mating connector following the same rules.




Smart-Lights must be registered before use (see *page 39*).

## 7.4.3 4-Wire (Kelvin) Fixtures

The 4-wire (Kelvin) measurement method allows the CR system to measure resistances as low as .005 ohm and if the test fixture is properly configured, it can eliminate the resistance of test cables/fixtures from the measurement. However, 4-wire measurements require special test cables/fixtures with each side of the measurement requiring two test points (four points total for each measurement).

In Summary:

2-Wire Testing

- Measures resistance from the face of the tester on both sides of the measurement
- Includes the test cable resistance ($R_{LEAD}$ in the graphic below) and the resistance of the Device-Under-Test ($R_{DUT}$) in the measurement.
- Uses two test points per measurement.
- Measures resistance from 0.1 Ohm to 100 Ohm ± 3% ± 0.1 Ohm

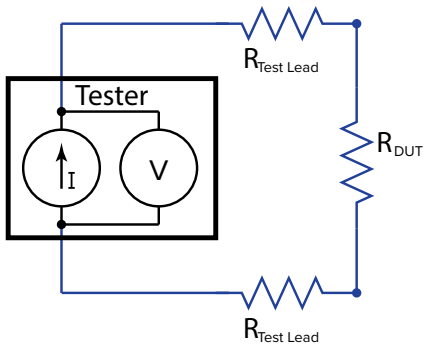
4-Wire Testing

- Measures resistance beginning at the point where the 4-wire pairs meet (Kelvin points)
- Using properly configured test fixtures, only measures the resistance of the Device-Under-Test ($R_{DUT}$).
- Uses four test points per measurement.
- Measures resistance from .005 Ohm to 80 Ohm ± 2% ± .005 Ohm

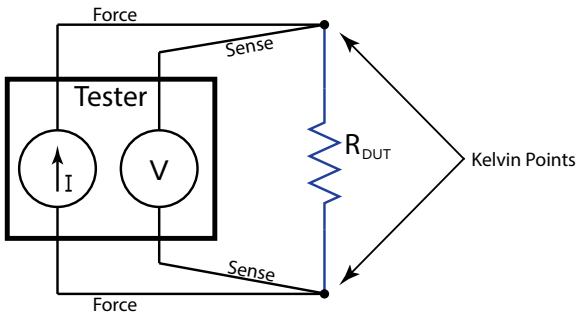
The 4-wire measurement method requires two test points for each termination in the device under test. These are called 4-wire pairs.

- One test point supplies current (referred to as “force”)
- The other measures voltage (referred to as “sense”)

Standard 2-wire Measurement

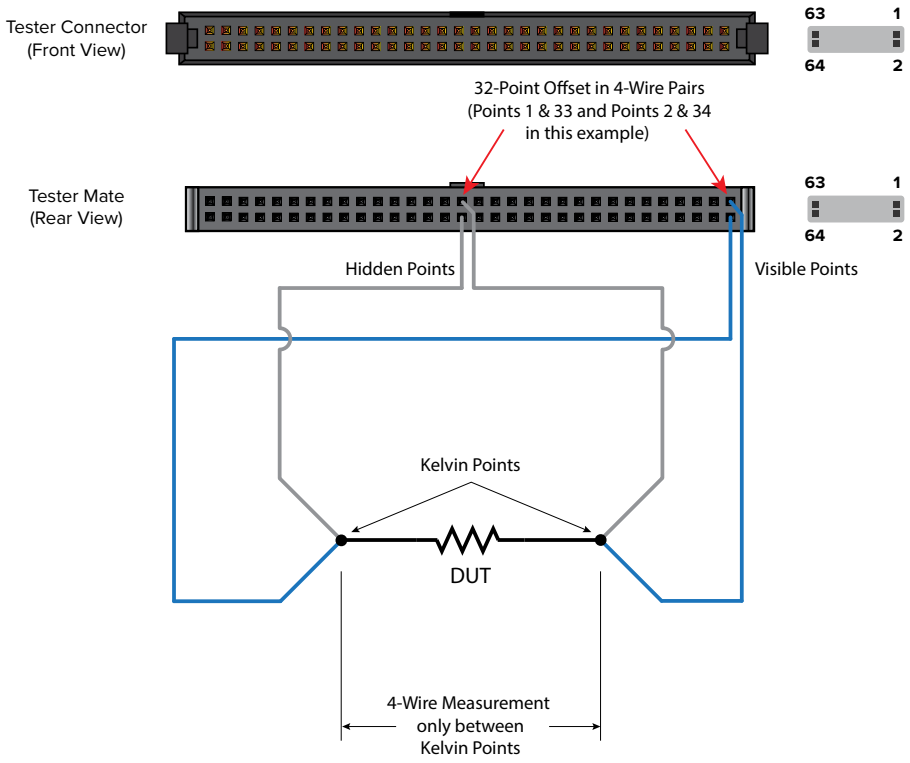



4-wire Measurement

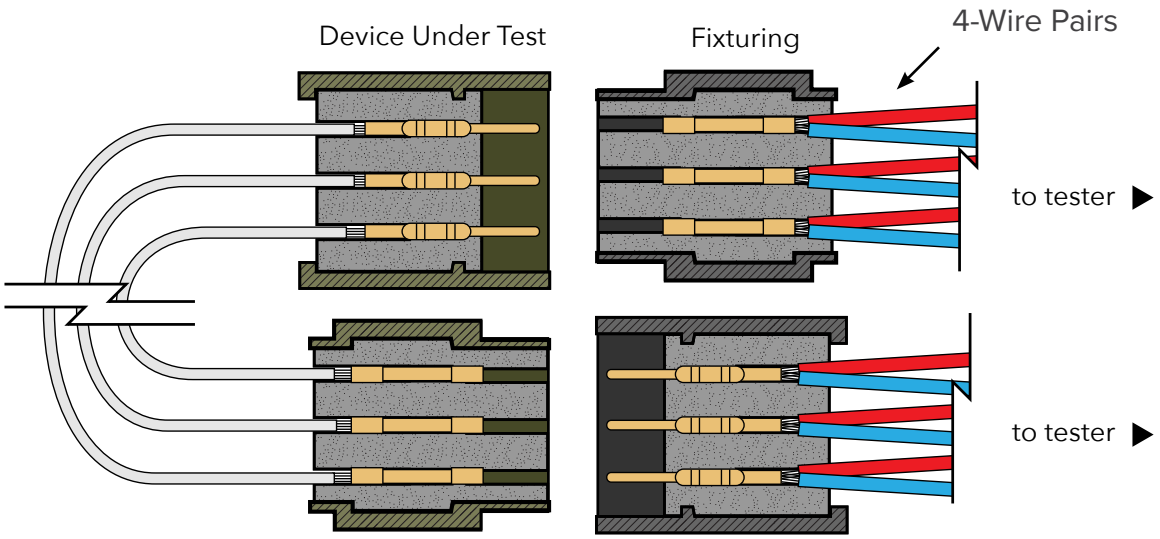


### 4-wire Fixture Assembly

- Each test point has a specific mate that can be used in a 4-wire pair. The pattern on the CR is a 32-point offset. In each connector, the potential 4-wire pairs are points 1 and 33, 2 and 34, 3 and 35, 4 and 36, etc.
- In the test program, only one of the two test points in each 4-wire pair will be visible, the other will be hidden. However, this fact doesn't impact the design of the test fixtures.
- In the Easy-Wire software all the positions in a connector can be configured to be 4-wire pairs or it's possible to make only specified points part of 4-wire pairs. For example, it would be possible to use 4-wire measurements on the shell and shield of the a DUT harness assembly, but to perform standard 2-wire measurements on the conductors.




- Kelvin Points, the points where 4-wire pairs meet in the test fixture, should be placed as close to the DUT as possible in order to eliminate extraneous resistance from the measurement. A common approach is to join the two points in the DUT mating connector contacts as shown in the graphic below. Such a configuration includes the mating resistance of the connector contacts in the 4-wire measurement, but it's generally considered a sound, practical approach.

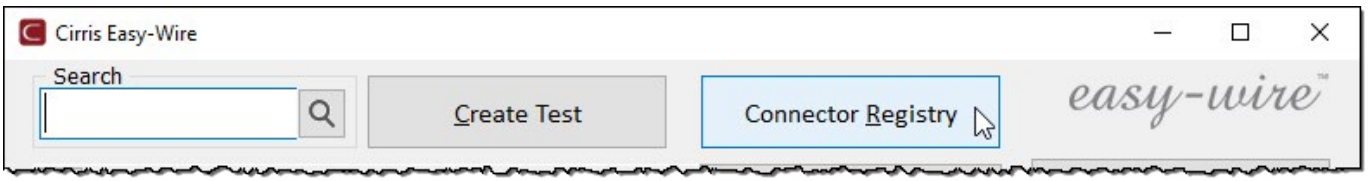


# 8. Connector Registry

The Connector Registry can be thought of as a library of connectors. Connectors included in the library are brought into a test program during the **Define Connectors** step in the programming process. The Connector Registry includes a variety of pre-defined connectors, but adding new connector types is straightforward. The required connectors or Smart-Lights must be in the Connector Registry before creating a new test program.

## 8.1 Viewing the Connector Registry

From the **Main Menu** > **Connector Registry**.



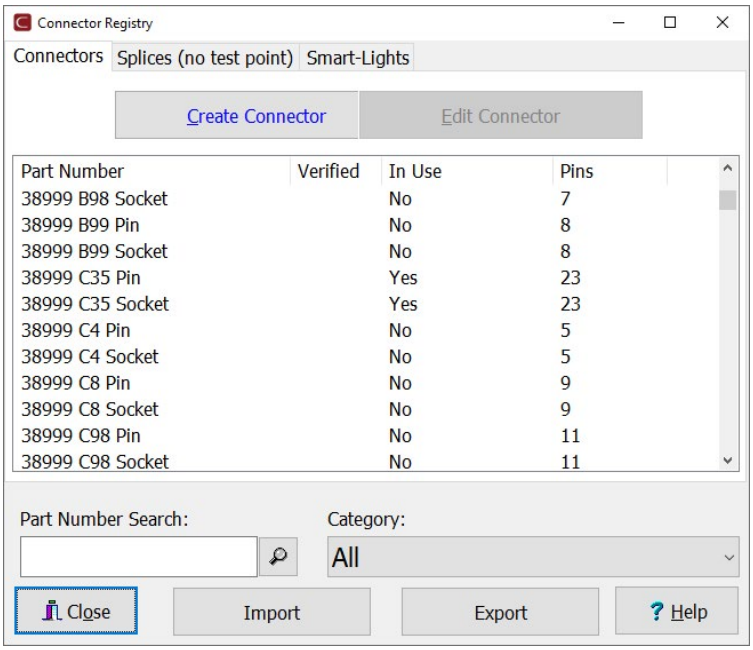

Connectors, Splices and Smart-Lights can all be viewed by selecting their respective tab. The contents of all three categories can be sorted by clicking on a column heading. Items in each can be exported to, and imported from, separate Easy-Wire databases.

Each connector in the registry represents a separate connector type. It may vary from other connectors by the number of pins, the names of the pins or by the graphic.

Splices do not map to test points and are used for operator guidance when using the guided assembly feature. See the Easy-Wire Help for more information.

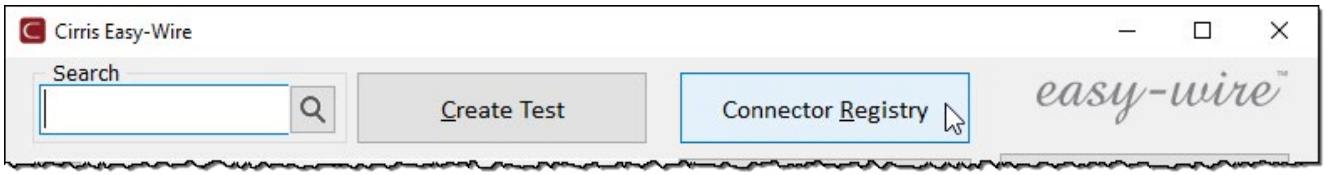
Smart-Lights are registered using an existing connector type.

Double-clicking on a connector or a splice opens the graphic for that item, if one was created.

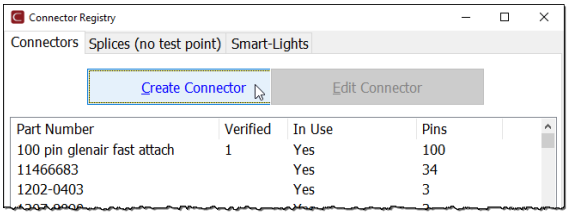


# 8.2 Creating a New Connector

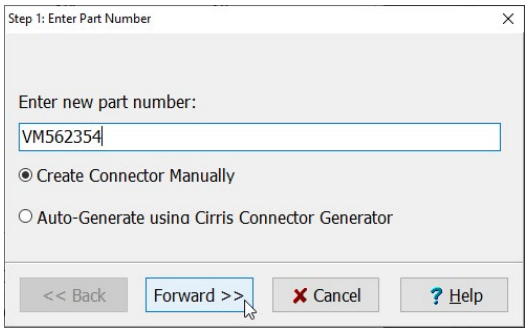
1. From the **Main Menu** > **Connector Registry**.



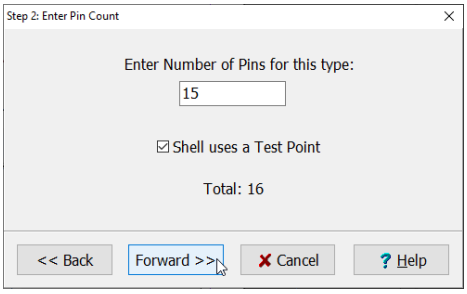

2. Under the Connectors tab, select **Create Connector** to start the process and follow the instructions on the screen during each step.



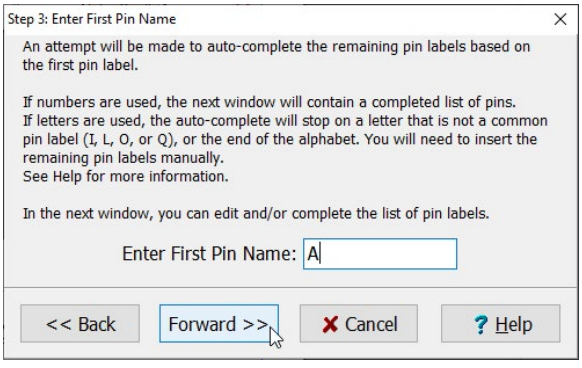

3. Step 1 - Enter a part number for the new connector. The connector type can be used multiple times in a test program and in multiple programs, so use a part number that's recognizable. Most connectors are created manually. Mil Connectors can be created automatically after entering the complete part number. Click **Forward>>**.



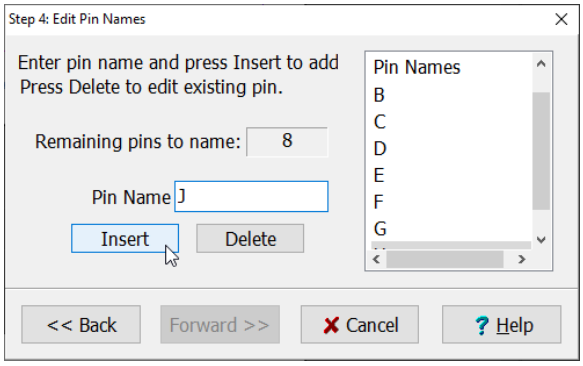

4. Step 2 - Enter the number of positions in the new connector and indicate whether the connector shell will be connected to a test point. Click **Forward>>**.




5. Step 3 - Enter the name of the first pin. The software will attempt to autofill the remaining pin names stopping at names that are typically skipped. Click **Forward>>**.



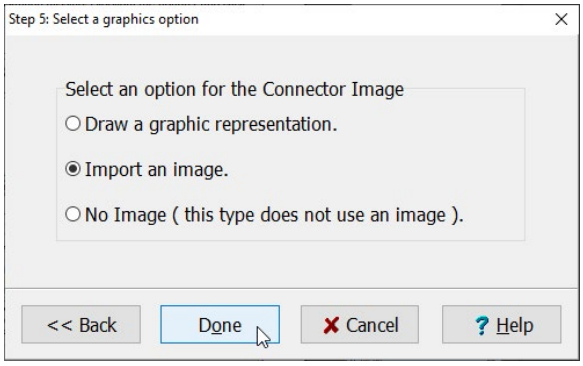
6. Step 4 - Edit the Pin Names as needed. Click **Forward>>** when finished.




7. Step 5 - Select an option for the connector image. Images/ graphics are not required but they are indispensable when using the tester's guided assembly feature and can be helpful for troubleshooting by showing the error location(s) in all cases.

   Connectors images can be drawn using the Easy-Wire drawing tools. However, it's often easier to import an image (.bmp, .jpg, .gif, or .png file) and then place the connector positions on top of the image.

   Click Done when finished.

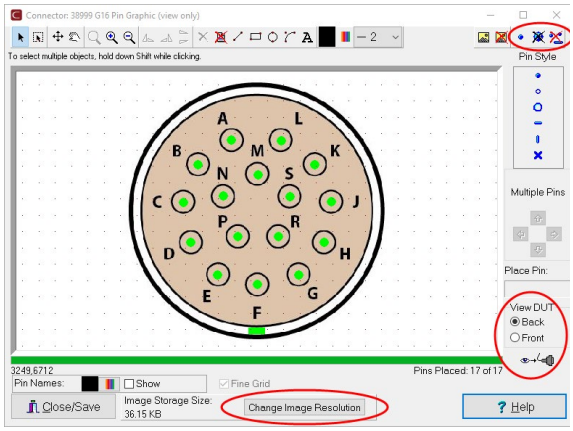



8. Keep in mind that the typical view is the pinning side of the connector as this is the operator's normal view of the connector during assembly and troubleshooting. The pinning side pin layout of the product connector is also the same as the front view pin layout of the test fixture connector, which is useful when using the probe to map test points during the Attach programming step. If desired, the view can be reversed when creating the graphic.

   When placing pins, the last placement or all pin placements can be deleted.

   Connector graphics are stored in the Easy-Wire database. If importing images, using the lowest acceptable resolution reduces its storage size and helps maintain the performance of the database. Limiting the storage size for each image to less than 100KB is recommended.

   Select **Change Image Resolution** to reduce the image resolution while previewing the change.

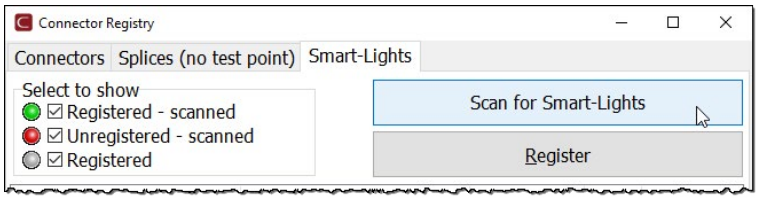


# 8.3 Registering Smart-Lights

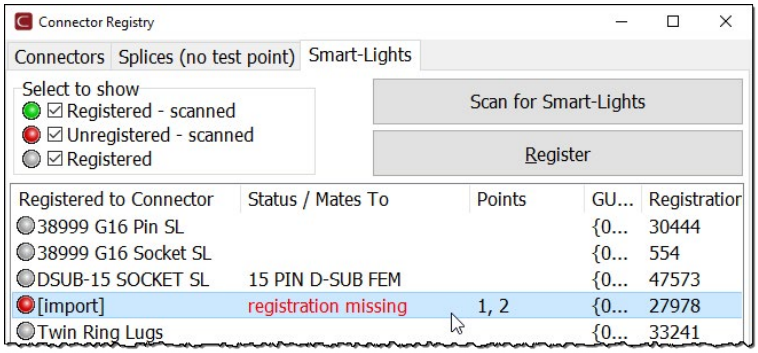
Before using a smart adapter, it must be registered in the Cirris Easy-Wire database accessed by the tester. If using multiple CR/CH2 testers, consider using a shared network database so that the smart adapters registered on one tester will automatically work on another. If each tester accesses its own, local database, Smart-Lights registered on one database can be exported and imported in other databases.

To register Smart-Lights:

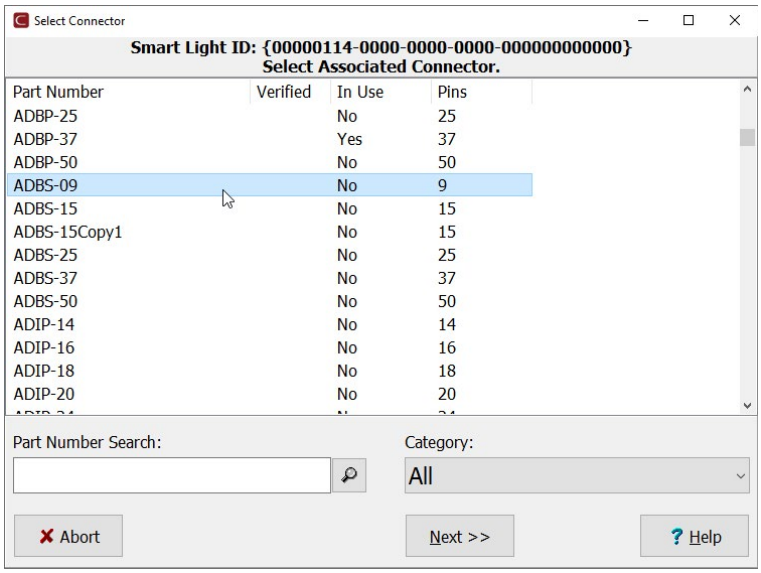
1. From the **Main Menu** > **Connector Registry**.
2. Ensure that a connector type for the associated Smart Adapter exists. If needed, create a new connector.
3. Connect the Smart Adapter with the Smart-Lights device to the tester.
4. Under the **Smart-Lights** tab, click Scan for **Smart-Lights**.



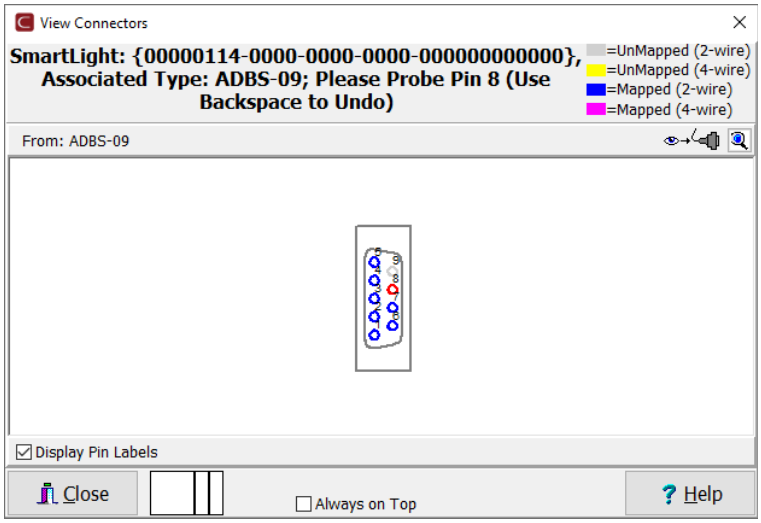

5. Click on the Smart-Lights device marked as **unregistered** or **registration missing**. The LED on the device should be illuminated red.
6. Click **Register**.



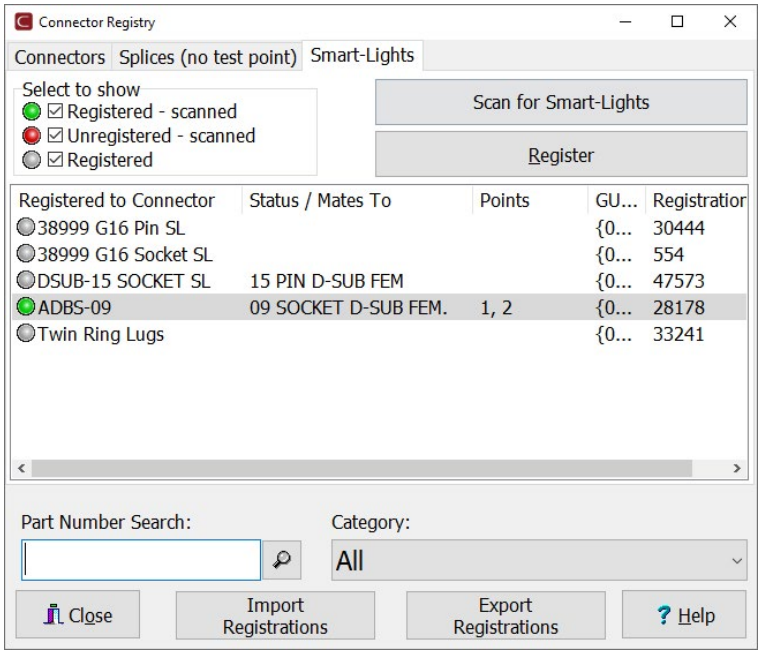

7. In the window that opens, select the connector type from the list of available connectors and click **Next>>**.



**8.** In the window that opens probe the positions in the connector as directed.



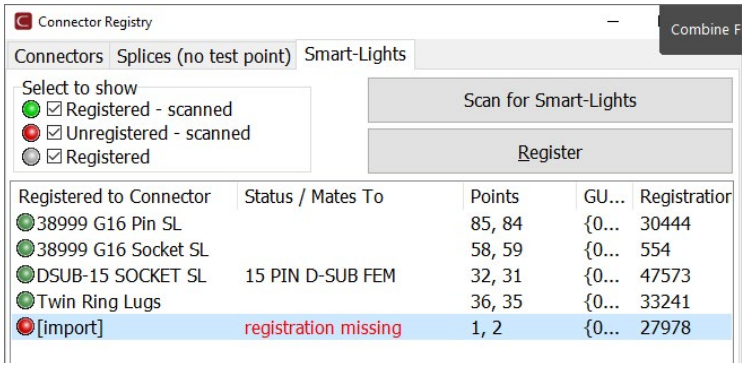

**9.** When the probing is complete, the Smart-Lights LED should be illuminated green and the registration will be complete.



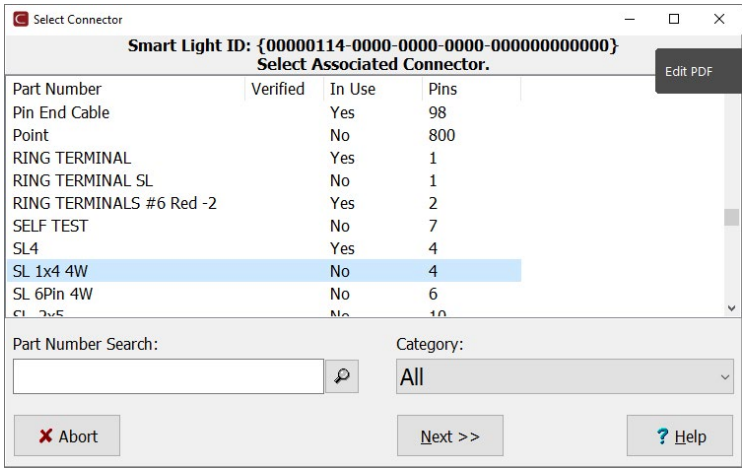
# 8.4 4-Wire Smart-Adapters

Smart-Adapters and Traditional Adapters can both be wired for 4-wire testing. However, because the wiring pattern for Smart-Adapters is stored in the Connector Registry, the 4-wire status of connector pins must be established in the Connector Registry. When using Traditional Fixturing, the 4-wire points are designated under the **Define Connectors** tab in the Test Program Editor (*page 47*).

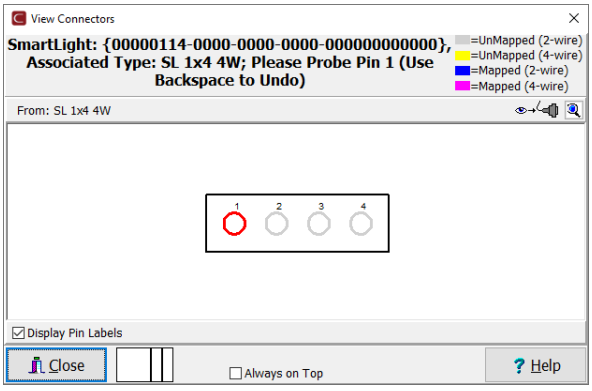
1. From the **Main Menu** > **Connector Registry** > **Smart Lights Tab**.
2. Connect the Smart-Lights 4-wire adapter to the tester.
3. Click **Scan for Smart-Lights**.
4. After scanning, the adapter will show an unregistered or as registration missing. Highlight the adapter and click **Register**.




5. Select the appropriate connector from the list of connectors in the registry and click **Next**.

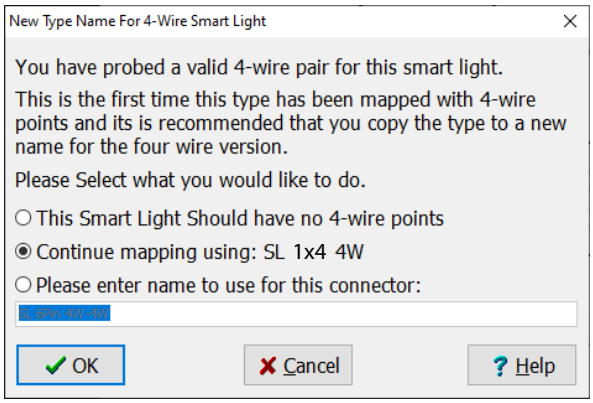



6. Probe the highlighted pin in the adapter.

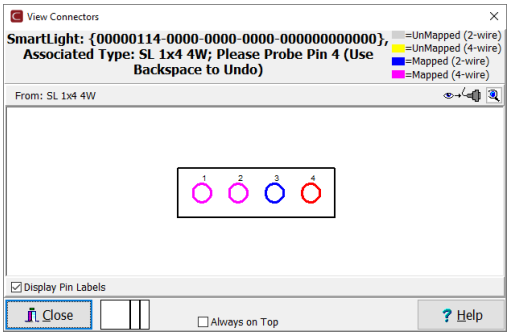


**7.** When a message is displayed asking to confirm that the pin is wired for 4-wire, confirm by selecting **Continue mapping using...**

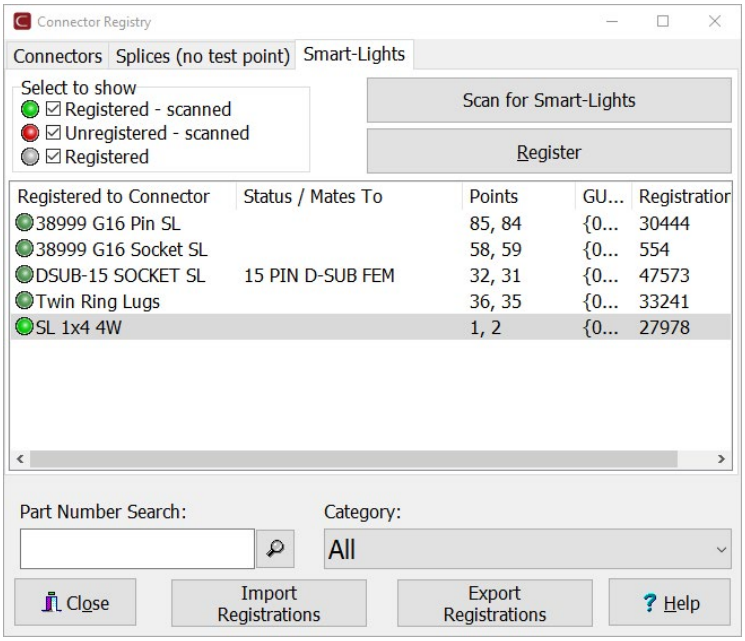
Click **OK**.




**8.** Continue probing as directed. Only pins wired for 4-wire testing will be marked as 4-wire pins with the difference shown according to the color legend. In the example shown, pins 1 and 2 are wired for 4-wire, pin 3 is wired for 2-wire, and pin 4 is highlighted and waiting to be probed.




**9.** When finished, the probing window will close and the new Smart-Adapter will be registered.



# 9. Programming

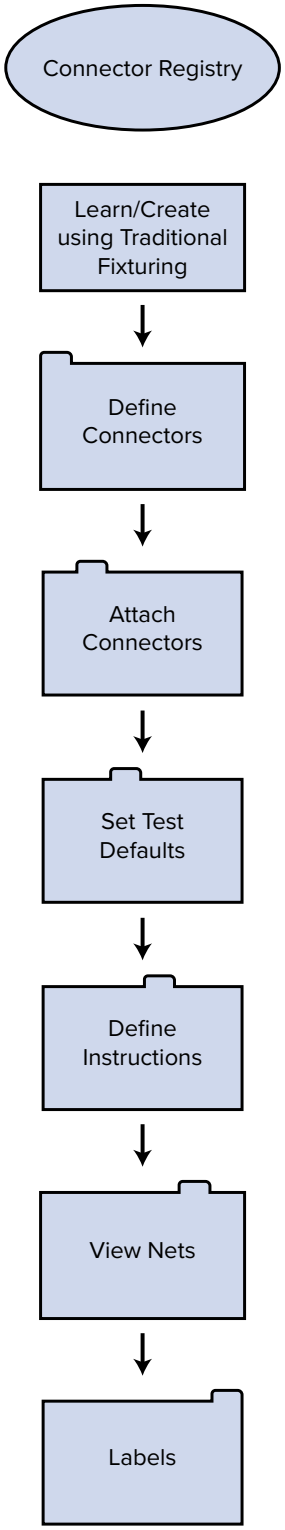
## 9.1 Overview

New test programs are developed in the Easy-Wire Test Program Editor. The editor consists of six tabs, each signifying a separate section of the test program. The first four tabs designate sections that must be completed - **Define Connectors**, **Attach Connectors**, **Set Test Defaults**, and **Define Instructions**. The additional two tabs, **View Nets** and **Label Points,** provide additional information about the Device Under Test (DUT) and/or the means to add optional features to the test program.


Selecting **Create Test** on the **Main Menu** begins the programming process. The user is immediately asked if the program will use **Traditional Fixturing** or **Smart-Adapters** as the process for each varies slightly. The main difference is that the Easy-Wire software scans Smart-Adapters and automatically completes the **Define Connectors** and **Attach Connectors** tabs. When using Traditional Fixturing these steps must be completed manually.

Regardless of which type of fixturing is being used, the required connector profiles must exist in the Connector Registry. When Smart-Adapters are being used, the associated Smart-Lights must be registered in the Connector Registry before beginning the programming process. If using Traditional Fixturing, the connector types required for the program must be in the Connector Registry.

## 9.1.1 Traditional Fixturing Programming Process




The Connector Registry is a library of connectors. The connector profiles include the number of positions (pins), the pin names, and most often include a graphic of the connector.

**Main Menu** > **Create Test** > **Learn/Create using Traditional Fixturing**

Load the required connectors into the program from the Connector Registry. Connector types can be used as many times as needed. Default references using "$" as a prefix are assigned, but they should be changed to match the product connector designations.

Map test points to the positions in the defined connectors by using the probe or by doing so manually. This allows the software to refer to the test points using product terminology.

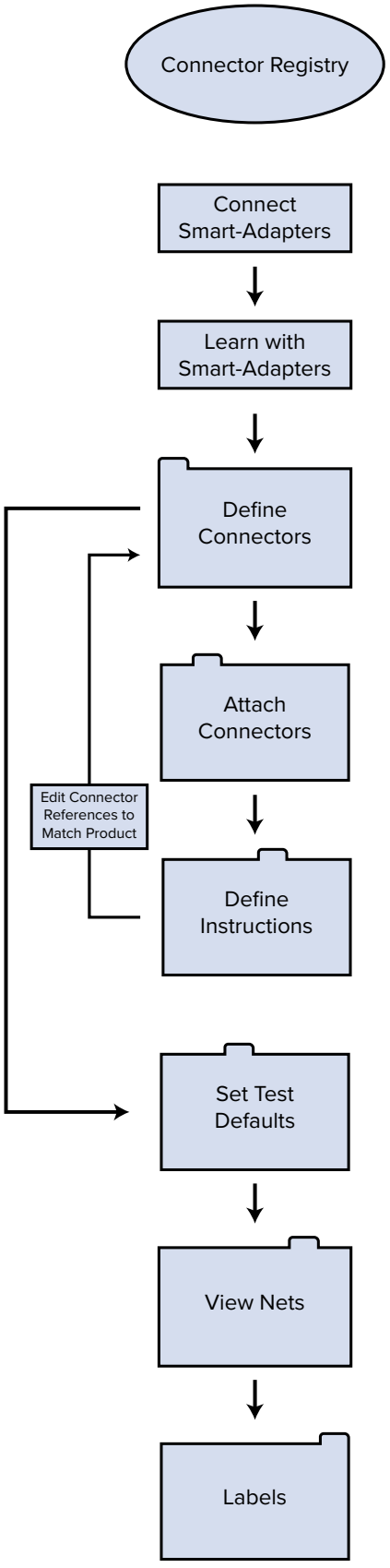
Set test parameters and options for the test including low voltage default test parameters, the test method, the start condition, operator notes, operator inputs prompts, report options, and test data collection options.

Define test instructions by learning a sample product, importing instructions, or by entering instructions manually.

View nets, nets joined by components, and single points in the DUT.

Assigning point Labels is not typically required as connector references are assigned under the Define Connectors tab and the names of connector positions (pins) are assigned in the Connector Registry.

## 9.1.2 Smart-Adapters Programming Process




The Connector Registry includes both Traditional connectors and Smart-Adapters. The Smart-Lights associated with Smart-Adapters must be registered in the Connector Registry before they're available for use.

Connect the Smart-Adapters before starting the program creation process.

**Main Menu** > **Create Test** > **Learn with Smart-Adapters**.

The software discovers the connected adapters and automatically adds the Smart-Adapters to the test program. Default references using "$" as a prefix are assigned, but they should be changed to match the product connector designations.

Smart-Adapters are automatically mapped to individual test points using the pattern established in the Connector Registry when the associated Smart-Light was registered.

The default process guides the user to learn a sample product to create instructions. If importing instructions or adding instructions manually, cancel the learn and first return to the Define Connectors tab to replace the default connector references with those of the product connectors.

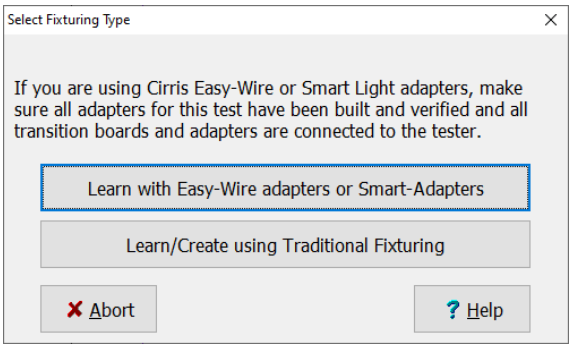
Set test parameters and options for the test including low voltage default test parameters, the test method, the start condition, operator notes, operator inputs prompts, report options, and test data collection options.

View nets, nets joined by components and single points in the DUT.

Assigning point Labels is not typically required as connector references are assigned under the Define Connectors tab and the names of connector positions are assigned in the Connector Registry.

## 9.2 Creating a New Program

To create a new test program, from the **Main Menu** > **Create Test**. In the window that opens, select the type of test fixtures being used - Smart-Adapters or Traditional Fixtures. If using Smart-Adapters, ensure they're all connected to the tester before making the selection.

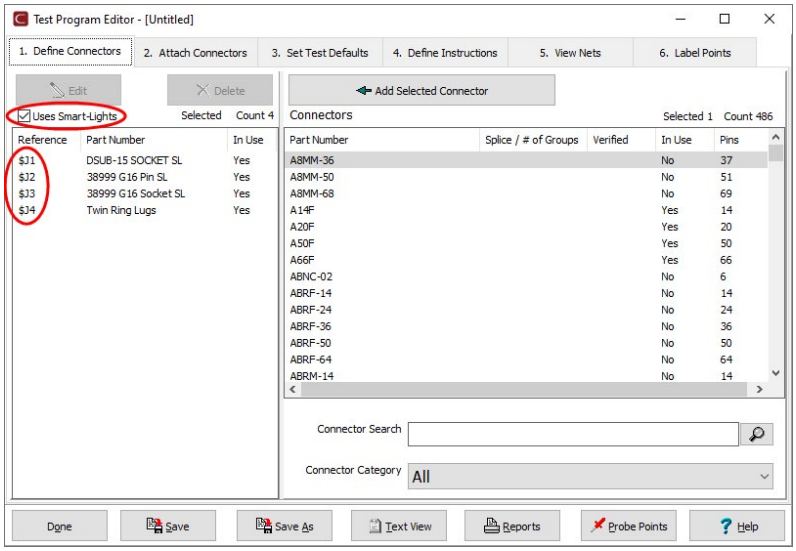



## 9.3 Define Connectors

Define Connectors is the first step in the programming process. As mentioned above, the action required depends on the type of test fixtures being used.

### 9.3.1 Smart-Adapters

If using Smart-Adapters, Easy-Wire will scan the attached fixtures and automatically complete the **Define Connectors** Tab by populating the program's list of connectors. It also completes the **Attach Connectors** Tab and moves directly to the Learn Parameters window. Before completing the program, return to the **Define Adapters** tab and change the default connector references ($J1, $J2 etc.) to the references used for the product. This allows the tester to use connector nomenclature familiar to the user.




To change the connector reference, slow double-click the connector reference or highlight the connector and click **Edit**. To help with accurate connector reference assignments, when a defined connector is highlighted, the corresponding LED on the Smart-Lights device is illuminated.

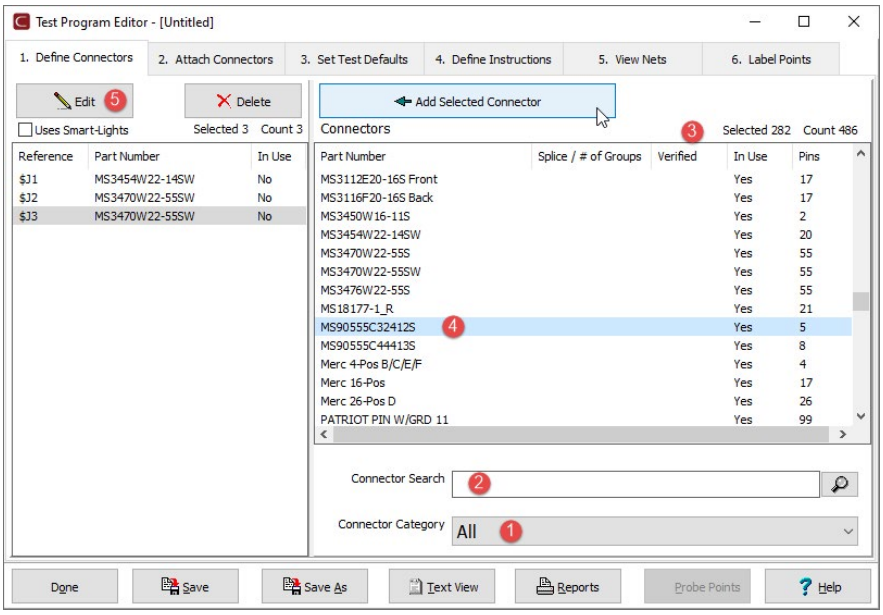
Note that **Use Smart Adapters** is checked.

It's not necessary, and has no effect on the program, but the order of the program's connectors can be changed by dragging connectors up or down in the list.

## 9.3.2 Traditional Fixturing

If using Traditional Fixturing, the programming process starts by adding connectors from the Connector Registry to the test program under the Define Connectors Tab.

1. Connectors in the Registry can be organized by categories. To view/ search connectors by category, select the desired category from the drop-down list. See the Easy-Wire Help for more information on categories.
2. Connectors can be searched by part number.
3. Connectors can be sorted by Part Number, by Splice / Not Splice and number of groups in the splice, by Verified / Not Verified, by In Use / Not In Use, and by the number of pins in the connector.
4. To add a connector to the program, highlight it the connector pane and click **Add Selected Connector**.



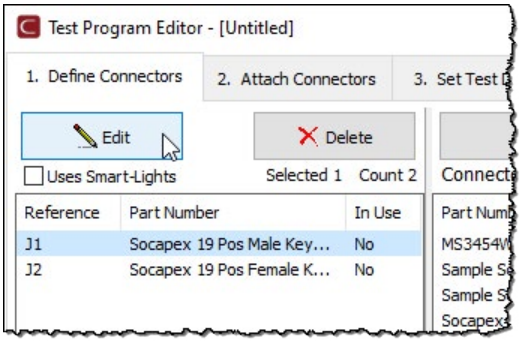

5. Highlight a connector in the left pane and click **Edit**, or slow double-click on its Reference Designator, to change the default reference to one matching the product nomenclature. This will allow the software to use product references in messages. It's not necessary, and has no effect on the program, but the order of the program's connectors can be changed by dragging connectors up or down in the list.

## 9.3.3 4-Wire Fixturing

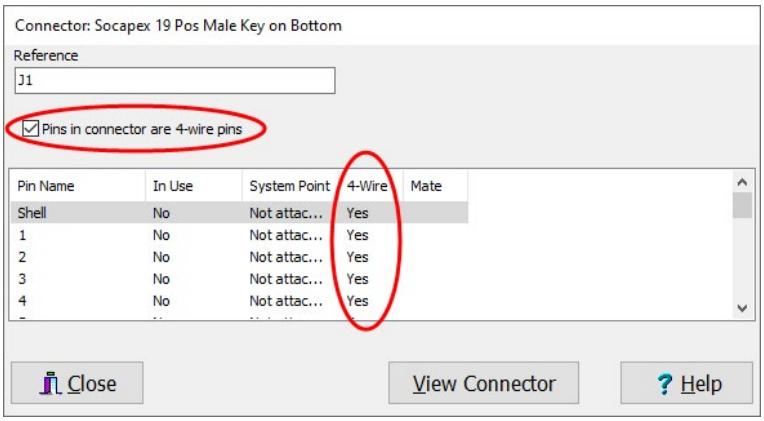
Both Smart Adapters and Traditional Adapters can be wired for 4-wire testing. However, as noted in Section 8.2 (*page 46*), Smart-Adapters are set up for 4-wire testing in the Connector Registry. Traditional adapters are set up for 4-wire testing under the **Define Connectors** Tab. Whole connectors can be marked as wired for 4-wire testing or only specific positions within a connector. See *page 34* for instructions on wiring 4-wire test fixtures.

To mark Traditional Adapters as wired for 4-Wire testing:

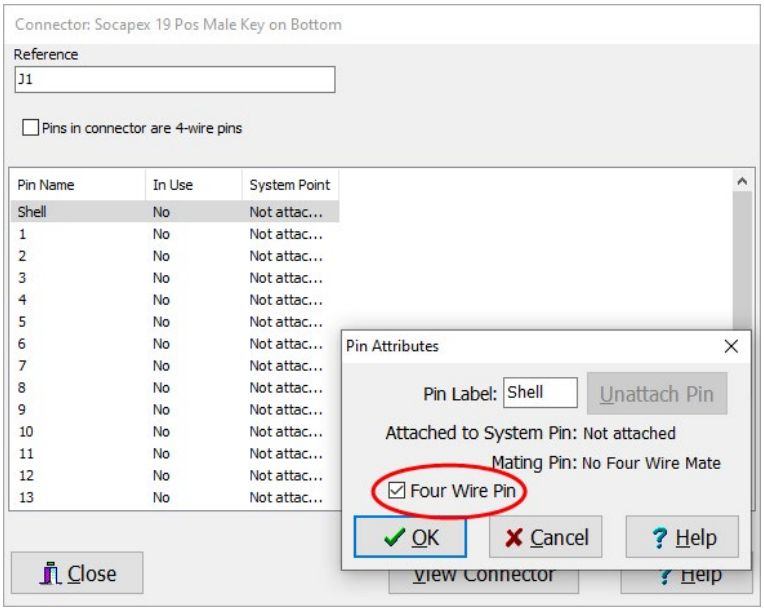
1. Highlight a Defined Connector and select **Edit**.



2. To mark all positions in the connector as wired for 4-wire testing, check **Pins in connector are 4-wire pins**. The 4-wire column will be added and all the pins in the connector will be marked **Yes** in the column.

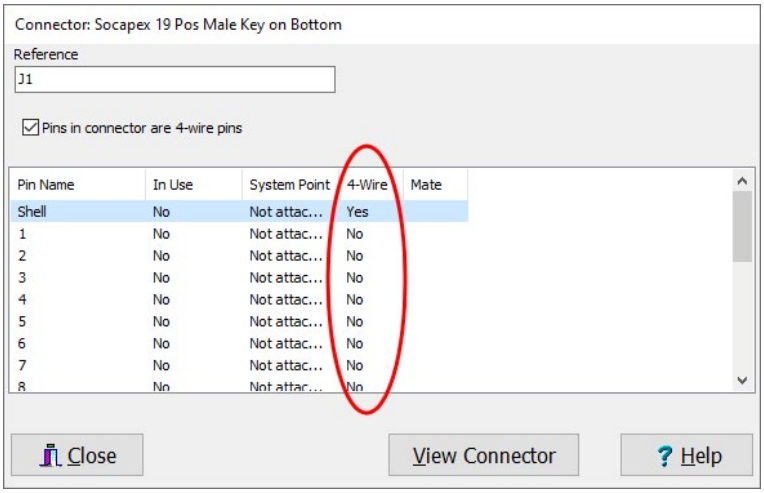



To select only a portion of the pins in the connector as wired for 4-wire testing, in the edit window, double-click on a pin to open the Pin Attributes window. Check **Four Wire Pin** then click **OK** to return to the edit window.




The 4-Wire column will be added and the specified pin will be marked **Yes** for 4-wire.

Repeat the process as needed.



# 9.4 Attach Connectors

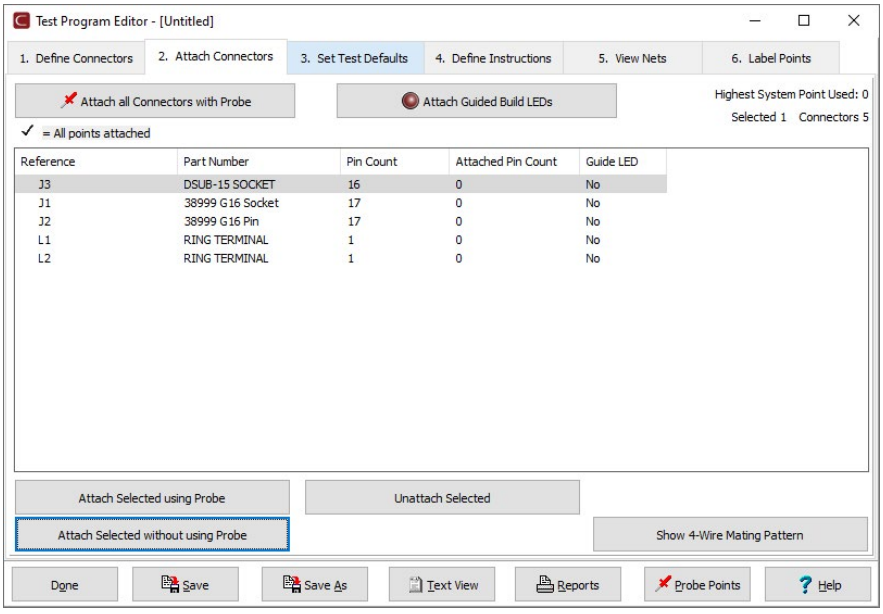
The Attach process maps positions in the product's connectors to specified test points. This step is necessary for the tester to display messages using terminology that matches the product nomenclature.

## 9.4.1 Smart-Adapters

If Smart-Adapters are used, Easy-Wire will scan the attached fixtures and automatically complete the **Define Connectors** and the **Attach Connectors** Tabs. It then moves directly to the Learn Parameters window. When setting up for subsequent test sessions, the Smart-Adapters can be connected to the tester in any sequence as the software will automatically scan the connected Smart-Adapters and reconfigure the Attach pattern as needed. If multiples of the same connector type are used in the same test, the user will be prompted to resolve the duplicates (see *page 69*).

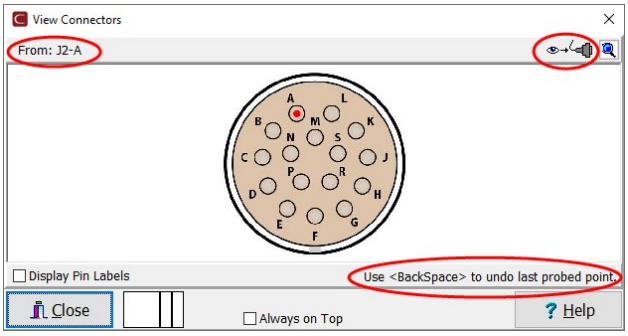
## 9.4.2 Traditional Fixturing

Connectors can be attached using the probe or by entering the test point associated with each connector position manually. The software guides the user through the process regardless of the method selected. Each connector added in the Define Connectors Tab is listed.




**Probe Attach Method**

1. Attach the test fixtures in the positions in which they will be connected for testing.
2. Select **Attach all Connectors with Probe** or highlight a connector and select **Attach Selected Using Probe**.
3. The software opens the **View Connector** window which includes the connector graphic, if one was created, and highlights the first position to be probed. It also displays the connector position (J2-A in the example shown). If the rear (typical) view of the product connector was selected for the connector graphic when it was created, probing the test fixture connector will be performed according to the image displayed as the view will match the pinning side of the product connector.



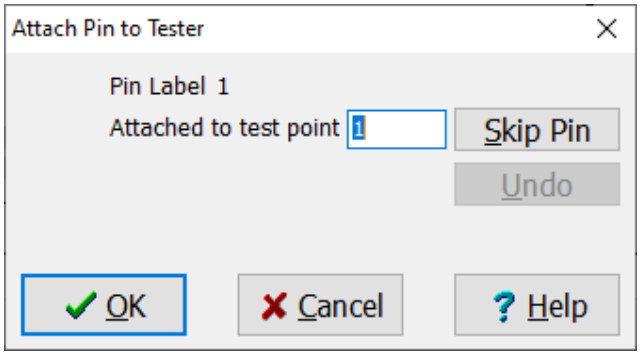

4. As each position is probed, the tester emits a "good" tone and increments to the next position. If a position previously attached is probed, the tester emits a "bad" tone and remains static. If using Fast Attach connectors, the user is only prompted to probe the first position in the connector. The rest of the wiring pattern is added according to the mapping saved in the Connector Registry.
5. If a mistake is made when probing, use the Backspace key on the keyboard to undo the last probed point.
6. Repeat the process until each defined connector is attached.

### Manual Attach Method

The manual attach method can be very efficient if the wiring pattern of the test fixtures is documented and especially if the wiring pattern is in test point sequence. An advantage of this method is that it does not require access to the physical test fixtures if the fixture wiring patterns are documented.

1. Highlight a connector in the Attach Connector window and select **Attach Selected without using Probe**.

2. In the **Attach Pin to Tester** window, the first **Pin Label** will be displayed. Enter the test point to which the displayed pin is connected and select **OK**. The software moves to the next Pin Label in the sequence and increments to the suggested next test point. Select **OK** to accept the suggested test point or enter a test point then select **OK**. Test points Repeat until all the connector pins are attached.




   ***Note**: Test points are numbered starting with 1 in the first connector of the first scanner (the left most scanner in the Base Unit) and continue sequentially through each connector to the end of the installed scanners.*

   **Skip Pin** moves to the next pin label without attaching a test point to the displayed pin label.

   **Undo** deletes the last entry and displays the previous pin label again.

3. Repeat the process until each defined connector is attached.

### Guided Build LEDs

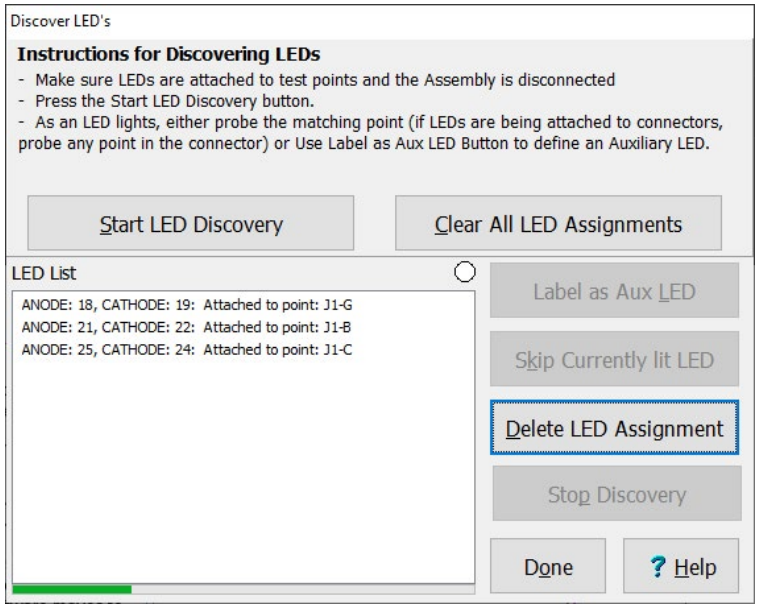
The Easy-Wire software can illuminate LEDs to guide operators to connectors associated with instructions during the assembly process and to highlight the locations of errors. Each LED is wired to two test points and is associated with a product connector using the **Attach Guided Build LEDs** process.

1. With the test fixtures connected to the tester, but no product connected yet, and the connector attach process complete, under the **Attach Connectors** Tab select **Attach Guided Build LEDs**.

2. Select **Start LED Discovery**.

3. Each connected LED will flash green, one at a time, as it's discovered. While the LED is flashing use the probe to touch any pin in its associated product mating connector.

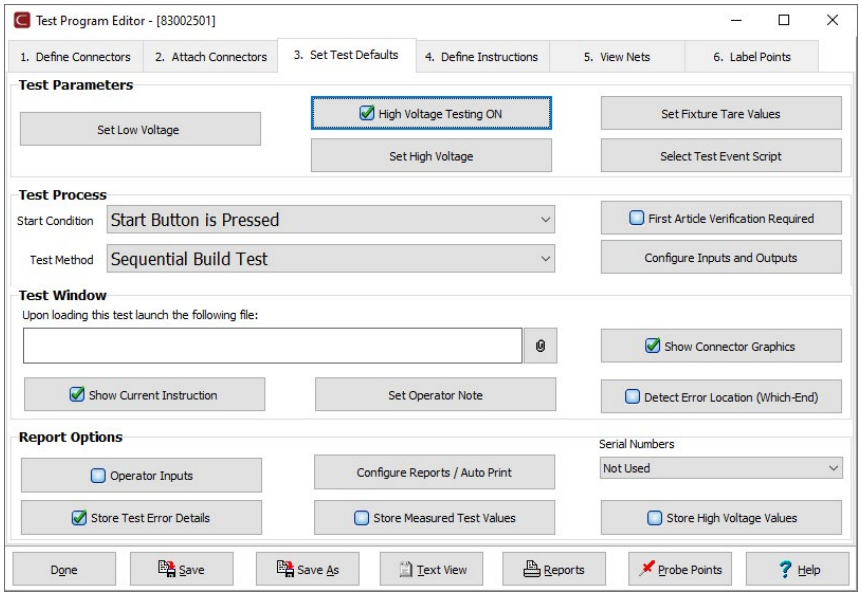
4. When all the LEDs have been attached, select **Done** to close the window.




***Note**: See the Easy-Wire Help for assistance with **Auxiliary (Aux) LEDs** which can be used to guide operators to locations other than connectors, such as parts bins, cable tie locations, etc.*

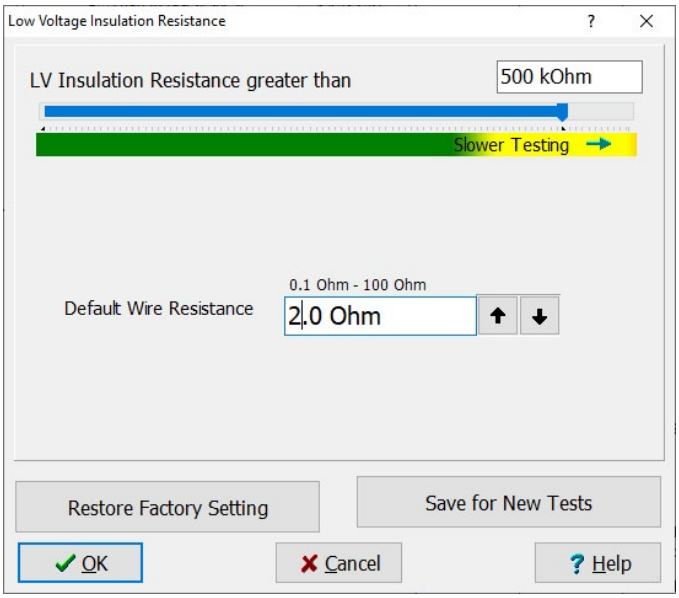
# 9.5 Set Test Defaults

The Set Test Defaults Tab includes a variety of test program options separated into four sections - **Test Parameters**, **Test Process**, **Test Window**, and **Report Options**. Options in the Set Defaults Tab can be selected before or after the **Define Instructions** Tab has been completed and as always, changes can be made at any time by opening the program in the Test Program Editor. Key settings are covered here. For detailed information on each setting, see the Easy-Wire Help.




## 9.5.1 Set Low Voltage

Set the LV **Insulation Resistance**. The LV Insulation Resistance (isolation) test checks for a minimum resistance between nets/single points that should be isolated from one another using the programmed pass/fail threshold. The low voltage isolation test is performed after all other instructions have been completed.



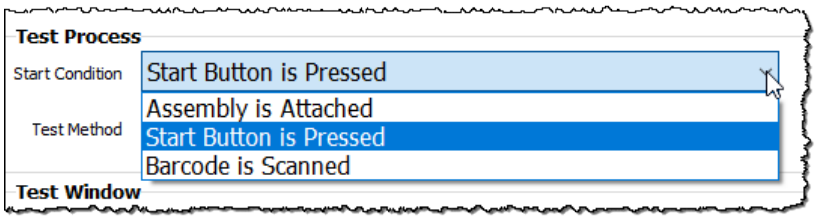

Set the **Default Wire Resistance**. The **WIRE** instruction is the term Easy-Wire uses for a continuity test. The value set here will be used as the default maximum acceptable value for WIRE instructions. The pass/fail threshold for individual WIRE tests can be edited under the **Define Instructions** tab.

Clicking **Save for New Tests** saves the current settings as the default for new tests.

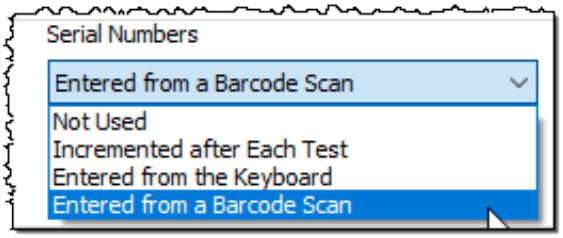
Clicking **Restore Factory Setting** will restore the factory settings of 5 Kohms for the LV Insulation Resistance and 5 Ohms as the Default Wire Resistance.

## 9.5.2 Start Condition

The **Test Process** section includes the **Start Condition.** Tests for simple products sometimes use the **Assembly is Attached** option to speed throughput. However, for tests of complex assemblies, like those often tested on the CR, the **Start Button is Pressed** or **Barcode is Scanned** is normally used. Tests can also be started using a digital I/O input or Windows messaging.



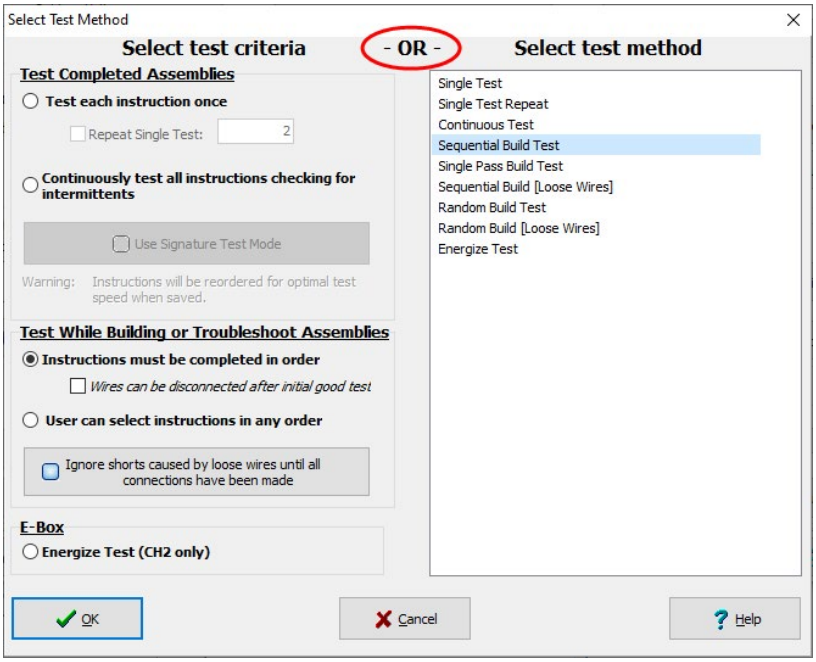

When **Barcode is Scanned** is selected as the Start Condition, the Serial number must be turned on with the **Entered from a Barcode Scan** or **Entered from the Keyboard** option selected. The test will start when the serial number barcode is scanned. The serial number will be saved to the database with the test results.




## 9.5.3 Test Method

The variety of Easy-Wire **Test Methods** offers flexibility not commonly found in other electrical testers. The Test Methods reflect another uncommon capability of the CR and the Easy-Wire software - test-while-building, guided assembly. In the descriptions below, it can be seen that there is an overlap between typical end-of-line Test Methods, like Single Test, and the various build methods.

It's helpful to note that build methods can readily adapt to end-of-line testing. In build methods, instructions are tested as they're encountered. If all the instructions are complete, and the test instructions pass, the test will proceed to low voltage isolation testing.




The **Select Test Method** window is divided into two panes. As indicated by **OR** at the top of the window, complete either the **Select test criteria** pane or the **Select test method** pane. A Test Method can be selected directly in right pane. Alternatively, complete **Set test criteria** in the left pane and a Test Method will be automatically selected.

**Test Method Descriptions**

- **Single Test** is an end-of-line test in which each instruction is executed one time. After completing the test instructions, the tester performs a low voltage insulation resistance (shorts) test. No assembly instructions are displayed during the test and any errors detected while executing the test instructions or while performing the shorts test, are displayed at the end of the test. When using this test method, the tester does not repetitively scan the assembly for intermittent errors. The start condition Assembly is Attached is not compatible with Single Test and test instructions may be automatically reordered for optimal speed. Best used for fastest test times on larger assemblies when checking for intermittent failures is not required.

- **Single Test Repeat** performs a complete Single Test, including hipot if programmed, the number of times specified in the Select test criteria portion of the dialog box.

- **Continuous Test** behaves like a Sequential Build Test in that assembly instructions and graphics are displayed until all test instructions have been completed. If the initial test results in a pass condition, the low voltage portion of the test program is cycled checking for intermittent failures indicated when the status goes from pass to fail and back to pass again. While the test cycles, the operator can stress the assembled product in an effort to induce failure conditions. If the test's Start Condition is set to Start Button is Pressed or Barcode is Scanned, the operator must click/tap Stop before removing the assembly or the result will be a FAILED condition. If the Start Condition is set to Assembly is Attached, the operator can simply remove the assembly when finished. Test instructions may be reordered for optimal speed. Best used when checking for intermittent errors is beneficial.

- **Sequential Build Test** provides graphical, textual and, if desired, audible guided assembly instructions to the operator in the same sequence as the instructions are listed in the test program. If during the assembly process the operator clicks Continue, the active test instruction will be bypassed. However, the bypassed test instruction will be presented again before the end of the test. The tester checks for continuity at each step and for miswires and shorts throughout the test process. If unprocessed wires may inadvertently touch each other, the Sequential Build [Loose Wires] Test method may be a better option to avoid erroneous shorts errors. Two examples of best use include (a) when forcing a sequential build process is beneficial or (b) when using COMMENTS with OPEN / CLOSE instructions to test an assembly with switches.

- **Single Pass Build Test** is an uncommonly used test method that's similar to the Sequential Build except for one major exception. Wires can be disconnected after testing good and the final test result will be a PASS if all the connections were wired correctly and tested good once. Errors introduced after initial testing could go undetected, therefore, the Sequential Build Test is typically a preferred test method unless the assembly/test process requires use of the Single Pass Build Test. An example of best use would be when it's necessary to assemble and test part of a cable then disconnect it from the tester before assembling another part of product.

- **Sequential Build [Loose Wires]** is identical to the Sequential Build Test with one difference intended to eliminate erroneous error messages caused by unprocessed loose wires touching each other and causing shorts. The Sequential Build Test checks for miswires and shorts as each test instruction is processed while Sequential Build [Loose Wires] checks for miswires / shorts only on the current instruction. All miswires and shorts are checked at the end of the test.

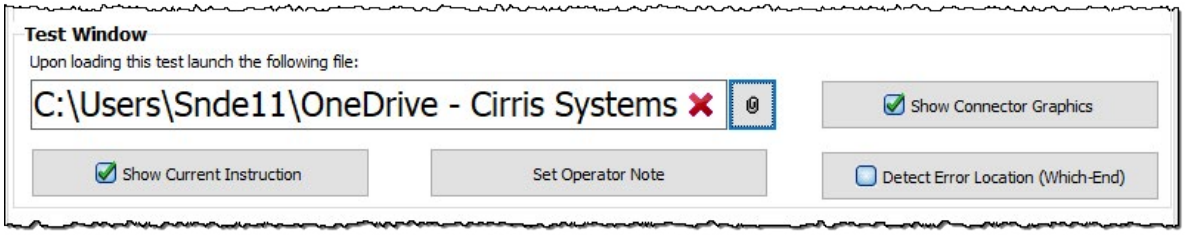
- **Random Build Test** provides graphical, textual and, if desired, audible guided assembly instructions to the operator in an order that can be varied by the user. Touching the conductor of a wire with the probe or while wearing a wrist strap will present the operator with the instruction associated with that wire. The tester checks for continuity, miswires and shorts as each test instruction is processed. If unprocessed loose wires may inadvertently touch each other, the Random Build [Loose Wires] Test method may be a better option to avoid erroneous shorts errors. Best used when the operator should be allowed to determine the assembly sequence.

- **Random Build [Loose Wires]** is identical to the Random Build Test with one difference intended to eliminate erroneous error messages caused by unprocessed loose wires touching each other and causing shorts. The Random Build Test checks for miswires and shorts as each test instruction is processed while Random Build [Loose Wires] checks for miswires / shorts only on the current instruction. All miswires and shorts are checked at the end of the test.

- **Energize Test** (CH2 only) is required when using the optional CH2 External Energization capability. No shorts testing or high voltage testing is performed.

## 9.5.4 Test Window

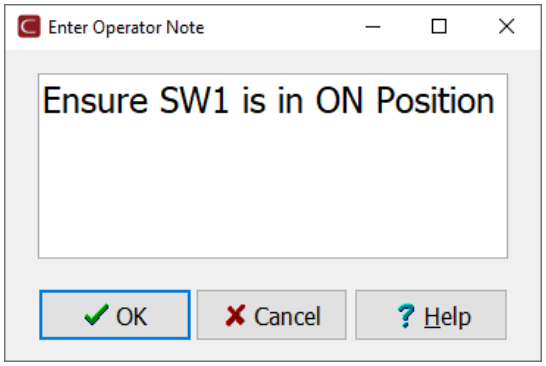
The Test Window section of the Set Test Defaults tab controls the properties of the Test Window.




- **Upon loading this test launch the following file**: The Easy-Wire software can open a file in its native application at the start of a test session. A test session starts when the operator selects a program on the Main Menu and clicks **Test**. The file only opens at the start of the session and remains open until closed by the test operator. This feature can be used to provide the test operator with instructions including drawings, videos, presentations, text files or any file for which the application required for viewing is installed on the PC controller. To enable the feature, enter the path, including the filename, for the file to be opened.

- **Show Current Instruction**: Select this option to display the current test instruction in the Test Window during testing. Typically used in conjunction with Build Test Methods.

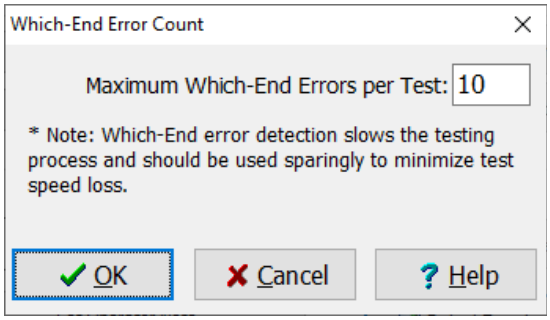
- **Set Operator Note**: The Operator Note window is displayed at the beginning of each unit test and allows the programmer to communicate instructions in a text message of up to 120 characters. The message is displayed until the operator starts the test when the Monitor tab takes focus. The operator may click the Operator Note tab to reference the message later in the test.

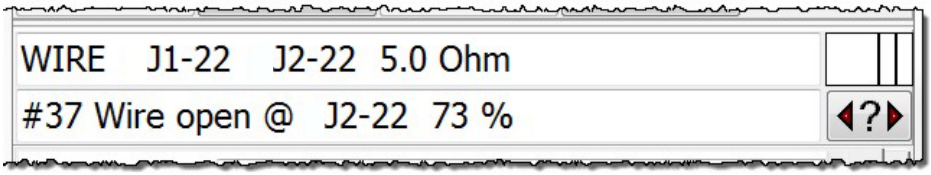



- **Show Connector Graphics**: Select this option to show the connector graphics during testing. Typically used in conjunction with Build Test Methods.

- **Detect Error Location (Which-End)**: By measuring the capacitance from both ends of an open or short error, the tester can often indicate at which end of the measurement the error is located. Selecting this option opens the Which-End Error Count dialog box, which allows the programmer to determine the maximum number of errors for which the feature will be implemented. Keeping the number to a minimum improves test times for units with large numbers of errors.

  Which-End errors are displayed as shown in the example with a percentage indicating the probability that the location is accurate. The tester displays a #37 error number if it can provide a which-end estimate for opens errors and a #38 error number for short errors.

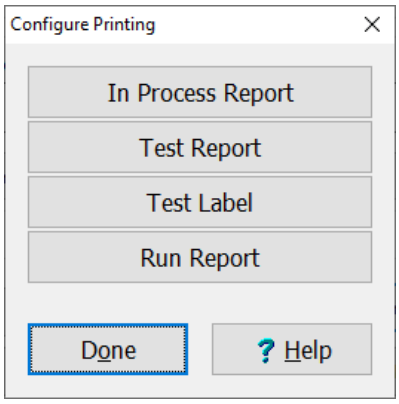


## 9.5.5 Report Options

Also see our Editing Test Reports YouTube video.

Under the Configure **Report / Auto Print** menu:




- **Test Reports** provide the results for a unit test and can be programmed to automatically print or to export as a .pdf or .csv file. The trigger for printing/exporting occurs when the DUT is disconnected from the tester or the test session is ended.
- Report formats are extremely flexible. Sections can be added or removed, as can fields/columns within sections. See the Easy-Wire Help for more information.
- All the data included in **Test Reports** is saved in the Easy-Wire database. Therefore, reports can be accessed, viewed, the format edited, printed, and exported in .pdf format after the fact from the database using search tools found in the user interface. From the **Main Menu** > **Utilities** > **Search Test Archives**. See the Easy-Wire Help for assistance.
- **Labels** can be automatically printed at the end of each test.
- The **Run Report** provides a summary of a test session's results.
- The **In Process Report** is temporarily accessible by operators after a unit test is completed but before the unit is disconnected from the tester.

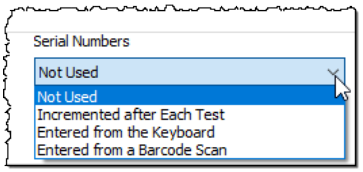
Detailed explanations and instructions for each option can be found in the Easy-Wire Help.

**Operator Inputs**

Custom messages can be used to prompt test operators to enter information during testing. Inputs are saved to the database and are available to include in reports. A brief video describing the feature is available on YouTube. See the Easy-Wire Help for additional details.

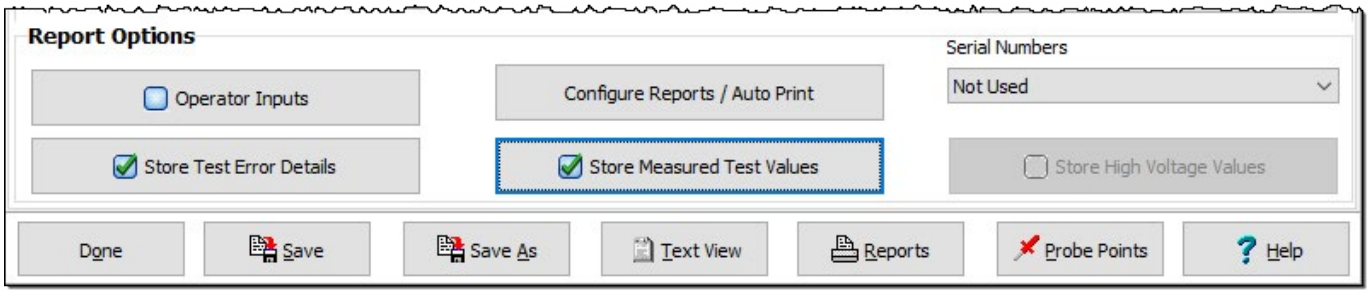
**Serial Numbers**

The operator can be prompted to enter the product serial number using keyboard or barcode input. The serial number can also be automatically incremented for each product tested after the initial input. Select the preferred option from the drop-down list.




**Store Test Error Details and Store Measured Test Values**

Selecting these options saves the corresponding details and/or measurements for each device tested to the database. If the data is saved, it can also be included in reports. Store High Voltage Values is only available on the CH2.



# 9.6 Define Instructions

Test instructions tell the software:

- What tests to perform (WIRE, RESISTOR, CAPACITOR, DIODE etc.)
- How to perform the tests (what test parameters to use)
- Where to perform the tests (between which test points)
- Depending on the Test Method selected, the instruction list may also define the order in which the instructions are performed.

The Easy-Wire software also uses the instruction list to build a Nets (Networks) listing, or netlist, in the background.

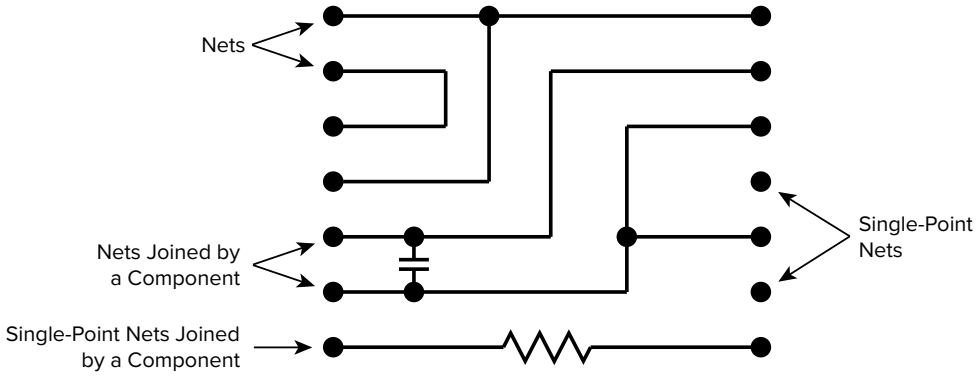
Nets are:

- Two or more points joined by WIRE instructions
- Single Points (points that are electrically isolated - sometimes called no-connect or NC point)

Nets can be isolated from other nets or joined to another net through a component (resistor, diode, capacitor, or link). Single-Point nets only appear in the Easy-Wire instruction list if they are connected to another net through a component. See **View Nets** on *page 63*.

The Easy-Wire software uses the netlist as the basis for performing low voltage isolation testing,which is automatically performed after all the test instructions have been completed. There is no separate, visible instruction for the low voltage isolation testing. See, *page 105* , for more information on the testing process.

Example Nets




Following the standard programming process, Tabs 1 and 2, **Define Connectors** and **Attach Connectors**, must be completed before adding instructions. This allows use of the product connector terminology in the programming process. However, it is possible to generate instructions with the tester's default connector terminology using the same methods, including:

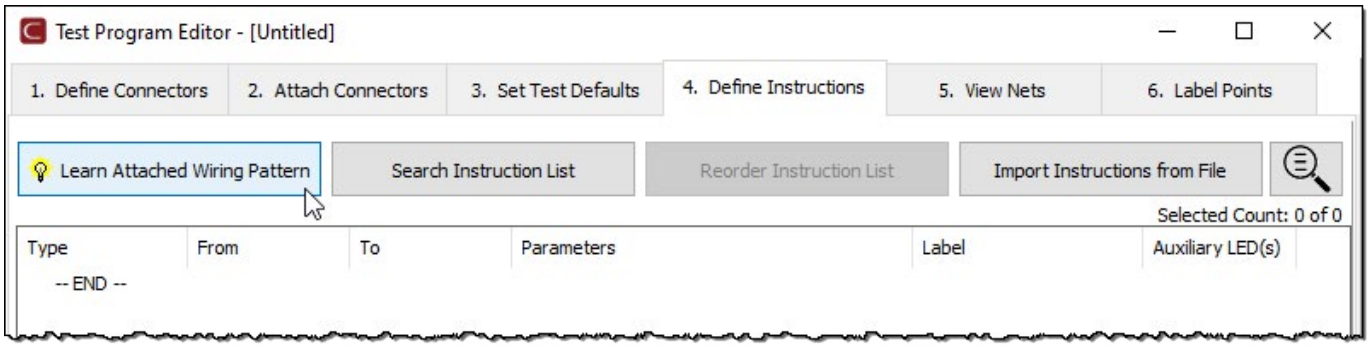
- Learning a sample product
- Importing instructions from external wirelist data including from Excel
- Manually entering instructions

When using Smart-Adapters, Tabs 1 and 2, **Define Connectors** and **Attach Connectors**, are completed automatically. The default process then guides the user directly to the Learn process, but if preferred, the **Learn an Attached Device** window can be closed and one of the other methods used.

## 9.6.1 Learning Instructions

Learning a sample product can be the fastest way to creating test instructions. The resulting instructions should always be checked against the product documentation to ensure the learned instructions accurately represent the product design.

1. Select **Learn Attached Wiring Pattern** on the **Define Instructions** tab to open the **Learn an Attached Device** window.

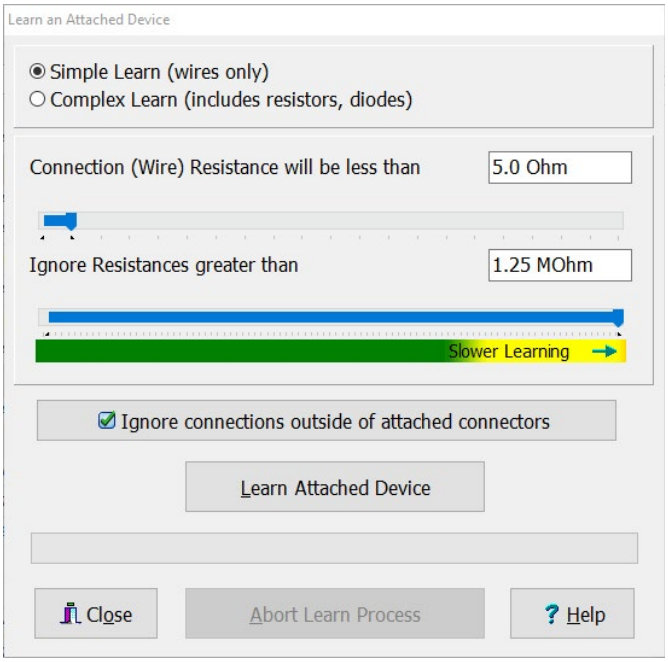



2. Select either **Simple Learn** for products including wires (connections) only or **Complex Learn** for products that include resistors, diodes, and/or capacitors.

3. Use the slider bar to set the maximum **Connection (Wire) Resistance**. Once the slider bar has focus, the keyboard arrow keys can be used to fine adjust the value. The defined value will be used as the threshold for connections during the learn.

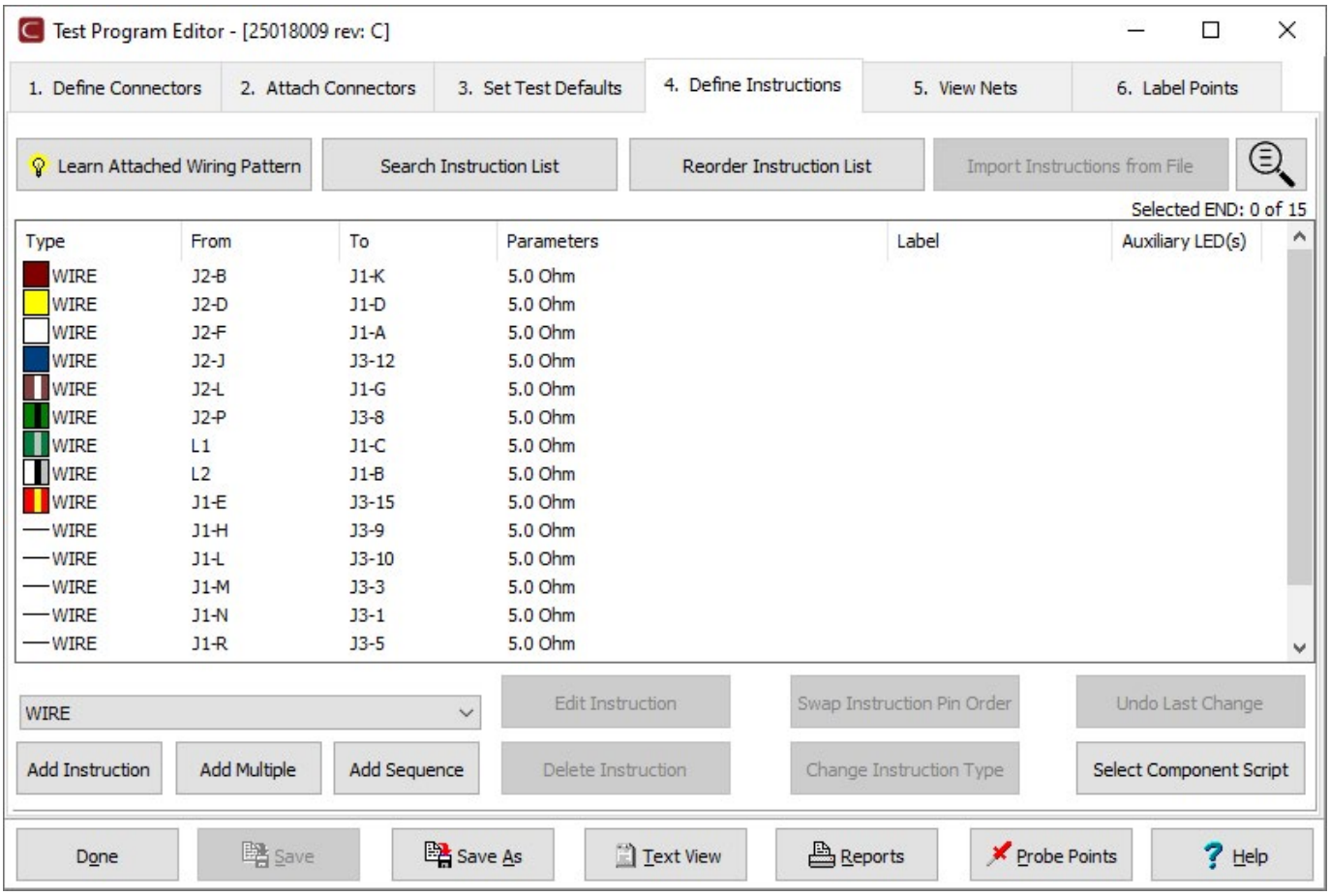
4. Use the slider bar to set the value above which resistances will be ignored. Once the slider bar has focus, the keyboard arrow keys can be used to fine adjust the value. Resistances between points above the specified value will not produce associated instructions as a result of the learn.

5. Checking **Ignore connections outside of attached connectors** means that the tester will only search for connections and components within the range of the connectors attached under Tab 2, Attach Connectors. Connections outside of this range will be ignored.




6. After connecting the sample product, select **Learn Attached Device**.

7. When the Learn is completed, the instruction list is populated. It's important to review the instructions to ensure they match the product documentation. Instructions for some components and devices, like switches, must be added manually.




## 9.6.2 Importing Instructions

Instructions can be imported from Excel or from other formatted wirelist data. It's important to recognize that in the imported data, the Connector References must match those specified under the Define Connectors tab and the Connector Pins (contact positions) must match those specified in the Connector Registry. For example, "J1-A" where "J1" is the Connector Reference and "A" is the Pin name (contact position) specified in the Connector Registry.

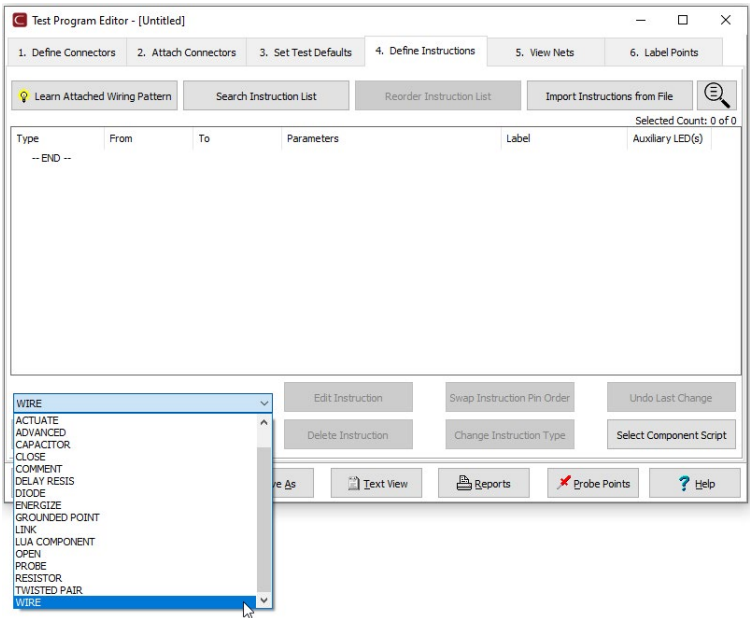
There are a several alternate methods that can be used to import data.

- The Cirris Format Conversion utility is installed with the Easy-Wire software. It allows the user to import a table of data into an instruction list by specifying the column location for each required field and to substitute default test parameters if the associated variable is missing. For more information, search **Format Conversion Tool** in the Easy-Wire Help.
- Properly formatted data in an Excel spreadsheet can be pasted into the Define Instruction Tab. For more information, search **Editing Instructions in Excel** in the Easy-Wire Help.
- Instructions can be imported from select CAD packages including Cadonix Arcadia and Zukin Harness Builder.
- Cirris is continuing to develop new conversion capabilities to import other test program formats into the Easy-Wire software.

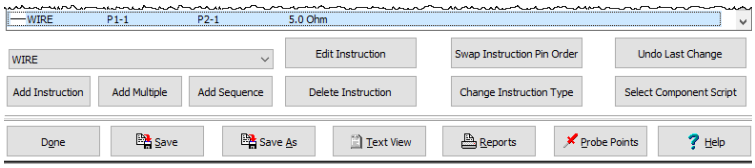
## 9.6.3 Adding Instructions

Instructions can be entered and edited using the tools provided in the user interface:

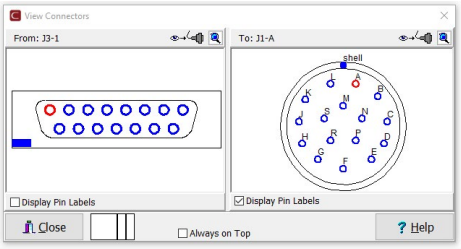
**1.** To add a new instruction, first select the instruction type from the drop-down list. See the Easy-Wire Help for complete descriptions of the instruction types.

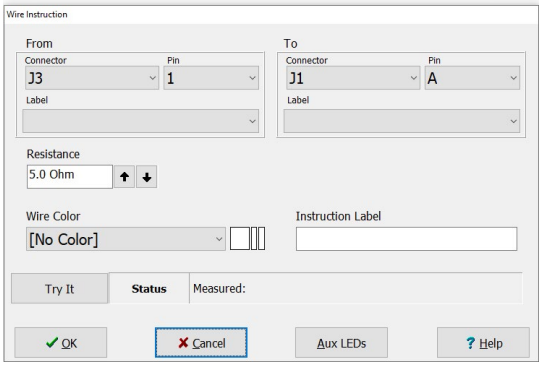



2. Selecting **Add Instruction**, opens the editing window for the instruction type selected.




3. Using the WIRE Instruction as an example (the fields will vary depending on the Instruction type), select the **From** and **To** Connectors and Pins from the drop down lists. As the connectors are entered, the connector graphics, if they were created in the Connector Registry, will be displayed.




Enter a value in the test parameter field(s) by using the up and down arrows or by typing a value. In the Wire Instruction this will be a maximum acceptable resistance value.

Selecting a **Wire Color** from the drop down list is optional as it may be helpful to assemblers.

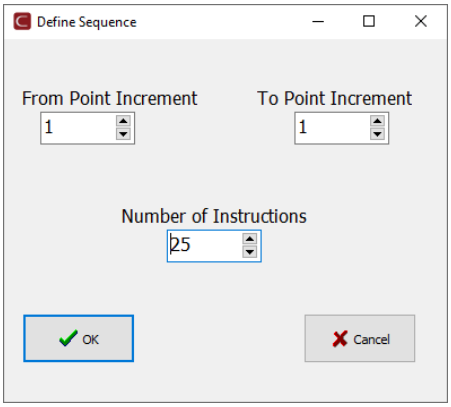
An **Instruction Label** is also optional. An example would be R1, R2 etc. for resistors.

Selecting **Try It** will perform the specified measurement and report the result.

***Note**: When nets include more than two points, for organizational purposes, typically the **FROM** point is repeated for each additional **TO** point OR the **TO** point in a preceding instruction is repeated as the **FROM** point in a subsequent instruction as in a daisy-chain. In fact, when adding a point to a net the **FROM** or **TO** point can be any point in the existing net. All these methods are acceptable and will allow the Easy-Wire software to build the netlist in the background.*

Selecting **Add Multiple** instead of **Add Instruction** (Step 2) will continue to open the editing window for new instructions of the same type each time an instruction is added. When finished, select **Cancel** on the unused editing window to end the sequence.

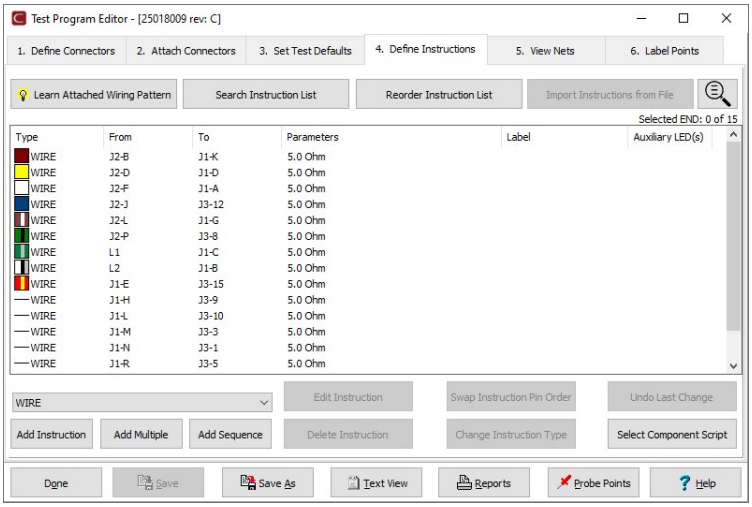
Selecting **Add Sequence** initially opens the selected Instruction type editing window. The **From** and **To** points entered become the starting point for the sequence. After the instruction is added, the **Define Sequence** window opens. Enter the **From Point Increment**, the **To Point Increment**, and the number of instructions before selecting **OK** to add the sequence of instructions.




## 9.6.4 Editing Instructions

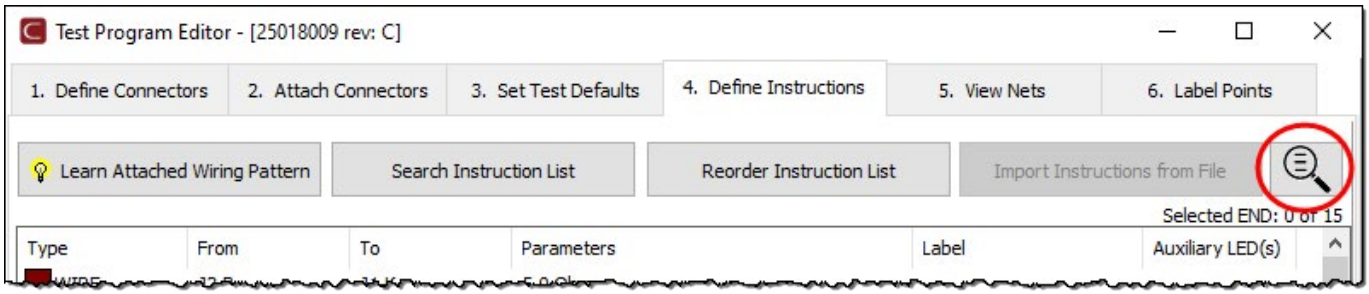
Instructions can be edited under the Define Instructions tab using the tools in the user interface:

- To edit an existing instruction, double-click on it or highlight it and select **Edit Instruction**. Right-clicking on an instruction will open a fly-out menu that also includes the **Edit** option.
- Instructions can be deleted by highlighting an instruction or a group of instructions and clicking **Delete Instruction** or by using the Delete key on the keyboard.
- The Instruction type can be changed by highlighting an instruction or a group of instructions and clicking **Change Instruction Type**.
- The **From** and **To** points can be reversed by selecting an instruction or a group of instructions and clicking **Swap Instruction Pin Order**. This can be helpful when using the tester's guided assembly capability with one of the Build Test Methods.
- The order of existing instructions can be revised by selecting **Reorder Instruction List**.



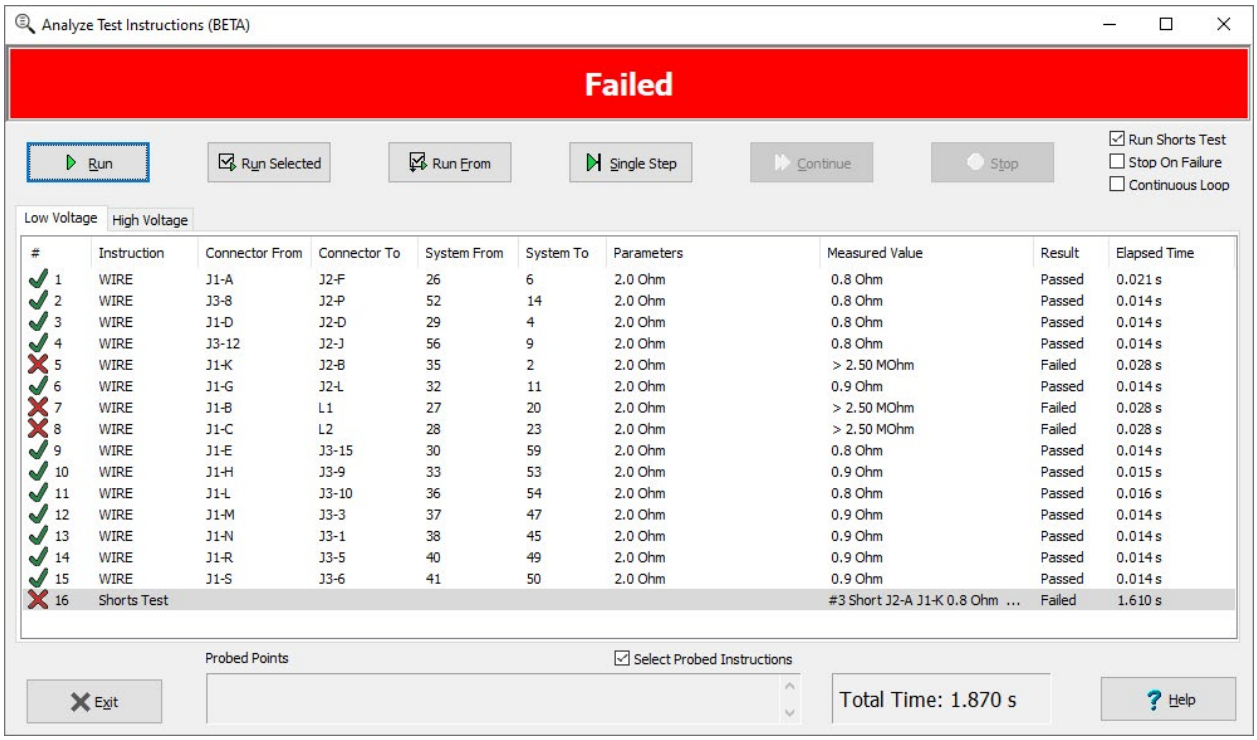
## 9.6.5 Analyze Test Instructions

Added in Easy-Wire version 2022.3.1, the Analyze Test Instructions function is accessible from the Define Instructions tab and from the Test Window by selecting the Magnifying glass icon. It's primary function is to validate/debug test programs and to troubleshoot test failures by performing a specified subset of the active program's instructions and returning the results.




### Usage

**Low Voltage Tab** - All the programmed instructions are listed under the Low Voltage tab. The list also includes the Shorts Test (low voltage isolation test), which is not specifically programmed, but which is automatically added and which during testing is performed after all the other low voltage tests have been completed. Instructions can be selected by using standard windows methods (click to select a single instruction, click and drag to select a group of instructions, click and shift + arrow key to select a group, etc.)  Nets can also be selected by using the probe with the Select Probed Instructions option checked.




**High Voltage Tab** - Only accessible on the CH2 test system.

## Commands

**Run** - Performs all instructions in the active tab (low voltage or high voltage). Select Stop to interrupt testing.

**Run Selected** - Performs all the instructions selected in the active tab (low voltage or high voltage).

**Run From** - Performs the instructions in the active tab (low voltage or high voltage) starting at the selected instruction.

**Single Step** - Performs the instructions in the active tab from the top, one instruction at a time as the button is clicked/tapped. To start Single Step from a specified instruction, select an instruction and click/tap Run Selected, then use the Single Step option to continue.

**Continue** - Restarts the active testing after the Stop button has been selected.

**Stop** - Stops the active Analyze Testing process. It's important to note that selecting Stop will not interrupt the active test instruction. It will stop Easy-Wire from processing any instructions that are in the queue to be performed AFTER the active instruction is completed. It may appear that the software has stopped functioning if the active test is a low voltage shorts test or a high voltage test with a long dwell (test) time, but that is not the case.

**Run Shorts Test Checkbox** - Selecting this option includes the shorts (isolation) test when running a complete low voltage test, when the Shorts Test is included in selected instructions and Run Selected is chosen, or when Run From is selected on the Low Voltage tab.

**Stop On Failure Checkbox** - Selecting this option stops testing when an error is encountered.

**Continuous Loop Checkbox** - Selecting this option performs a continuous loop of the selected instructions. Typically used with low voltage testing when troubleshooting errors. Select Stop to interrupt the looping test.

**Probing** - Using the probe to touch points connected to the tester will report the point labels (for example, J1-001). If Select Probed Instructions is checked, the instructions/nets associated with the probed points will automatically be selected. During an Analyze Test, the probe can be used as it would be normally during testing, except the user will not be prompted to probe the point as would occur during a normal test. This can be compensated for by using a Breakpoint as described below.

**Test Results**

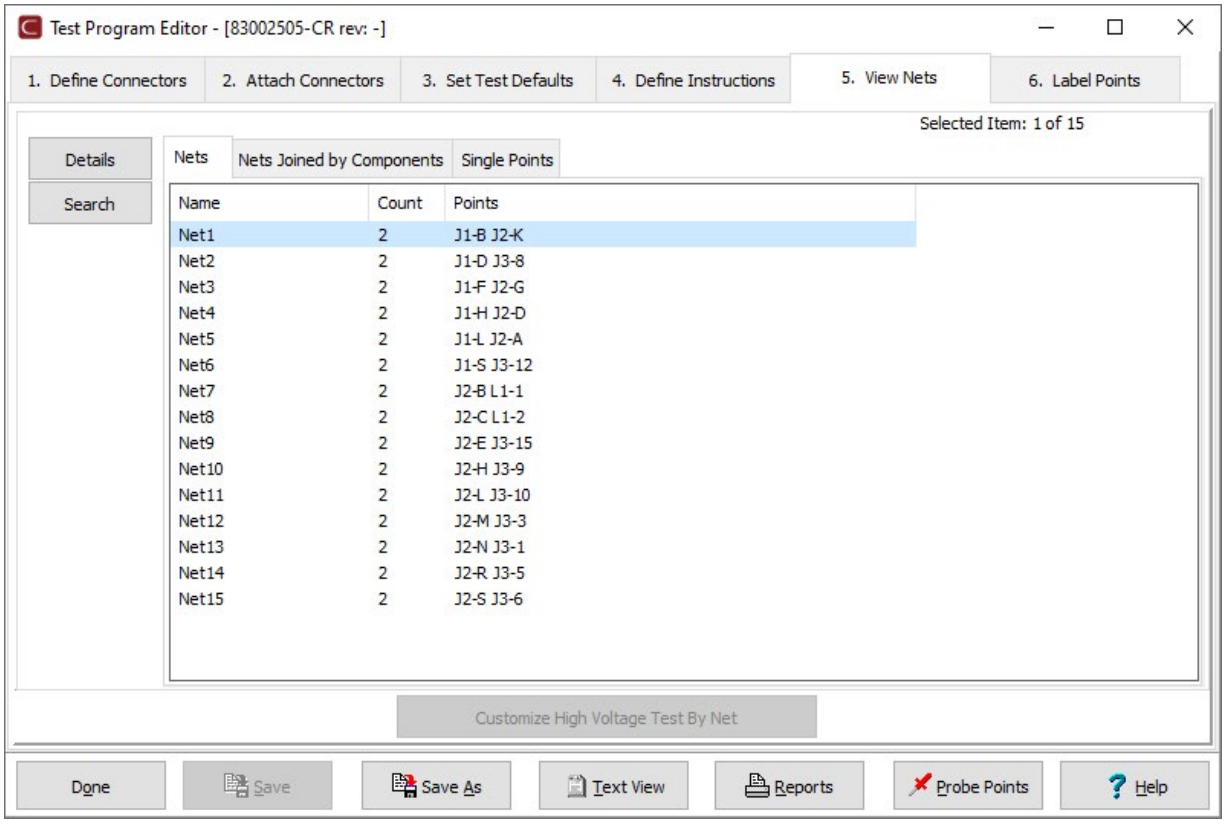
- A green check indicates that the instruction was performed and the test passed.
- A red "X" indicates that the instruction was performed and the test failed.
- The measured value, the test result (passed or failed), and the elapsed time are all reported in the active tab.

**Breakpoint** - Indicated by a red dot preceding an instruction, a breakpoint stops the Analyze Test BEFORE the breakpoint instruction. Setting a breakpoint can be done by double-clicking an instruction, right-clicking an instruction and selecting Breakpoint, or by the ALT + B keyboard shortcut. During testing, when a breakpoint is encountered, the user can select Single Step, Continue, or Stop.

Some instructions typically used with the Build Test Methods are not processed when performing Analyze Testing, including PROBE and COMMENT instructions that direct users to perform prerequisite actions before OPEN and CLOSE instructions. As the user will not be notified to perform the required actions, the associated instructions will fail. Inserting a Breakpoint at these instructions gives the user the opportunity to perform the needed actions before proceeding.

# 9.7 View Nets

Under the **View Nets** Tab, the user can view Nets compiled by the software based on the instructions entered in the **Define Instructions** tab. Points are grouped into three categories - **Nets**, **Nets Joined by Components**, and **Single Points**.

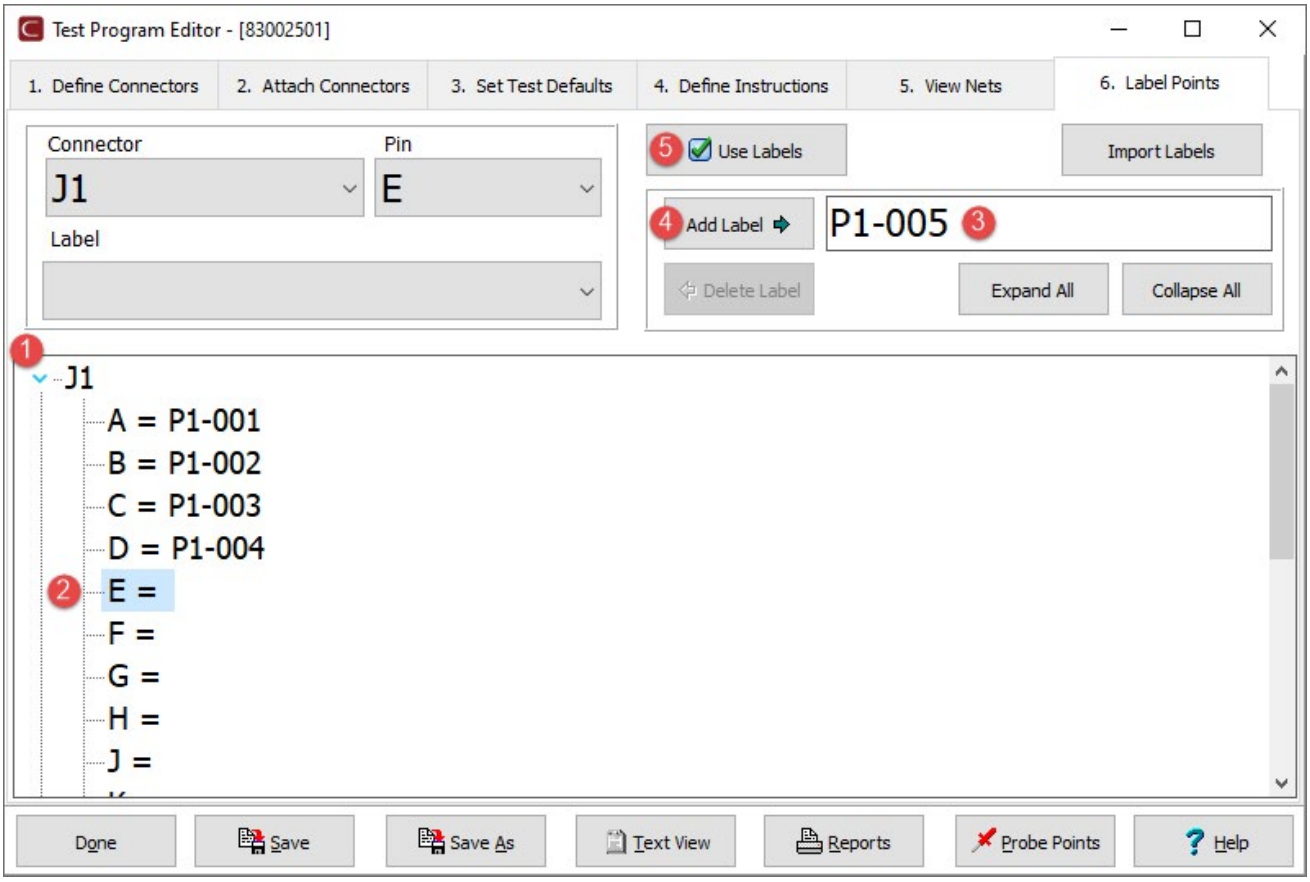


# 9.8 Label Points

The Label Points tab provides the capability to assign alternate nomenclature to test points. In most cases this is not necessary as the connector references have been assigned under the Define Connectors tab and the connector pin names have been assigned in the Connector Registry. However, the capability can be useful in some instances. One example may be when importing test instructions. Labels assigned under the Label Points Tab will be used in the Define Instructions Tab and they will be used in reports and error messages.

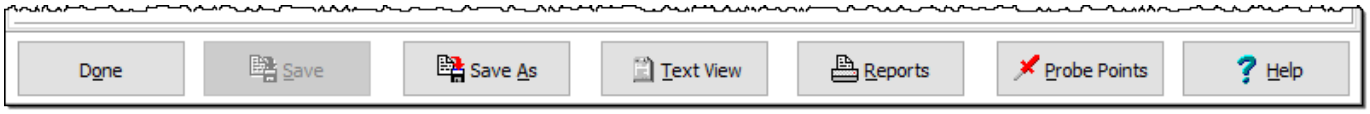
To Label Points:

1. Navigate to the desired **Connector** by using the scroll bar or by selecting the existing connector designation from the connector drop-down list.
2. Highlight the desired **Pin**.
3. Enter the alternate **Pin Label** in the text box to the right of the **Add Label** button.
4. Click **Add Label**. The label will be added and the software will automatically increment to a suggested Pin Label for the next connector position. To accept the suggestion, click **Add Label** or change the suggested Pin Label before clicking **Add Label** again.
5. When finished check **Use Labels**. Un-checking **Use Labels** will revert to the original nomenclature (the Point Labels will not be lost). To verify that the labels are being applied, view the instructions under the **Define Instructions** Tab. The new Point Labels should be used instead of the original designations in the instructions list when **Use Labels** is checked.

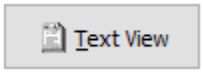


# 9.9 Test Program Editor Options

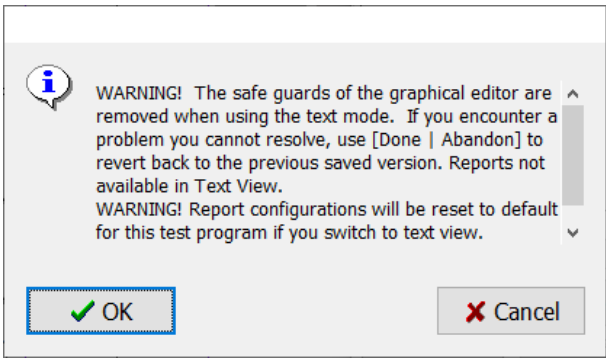
Several universal options are accessible by selecting buttons at the bottom of the Test Program Editor window.

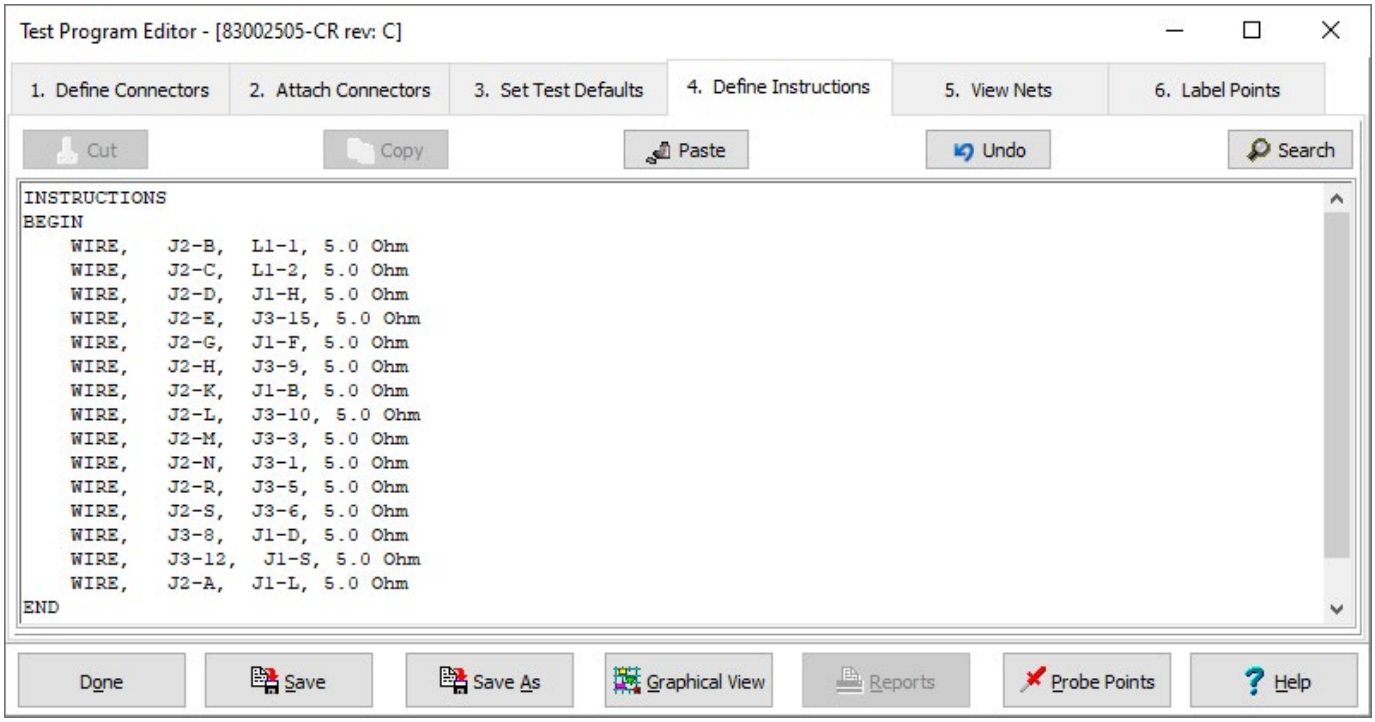



## 9.9.1 Text View

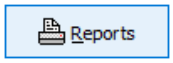



The Text View removes the graphical interface to reveal the underlying program code. The program can be edited in the Text View but the interface does not include a syntax check. Therefore, it's recommended only for advanced users.

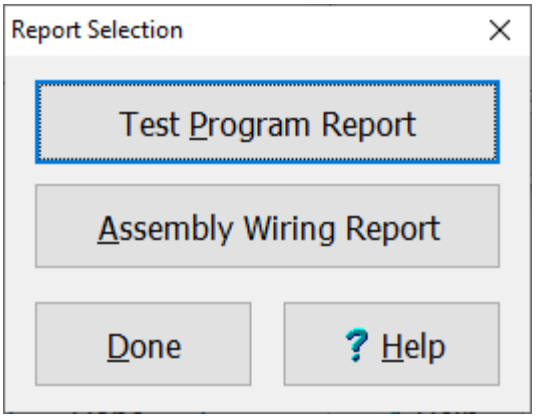


## 9.9.2 Program Reports



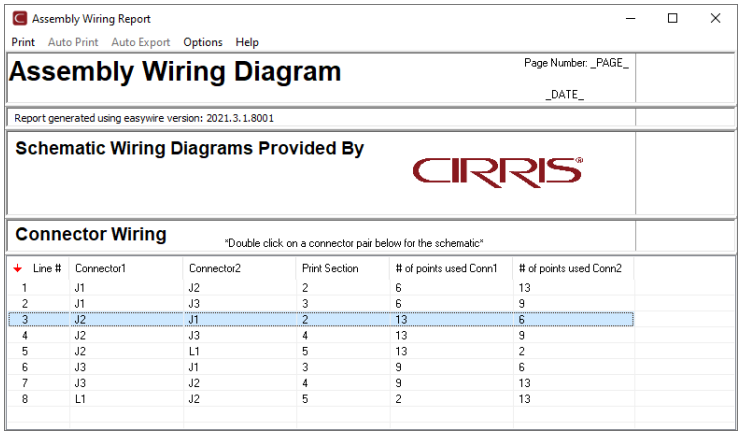

Selecting the **Reports** button opens the **Report Selection** submenu.

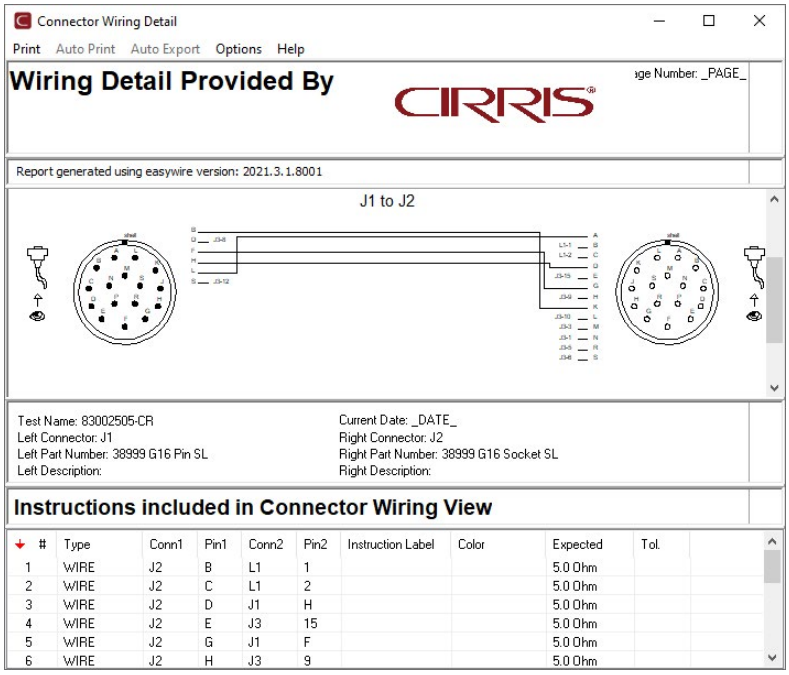



The **Test Program Report** includes information about:

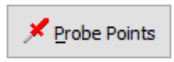
- System Settings
- Program Revisions
- Test Parameters
- Fixturing
- Test Instructions
- The Net List
- Summary of Test Results for the program

The **Assembly Wiring Report** includes a list of connections. Drilling down by double-clicking on any line of the Connector Wiring Section opens the Connector Wiring Detail.

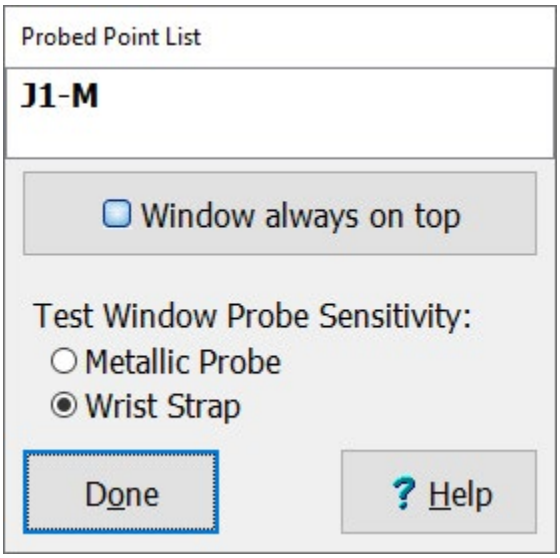


## 9.9.3 Probe Points




Selecting the **Probe Points** button opens the **Probed Point List** which displays the test points that are being contacted by the probe.

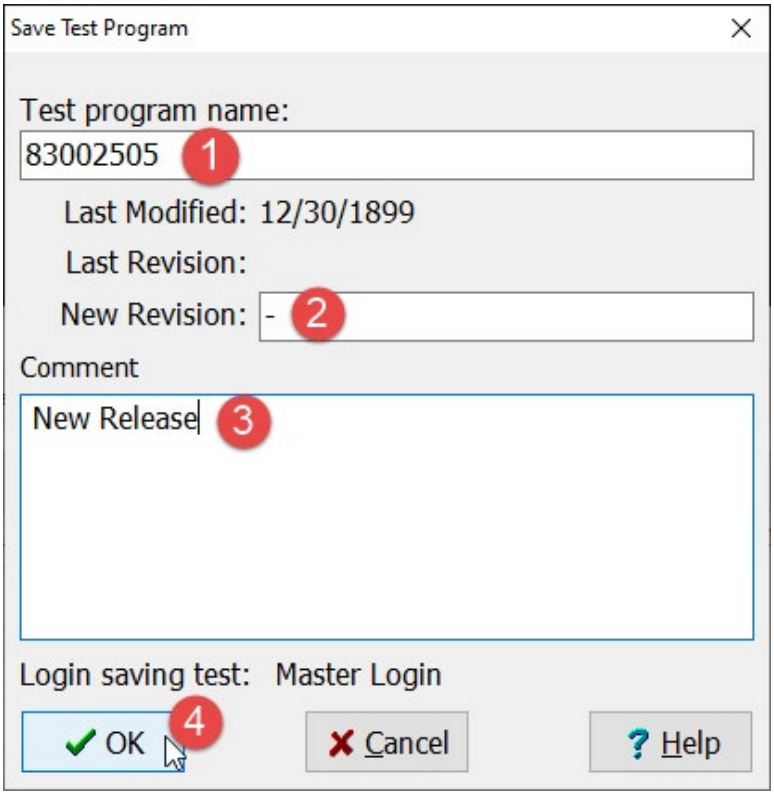



# 9.10 Save the Test Program

To save the new test program Click **Save** in the Test Program Editor. In the window that opens:

1. Enter the test program name. This is the name that will appear in the **Main Menu**. It will be available to include in reports.
2. If desired, enter the revision level of the test program. The revision level will appear next to the program name in the **Main Menu** and can also be included in reports.
3. If desired enter a comment associated with the revision. The comment can be included in reports.
4. Click **OK** to save the program.

***Note**: The Last Modified date is assigned automatically and will appear on the **Main Menu**. It can also be included in reports.*



# 10. Testing

Of course, it's necessary to connect the test interface (test fixtures) to the tester before testing begins. However, the sequence in which the test session begins, the test fixtures are gathered and when they are attached to the tester depends on the organization's processes. It may be the standard practice to document the test interface requirements outside the Easy-Wire software, for example, within a printed traveler or electronic shop order. However, it's also possible to set up the documentation so that it's accessed through the Easy-Wire software using one of two primary methods:

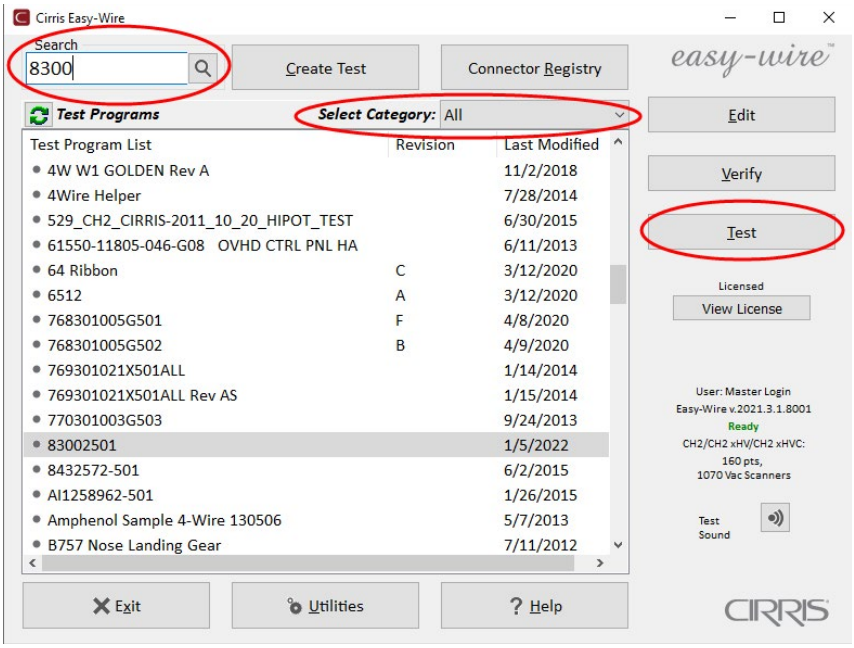
- If Smart-Adapters (Smart-Lights) are being used, the test fixture list is automatically displayed if the adapters are not connected to the tester when the test session starts. The list of adapters can be printed for reference.
- The Easy-Wire software can programmed to automatically open a document or video in a separate application when a test session is started. This document or video can include instructions for setting up the test fixtures. See **Upon loading this test launch the following file** on *page 54.*

Therefore, in some cases it may be normal practice to have the test interface hardware attached to the tester before the test session is started and in other cases the test session may start before the test interface hardware is gathered and attached to the tester. As the sequence can vary, the following steps may be performed in different order than you find them here.

## 10.1 Starting a Test Session

To begin a test session, from the **Main Menu**, highlight the appropriate test program and click **Test**. Test programs are listed numerically then alphabetically. They can also be sorted by the Revision or Last Modified date by clicking on the column headings.

Test programs can be searched using the program name or the leading characters of the name. Test programs can also be organized in categories to make it easier for operators to navigate to test programs. To view test programs in an individual category, select the category from the **Select Category** drop-down list. All test programs will be displayed when the **All** category is selected. To create new categories, from the **Main Menu** > **Utilities** > **Category Maintenance** and see the **Help** for assistance.



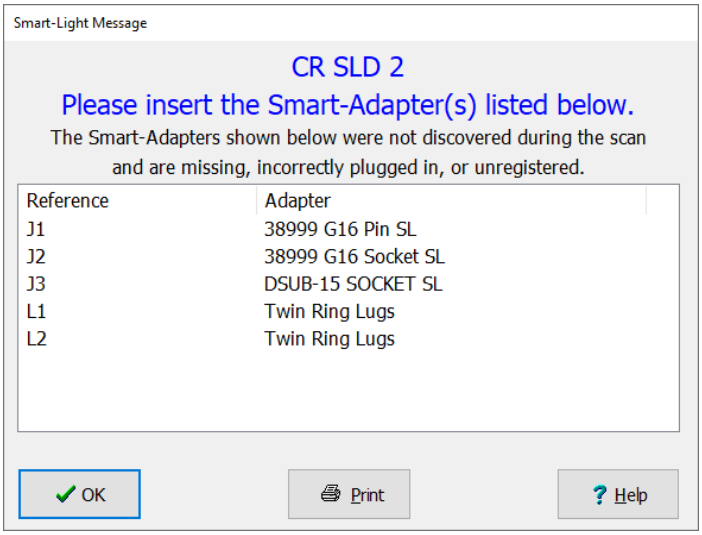
## 10.1.1 Testing with Traditional Test Fixtures

If Traditional Test Fixtures are being used, they must be attached to the tester in specific positions matching the set-up for which the test program was created. The name or part number of the fixtures and their respective positions must be documented to allow this requirement to be met.

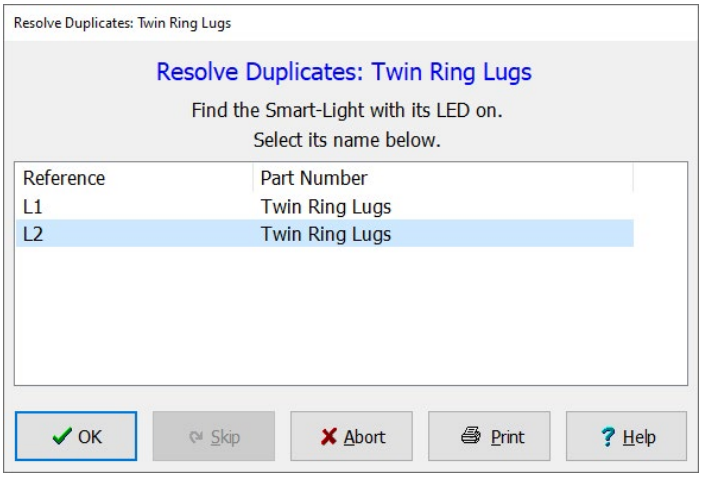
## 10.1.2 Testing with Smart-Lights

If Smart-Adapters are being used, they can be attached to the tester in any position. When the test session is started, the Easy-Wire software automatically scans the attached fixtures.

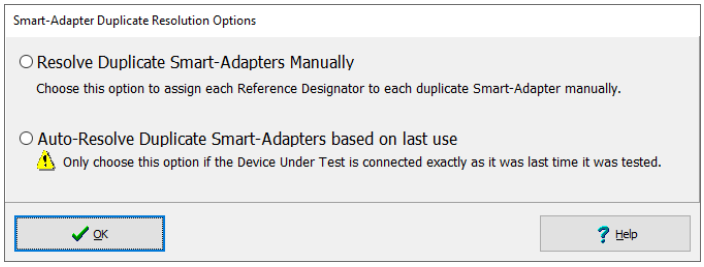
- If all the required Smart-Adapters are attached to the tester, and there are no duplicates, testing can proceed and the Test Window opens.
- If any of the required Smart-Adapters are not attached to the tester, a message will be displayed listing the missing adapters. The list can be printed for reference. Click **OK** to return to the Main Menu to repeat the process.




- If all of the required Smart-Adapters are attached to the tester, but one or more duplicates exist, a message will be displayed asking the user to resolve the duplicates by identifying the reference of each duplicate. It does this by lighting the green LED on one Smart-Light at a time and asking the user to select the associated adapter on the list of duplicates.




Users with the necessary security rights can configure the software to ask the operator if the duplicates should be automatically resolved. The operator should only choose this option if the DUT is connected exactly as it was the last time it was tested. To enable this option **Main Menu** > **Utilities** > **Setup System Options** > **Software Settings Tab** > check **Allow auto Smart-Adapter duplicate resolution**.



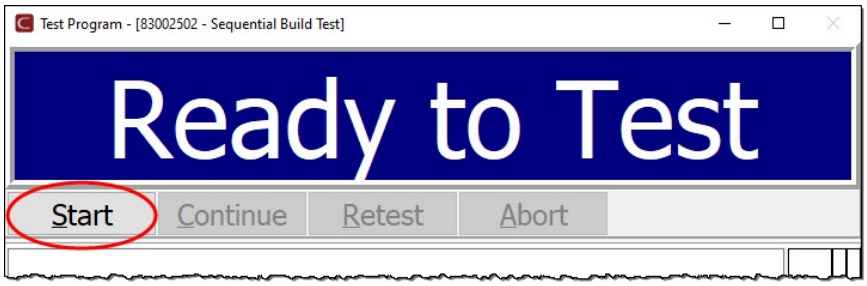
# 10.2 Test Window

## 10.2.1 Starting a Test

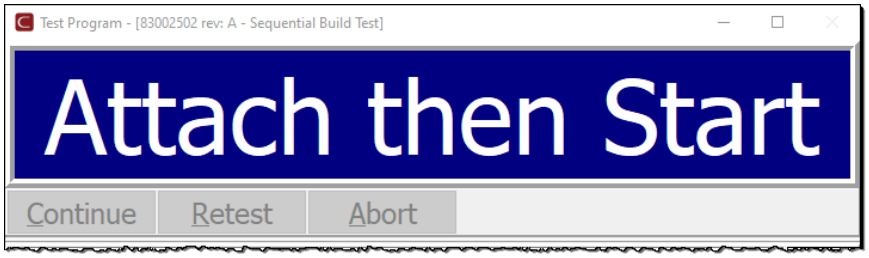
When beginning a test session, the Test Window will display a blue header with instructions for starting the test. The instruction will depend on the programmed start condition.

- **Start Button is Pressed** is the most common start condition used on the CR. It produces a **Ready to Test** header and an active **Start** button. Attach the product then click **Start** to begin the test.

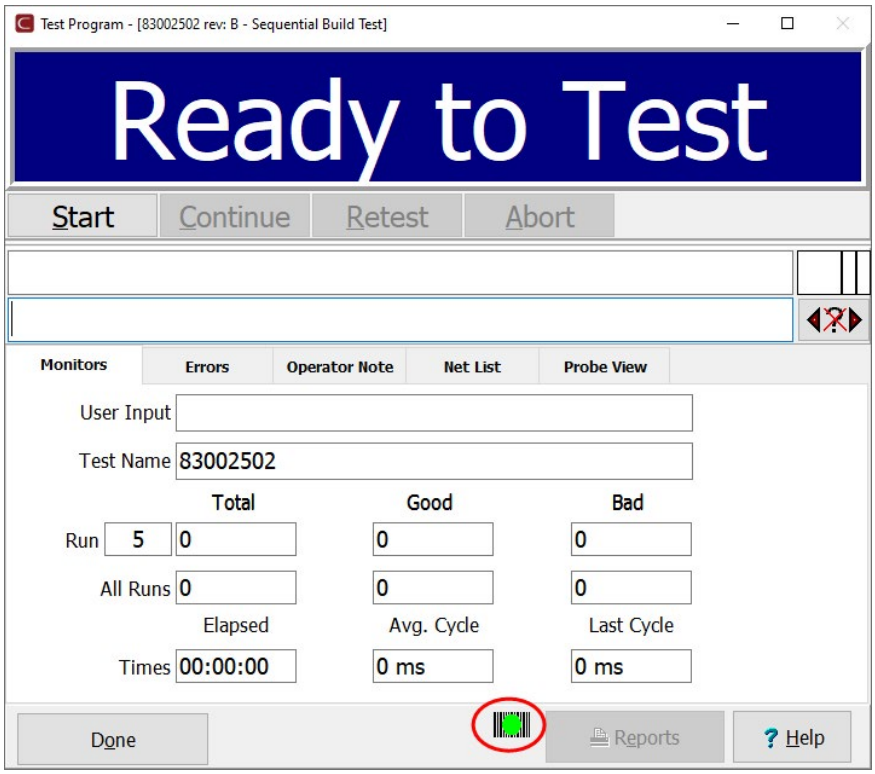
  ***Note**: Instead of clicking the Start button, pressing **Alt + S** on the keyboard or using a foot pedal or other button programmed to emulate **Alt + S** keystrokes will start a test. Scanning the "Start" barcode described in the Easy-Wire Help will also start a test (search **Test Button Barcodes**).*




- **Assembly is Attached** can be used for simple assemblies to speed throughput. The header reads **Attach then Start**. Attach the product to begin the test automatically.




- When **Barcode is Scanned** is the programmed start condition, the Test Window displays a **Ready to Test** header and a scan barcode icon in the lower section of the window. The start button is also active. The test starts when the serial number barcode is scanned. The serial number is saved to the database with the test results. If the start button is clicked instead, the test will start and the serial number input will be requested at the end of the test.



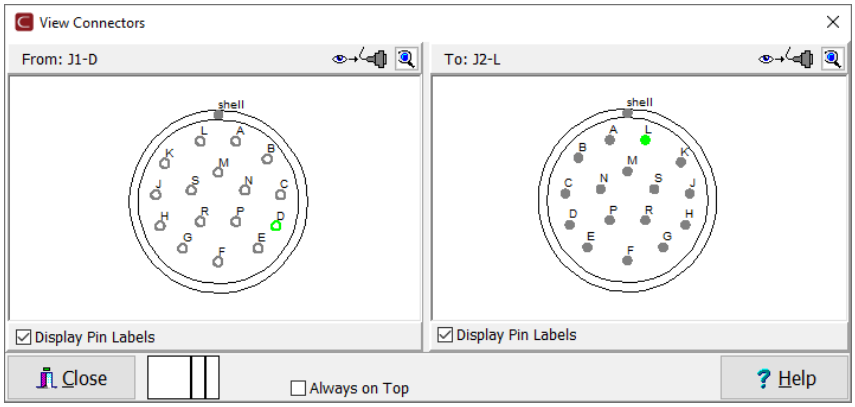

***Note**: Tests can also be started using Digital I/O or Windows Messaging. See the Easy-Wire Help for additional information.*

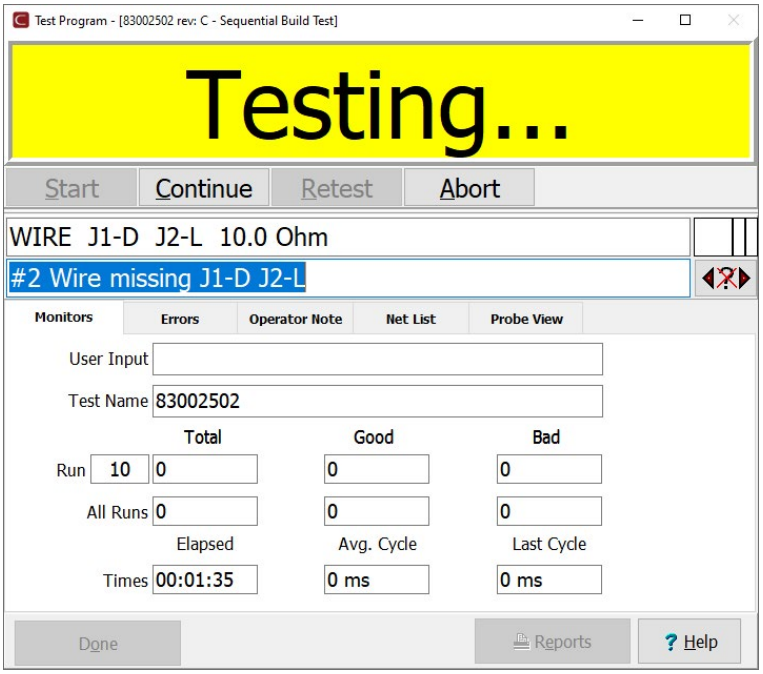
## 10.2.2 Test Process

There are a few key points that help make the testing process easier to understand.

- The Easy-Wire software gives the test programmer a variety of Test Method options (see *page 52*). These methods control the testing process and present the user with slightly different ways of interacting with the tester. The active Test Method is displayed at the top of the Test Window following the Test Name and Revision Level. However, the Test Method names can be misleading as there is some overlap in their use. For example, the Sequential Build Test Method implies that the guided assembly capability of the tester is being used, but it can just as readily be used to present the test operator with instructions during testing (for example, when testing assemblies with switches). It can also be used for a end-of-line test.

- When using Build Test Methods, the test program will stop at the first incomplete instruction, display the instruction in the Test Window, and show the associated connector graphics in a separate window. Sequential Build Test Methods force the operator to follow a sequential process. Random Build Methods allow the user to contact the pin/contact of a wire connected to the tester using the probe or touching it while wearing a wrist strap to move to the associated instruction for second-end pinning (defined in the Glossary *page 102*).



# 10.3 Test Results

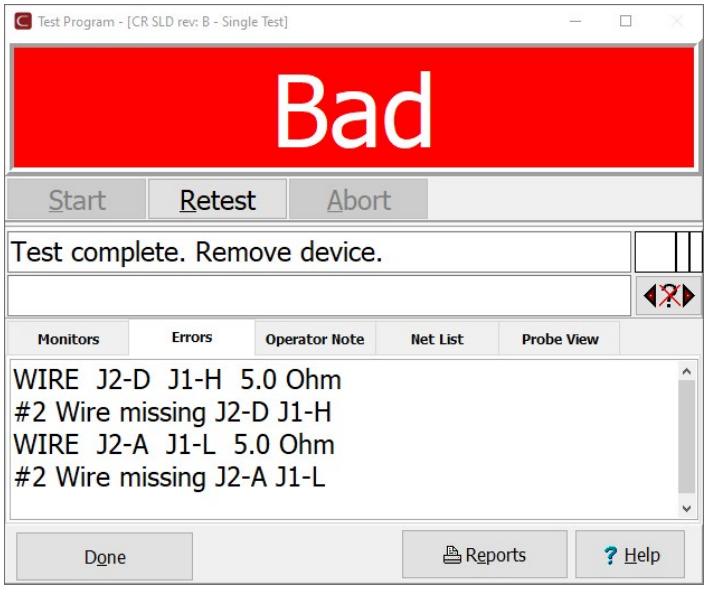
The way in which errors are reported varies depending on the Test Method.

- Sequential Build, Sequential Build (Loose Wires), Random Build, Random Build (Loose Wires), Single Pass Build, and the Continuous Test methods stop at the first incomplete instruction or error and gives the user the opportunity to correct the condition before continuing.
- The Single Test method reports errors at the end of the test.
- The  Single Test Repeat reports errors at the end of each pass with a summary displayed at the end after repeating the test the designated number of times.

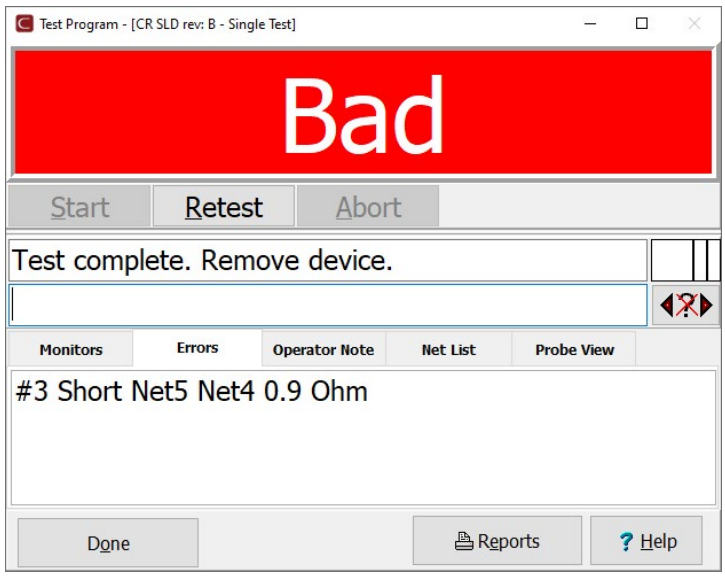
## 10.3.1 Errors

Depending on the programmed Test Method, the error messages may be accompanied by the connector graphics with the error position highlighted.

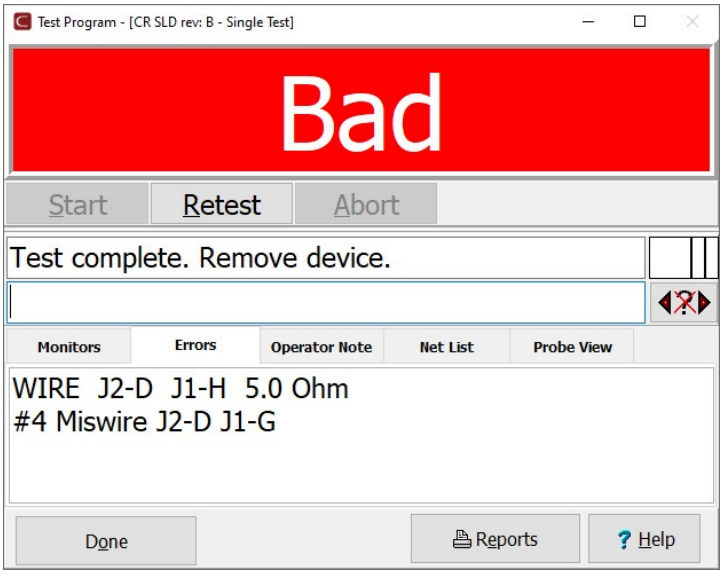
**Open** indicates that a gap exists in an intended electrical path across which current cannot pass. This is displayed as **Wire missing** error with the intended **From** and **To** points.



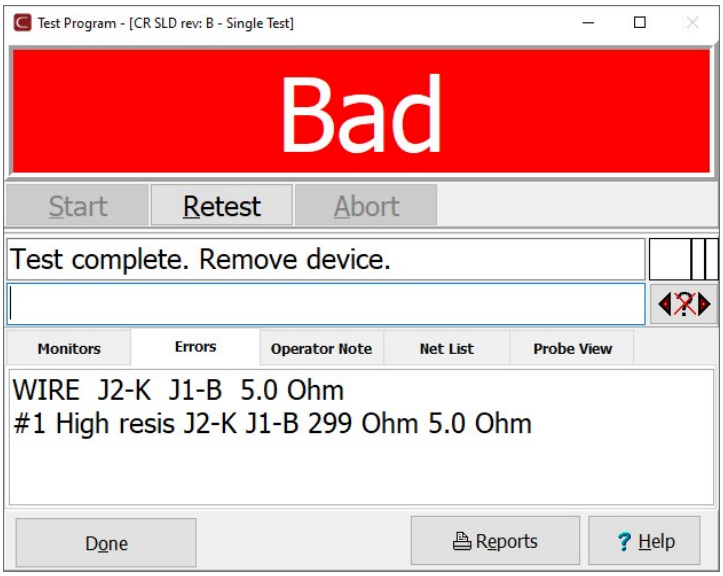

**Short** indicates that an unintended connection exists between two or more nets and/or single points.



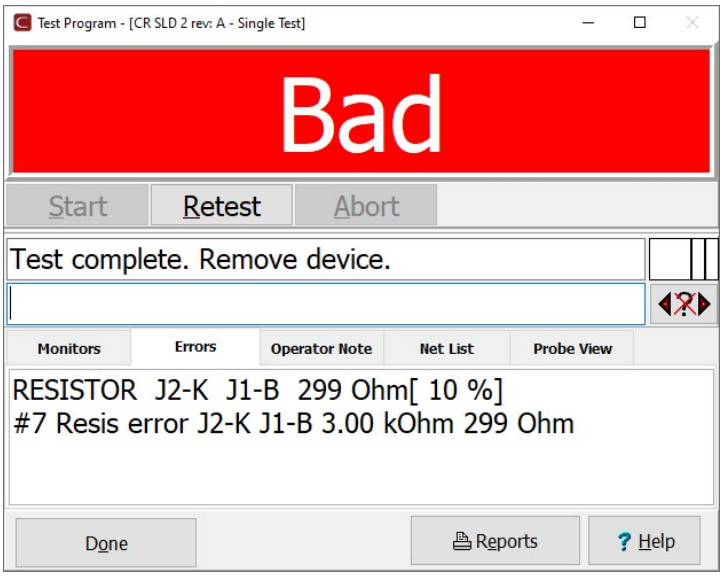
**Miswire** is a combination of an open error and a short error and indicates that an intended connection is missing and an unintended connection exists instead. In the error message, the intended connection is displayed with the miswire shown on the line below.




**High Resistance** indicates that the resistance of an intended connection measures greater than the pass/fail threshold of the WIRE test, but less than the low voltage insulation resistance threshold, which means that it's not a complete open.

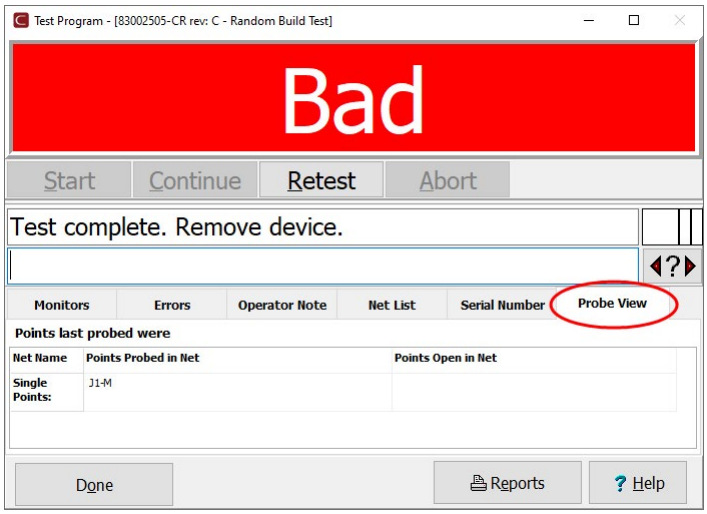



**Component Errors** indicate that a component is measuring outside of its programmed tolerance range. The error message includes the expected value and the measured value.



## 10.3.2 Probe

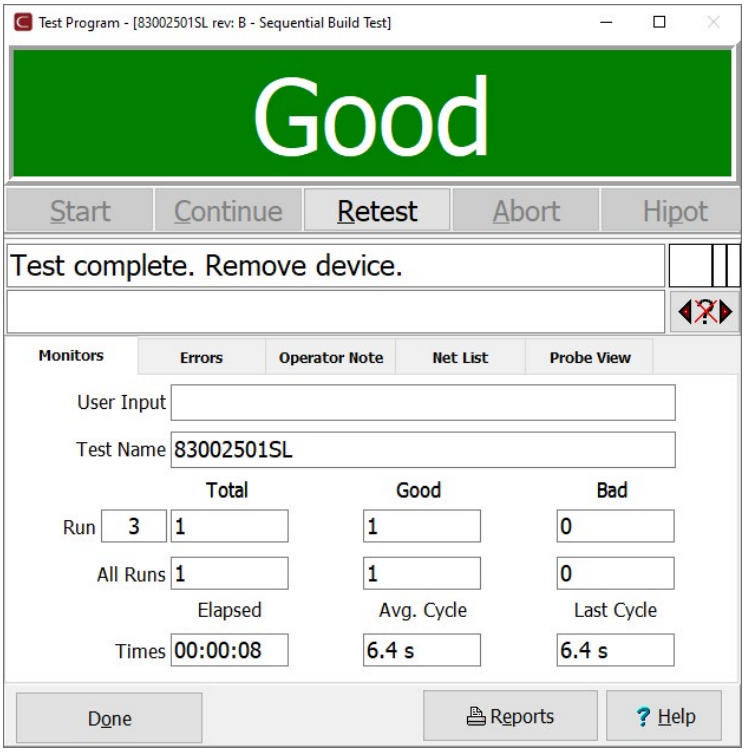
The probe can be a useful tool when trouble-shooting errors. When the probe is used after a test has failed and with the product still attached, the Test Window automatically switches to the **Probe View** tab and displays the point(s) touched by the probe.



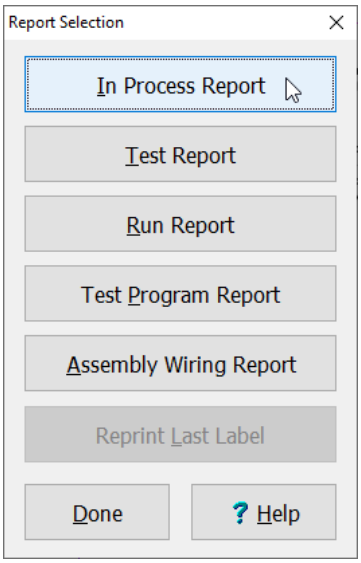

## 10.3.3 Pass Condition

If the test passes, the software will display a green **Good** header with a notice that the test is complete and instructions to remove the device.

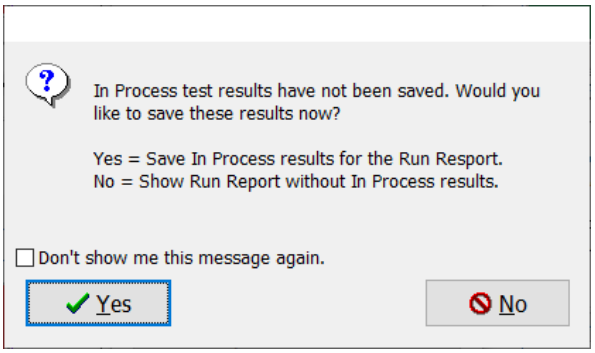
If the Test Report or Test Label was programmed to print or export automatically, it will do so when the DUT is removed from the tester. All test results data will be saved to the Easy-Wire database at the same time.



The In-Process Report can be printed until the DUT is disconnected by clicking the **Reports** button in the Test Window and selecting **In Process Report** on the menu that opens.

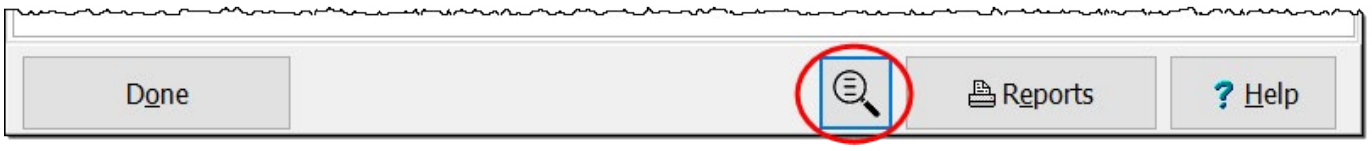



Selecting another report will prompt the user to save the In Process report before access is granted.




## 10.4 Analyze Instructions

Added in Easy-Wire version 2022.3.1, the Analyze Test Instructions function is accessible from the Test Window and from the Define Instructions tab of the Test Program Editor by selecting the Magnifying glass icon. It's primary function is to validate/debug test programs and to troubleshoot test failures by performing a specified subset of the active program's instructions and returning the results.




See *page 61* for usage tips.

# 11. Guided Assembly

One of the unique and powerful features of the Easy-Wire software is its guided assembly capability. When used with the CR tester, the process provides both testing and zero-defect assembly into one affordable package. Portions of the material covered in this section have been mentioned previously, but here the focus is on how these key topics interact with the test-while-building process.

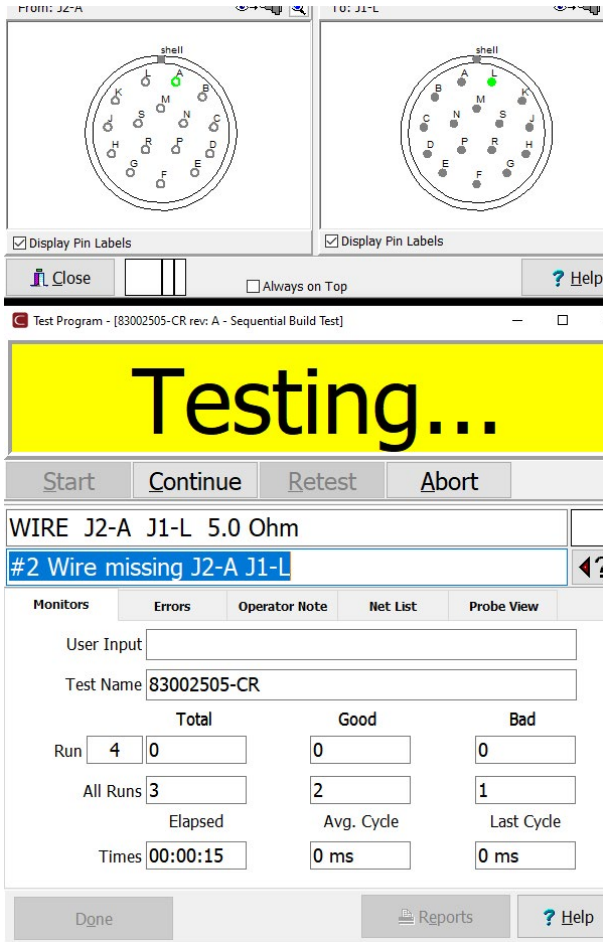
## 11.1 Overview

As described on *page 52*, the software can be programmed to test using a number of different methods, including five Build Test Methods:

- Sequential Build Test
- Sequential Build (Loose Wires)
- Random Build Test
- Random Build (Loose Wires)
- Single Pass Build

The build methods are designed to provide operator guidance for the assembly process using on-screen instructions, connector graphics, audible instructions, and immediate audible and visual feedback to confirm proper execution or to indicate errors. Operators are given the opportunity, and the information needed, to correct mistakes as they happen providing for an error-free final assembly.

Applications include wire harness assemblies but can also include a wide variety of complex assemblies in which operators are making electrical terminations.



## 11.2 Build Test Methods

As mentioned above, the Easy-Wire Test Methods are fully described starting on *page 52*. Here, we'll focus on the two most widely used Build Methods, the Sequential Build and the Random Build and their Loose Wires counterparts. The remaining build method, the Single Pass Build Test, is only used in special circumstances, however, it's very similar to the Sequential Build method with a single difference described on *page 53*.

Briefly, the **Sequential Build** methods provide assembly instructions in the sequence defined in the test program. These methods are often preferred for assembling densely-populated connectors, where it's best to start pinning at the center and work outward to ensure access to the pinning positions as the assembly continues. They also support the use of comment instructions intermingled with connection instructions to provide supplementary guidance to assemblers, such as direction to install a cable tie at a specified location.

The **Random Build** methods allow the assembler to determine the build sequence. With the first end of an assembly populated and connected to the tester, the assembler can touch any conductor with the probe or while wearing a wrist strap connected to the tester's probe jack to advance to the corresponding instruction. This process continues until all the instructions have been completed.

The **Loose Wires** versions of the Sequential and Random Test Methods are used when unterminated conductors inadvertently touch during the assembly process. A common example of this issue occurs when a group of unterminated wires with stripped ends or installed contacts randomly contact each other during the assembly process. By default, the tester performs complete shorts testing during the assembly process, which can result nuisance shorts error messages in such circumstances. The Loose Wires versions of the Build Test Methods checks each termination as the active instruction is processed but eliminates the nuisance errors by delaying the complete shorts test until the end of the assembly when all the instructions have been completed.

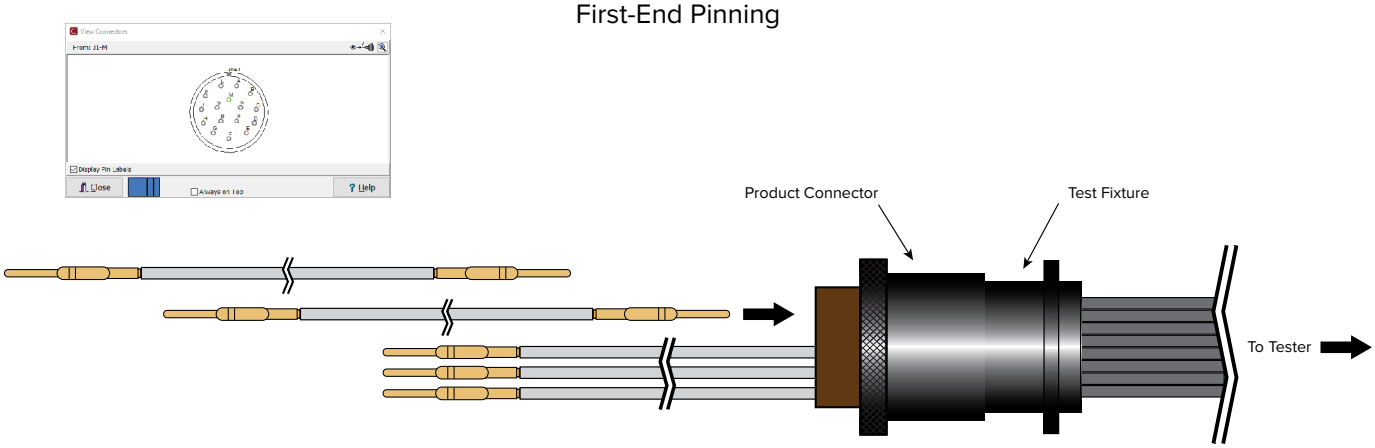
## 11.3 First-End Pinning

First-end pinning refers to building the first connector(s) in an assembly. Some designs require that wires with distinctive characteristics be terminated in specific positions in a connector. For example, wires can be different colors, be different lengths, or have unique labels. In such applications, the CR **Install Pin** instruction can be used to assist assemblers by providing directions and verifying the proper placement of each wire with capacitance measurements.

Either the Sequential or Random Build Method can be used. The Sequential method instructs the assembler which wire is to be used in each step and verifies its proper placement. Using the Random method, the assembler enters a wire's label, by keyboard entry or barcode scan, and the program advances to the corresponding instruction.

First-end pinning can be performed as part of the full guided assembly and test that results in a finished and tested product, but it is typically performed one connector at a time. For first-end pinning the connector being assembled must be connected to the tester through fixturing.

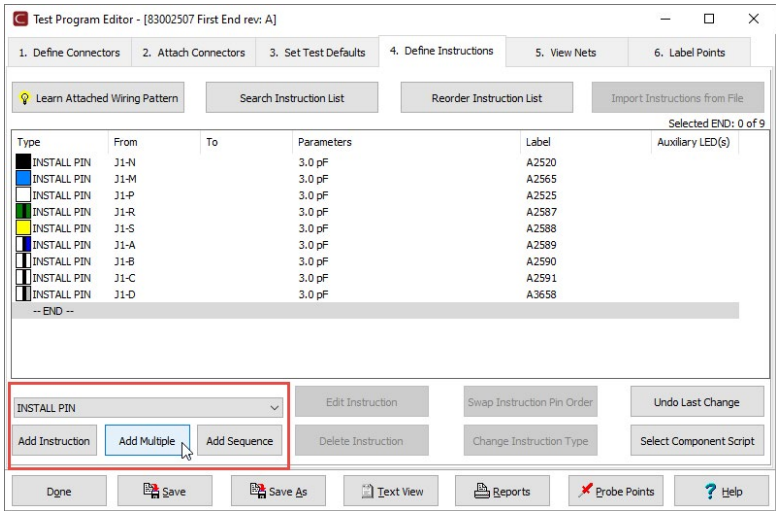
First-End Pinning



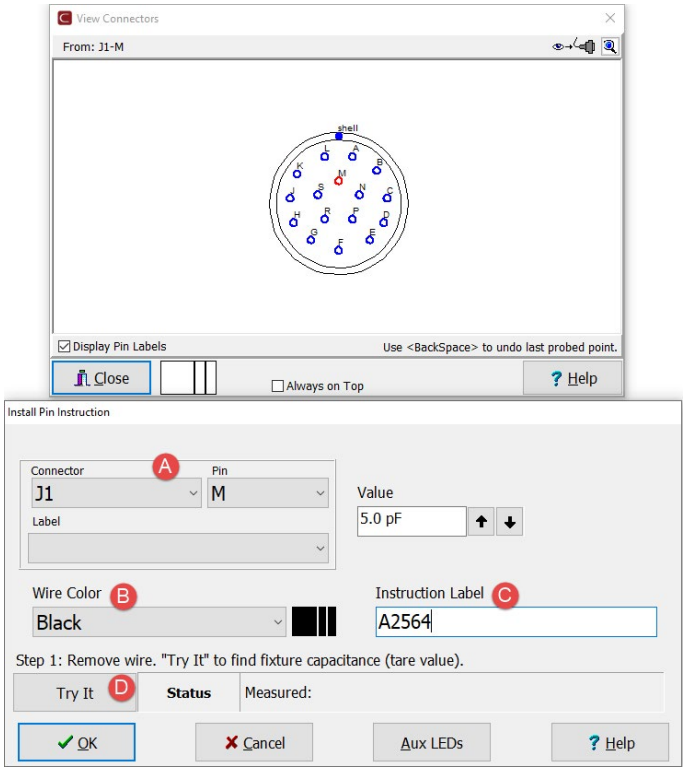
## 11.3.1 First-End Programming

Adding each Install Pin instruction is a multi-step process.

1. Under the Define Instructions Tab, select **Install Pin** from the instruction type drop down list and select **Add Multiple** to open the Install Pin Instruction window.




2. In the Install Pin Instruction window:




   **A.** Select a **Connector** and **Pin** from the corresponding drop down lists (typically only one connector is built at a time, so only one connector will be in the drop down list).

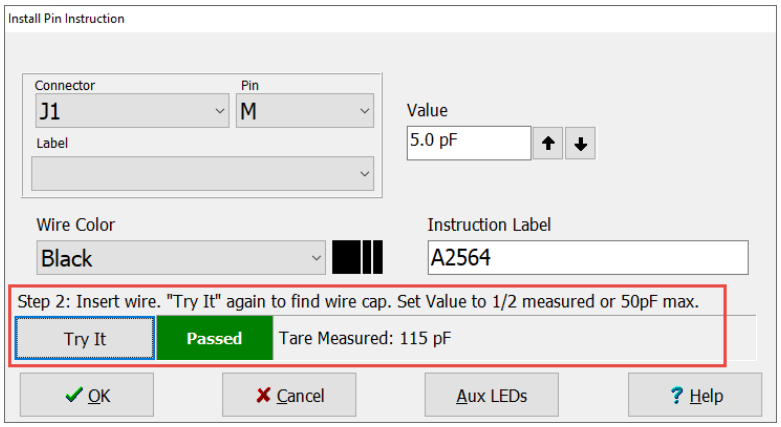
   **B.** If appropriate select a **Wire Color** from the drop down list. To add new colors to the library **Main Menu** > **Utilities** > **Wire Color Library**.

   **C.** Add an **Instruction Label**. The Instruction Label is the Wire Label that the assembler will enter if using the Random Build Test Method or it will be the Wire Label presented to the assembler to identify a wire when using the Sequential Build Test Method.

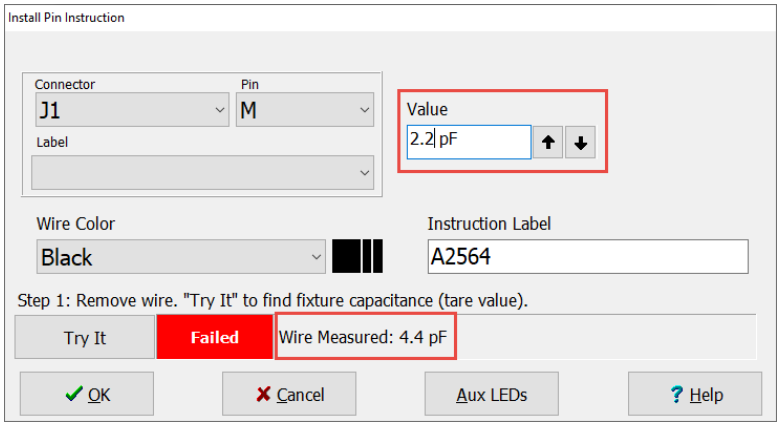
   The Wire Label must be unique, but if multiple wires share the same characteristics, a unique suffix can be added for assembly purposes. For example, “48” #1”.

   **D.** As noted in the instruction window, ensure the wire is not installed in the connector and select **Try It** to prompt the tester to perform a capacitance measurement to establish a tare value for the test fixture and product connector.

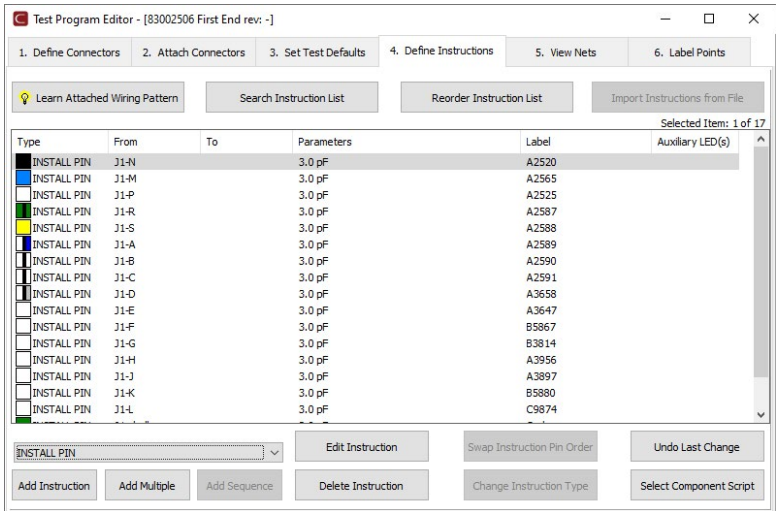
3. The tester reports the Tare Measurement. Install the wire and press **Try It** again.



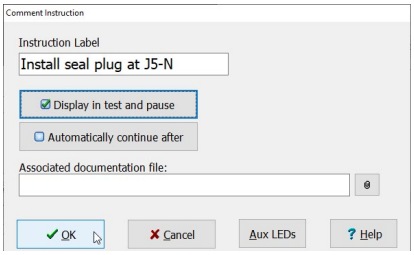

4. Enter a value about half the measured value. (The software rounds entries up to the full pF values.) During the assembly process the tester will validate proper placement if the measured capacitance is greater than the value entered. Using a pass/value threshold about half the measured value provides a reasonable tolerance for this purpose.




5. Continue adding Install Pin instructions until the assembly is complete. Press Cancel on the unused instruction window at the end to return to the Define Instructions tab.

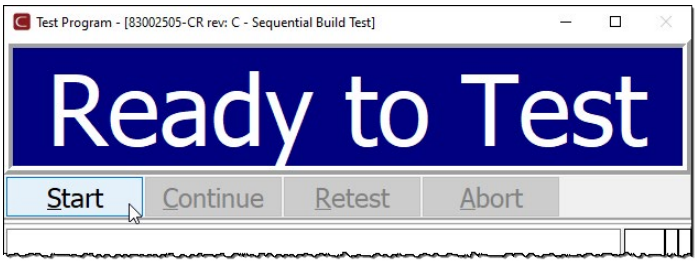



6. Comment instructions can be used to direct assemblers to insert seal plugs. No test is associated with Comment instructions.



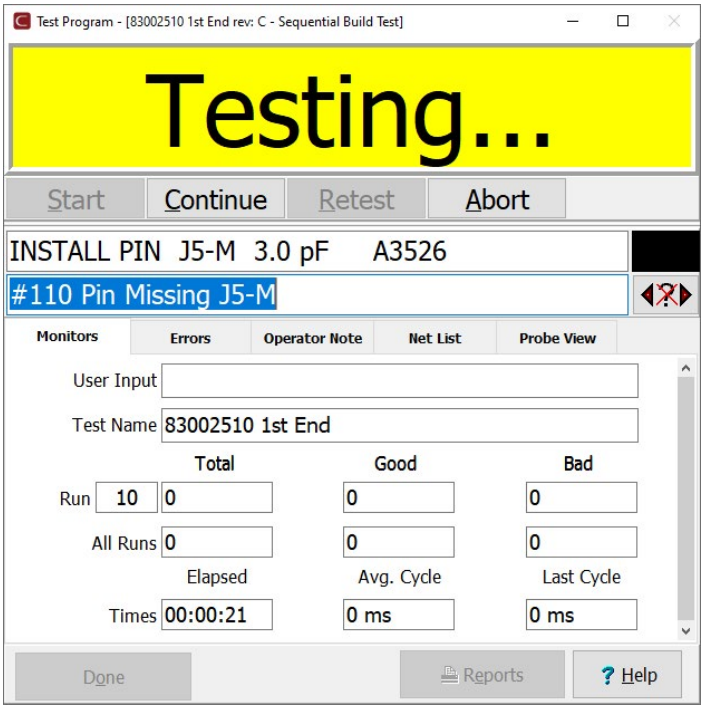
## 11.3.2 First-End Assembly Process

Before clicking **Start** in the Test Window to begin the build process, ensure that the test fixture is connected to the tester and that the product connector is attached to the fixture. Also, ensure that no wires have been installed in the product connector. This is important because each time the test is loaded, the tester performs capacitance measurements of the setup to calculate the fixture tare values.




The software will proceed to the first instruction. In the Sequential Test Method, the operator follows the sequence established in the test program. In the Random Build Test Method, the operator can determine the sequence by entering the Wire Label by keyboard entry or by scanning a barcode.

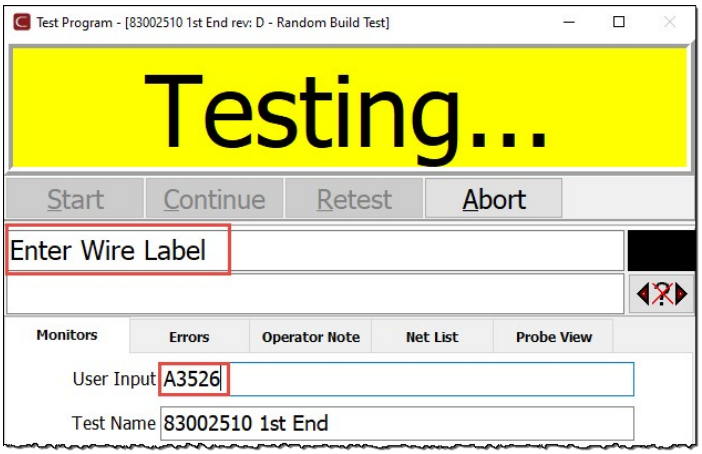

- The Test Window displays a yellow **Testing...** header.
- The active instruction is displayed - **INSTALL PIN J5-M 3.0 PF A3526** in the example shown. **A3526** is the Wire Label.
- The status of the active instruction is displayed - **#110 Wire Missing J5-M** in the example shown.
- The connector graphic highlights the position associated with the instruction in green. Pins associated with completed instructions are shown in blue.



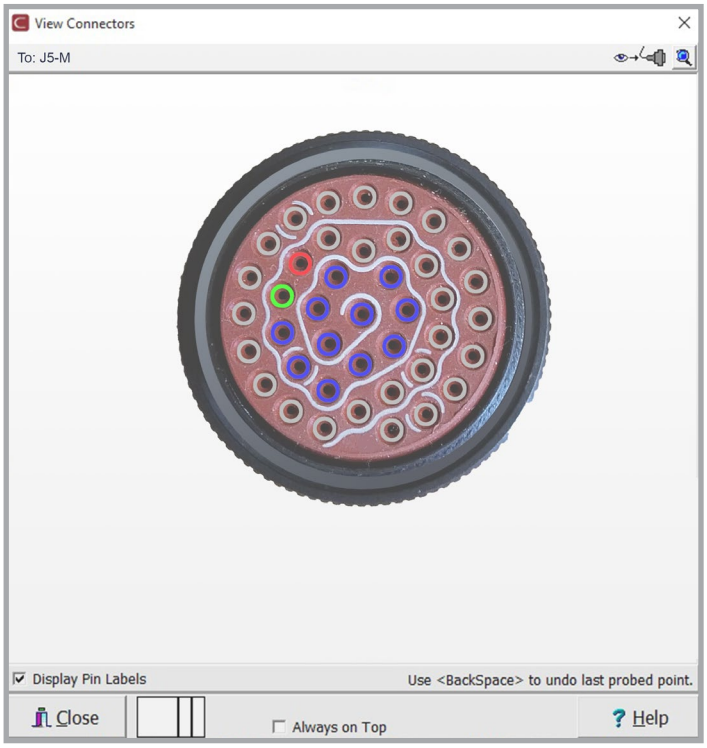
In the Random Build Test Method, the Test Window will prompt the assembler to enter a **Wire Label** to advance to the corresponding instruction.

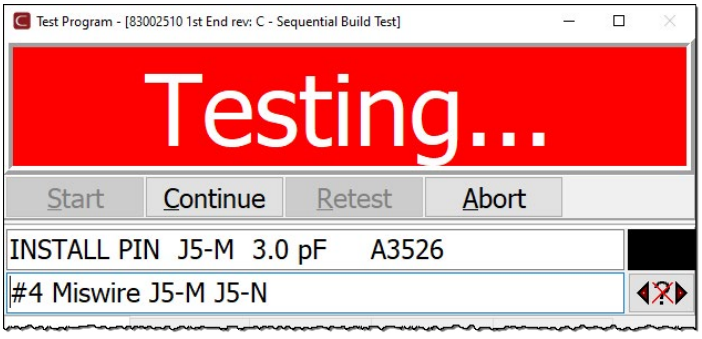
Selecting **Continue** advances to the next instruction. In a Sequential Build the skipped instruction is moved to the end of the instruction list. In a Random Build the assembler can enter another Wire Label. The test will not pass with an incomplete instruction.

If the instruction is completed successfully, the software advances to the next instruction. In Random Build, the assembler enters a new label.

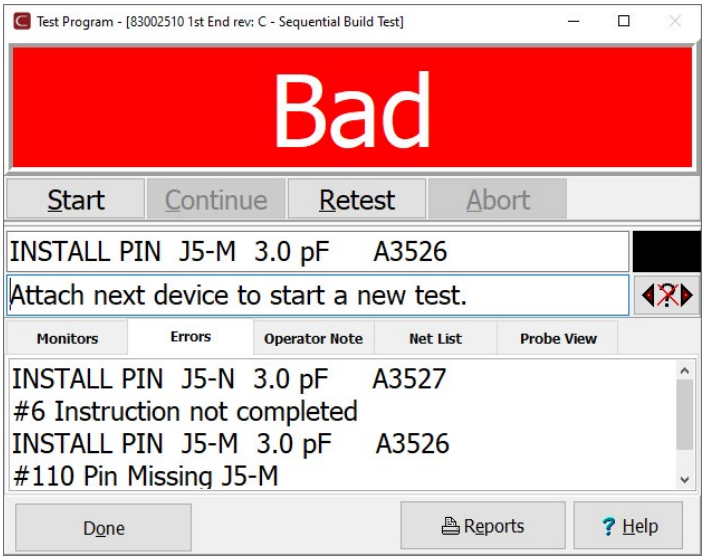



Installing the wire in the wrong location results in a Miswire error and the position associated with the error is highlighted in red in the connector graphic.

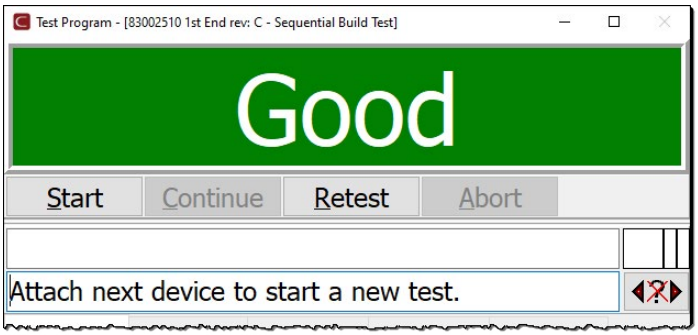


Selecting **Abort** terminates the test in a failure and displays the errors.

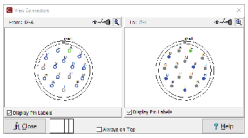



Completing all the instructions successfully produces a Pass (Good) result.

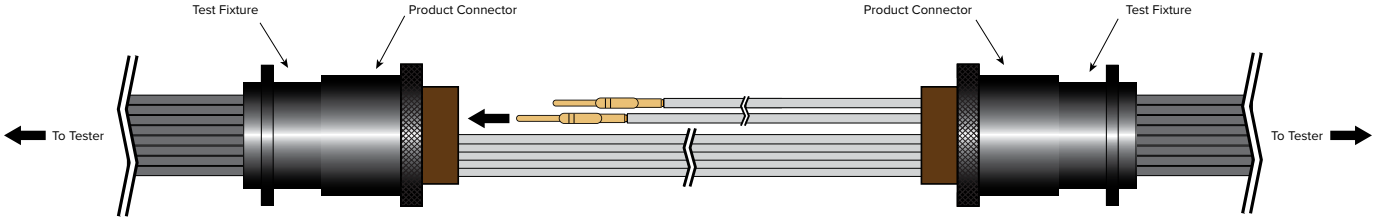


# 11.4 Second-End Pinning

Second-end pinning is build-while-testing, guided assembly that results in a completely assembled and electrically tested product. Although the description includes the term “second-end” the product can include any number of connectors and terminations. It can be performed in combination with first-end pinning or it can be performed separately after first-end connectors have been wired. As the first and second end of instructions are presented to assemblers, it’s not a requirement to use a separate Install Pin instruction as described in the previous section with Second-End Guided Assembly.



Guided Assembly
(Second-End Pinning)

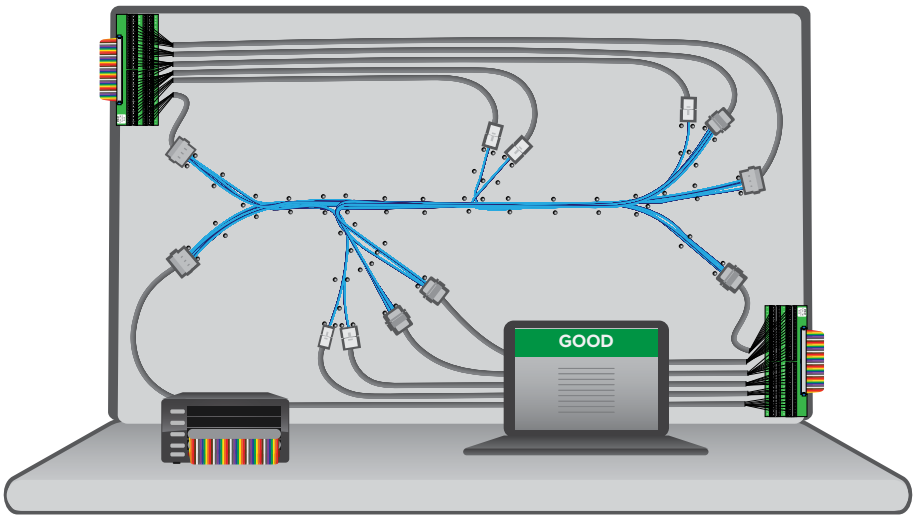



## 11.4.1 Fixturing

Guided assembly is often performed using harness boards or form boards. However, as the capability can be used with a wide variety of products, fixturing also varies widely. The only firm rule is that each position in the product connectors are back-wired to individual test points. Both Traditional Fixturing and Smart Fixturing can be used in Guided Assembly applications.

### Traditional Fixturing

Traditional Fixturing is frequently built using Screw Terminal Transition Boards (P/N ETB-ST) or Screwless Terminal (Spring Terminal) Transition Boards (P/N ETB-SLT) where the fixture wiring is permanent and the transition boards are mounted to the fixture. In such a configuration, the test setup is broken down by disconnecting the cables that connect the tester to the transition boards. For subsequent test/build sessions the transition boards have to be reconnected to the tester in the same sequence. For that reason, the boards are often marked with the tester positions to which they connect using sequence numbers such as J1, J2, J3 etc. Traditional fixtures are typically stored between test/build lots.



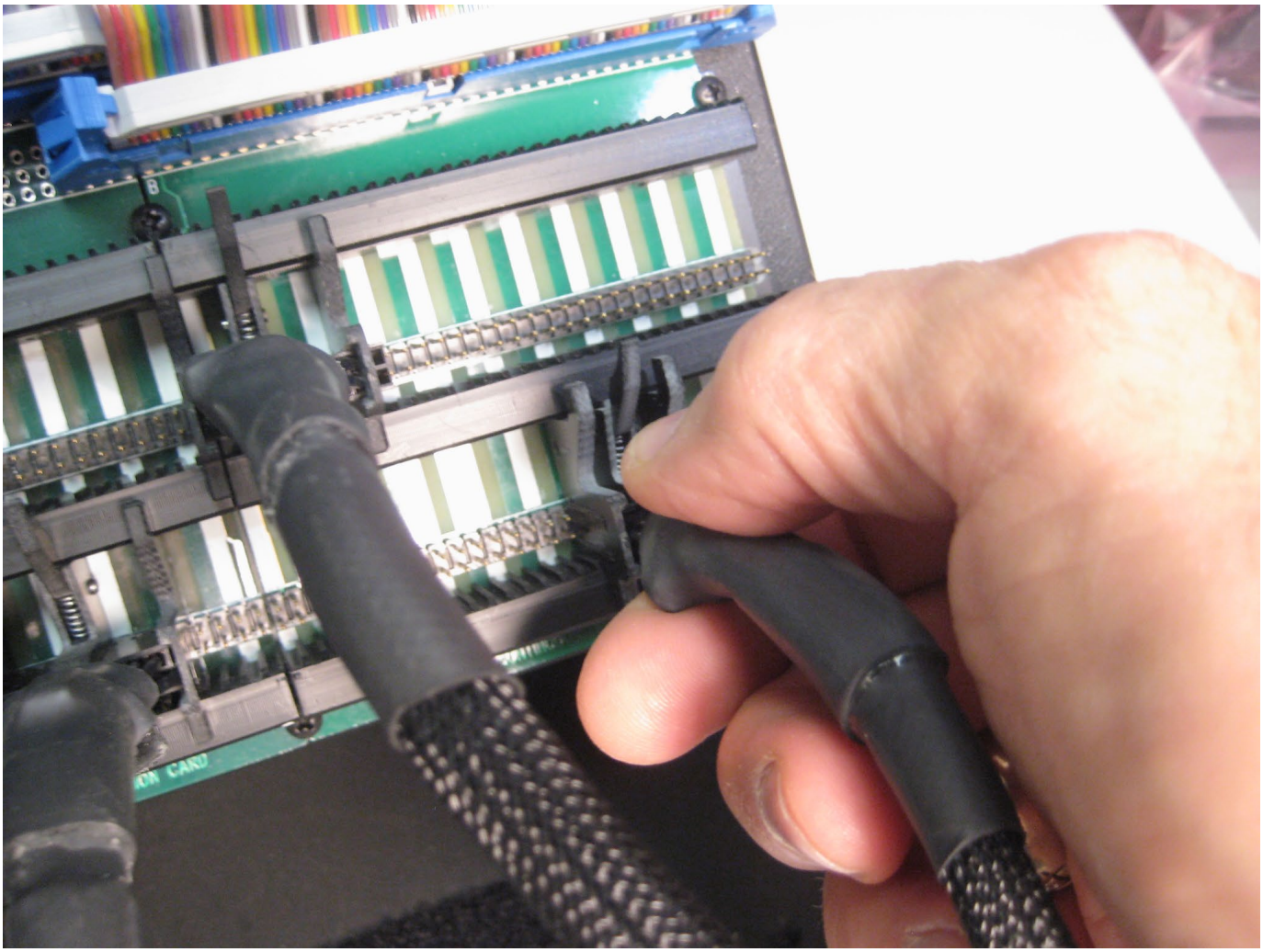
**Smart Fixturing**

See *page 32* for a full description of Smart-Lights and Smart-Fixtures.

One of the benefits of Smart Fixturing is that setting up for test/build sessions is dramatically simplified because the fixtures can be connected to the tester in random order. Therefore, instead of storing the dedicated tester/product interface fully assembled, as done with traditional fixturing, test setups that use Smart Fixtures are often disassembled, or partially disassembled, after each build cycle. This allows the Smart Fixture hardware to be reused in other applications, while product-specific portions of the fixturing, like the form board, can be stored for later use.

Header Strip Transition Boards (P/N ETB-HS) are purpose-designed for this use and offer two main benefits. First, making connections is quick and easy. Second, because connectors that mate with the header strips are available in various sizes, test cables can be simplified with only one product-mating connector per assembly without concern for wasted test points. Also, Header Strip Transition Boards can be positioned side-by-side to assemble continuous header rows without segment breaks. Once again this helps conserve test points as mating connectors can bridge the gap between boards. See the Cirris web site for additional information.

Breaking down the Smart Fixture portion of the setup consists of removing the test cables from the transition boards. Header Strip Transition Boards can be mounted on dedicated product fixtures, but are more frequently mounted separately to allow for constant use. As an option, grid tile harness boards and associated fixtures can be used for setting up product-specific routing guides and termination points. Grid tile boards allow for regular tear down and set up. See the Cirris Web Site for more information on harness board fixturing using grid tiles.



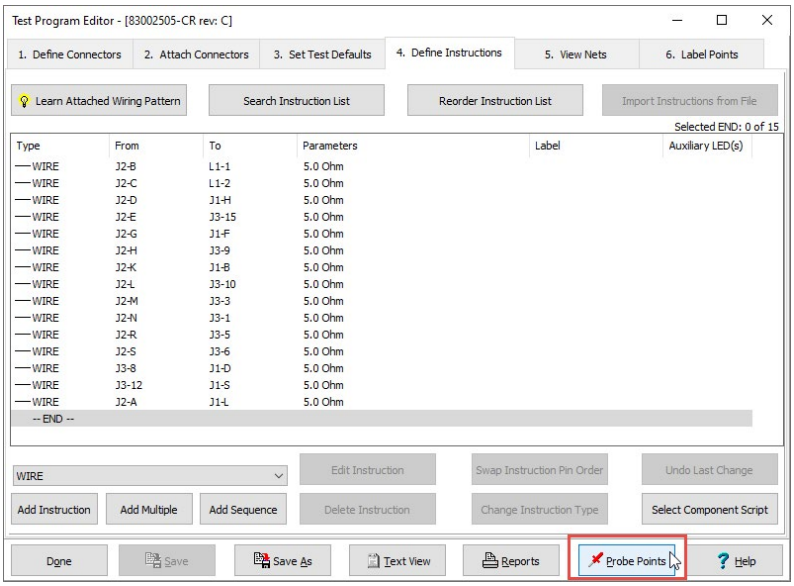
## 11.4.2 Programming

Programming a Guided Assembly test follows the same process described earlier in this manual. However, a few key items, reiterated and expanded here, can help optimize the build and test process.

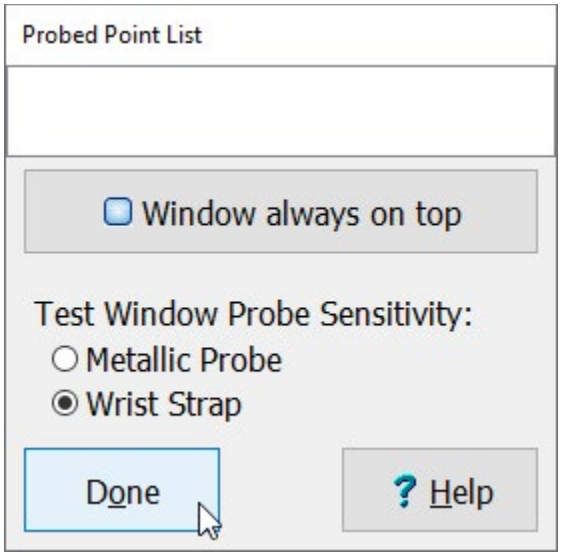
### Probe or Wrist Strap

When performing guided assembly using a Random Build Test Method, the assembler determines the order of the instructions by touching a wire's conductor using a probe, or while wearing a wrist strap connected to the tester's probe port, to advance to the corresponding instruction. The sensitivity of the probing function is set in the test program to accommodate either the probe or the wrist strap. Using the wrist strap, the tester expects to detect a higher resistance through the assembler.

In the Test Program Editor, select **Probe Points** in the row of fixed icons at the bottom of the window.

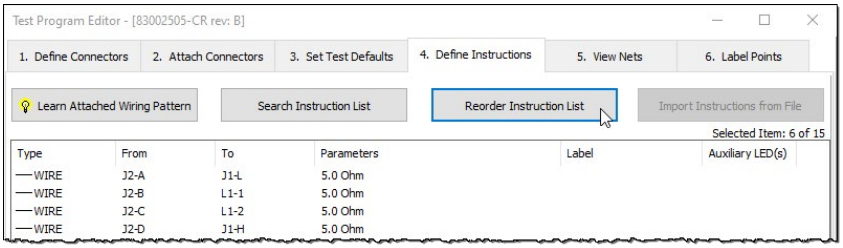



In the window that opens select the preferred **Test Window Probe Sensitivity** for the test program, then select **Done**.

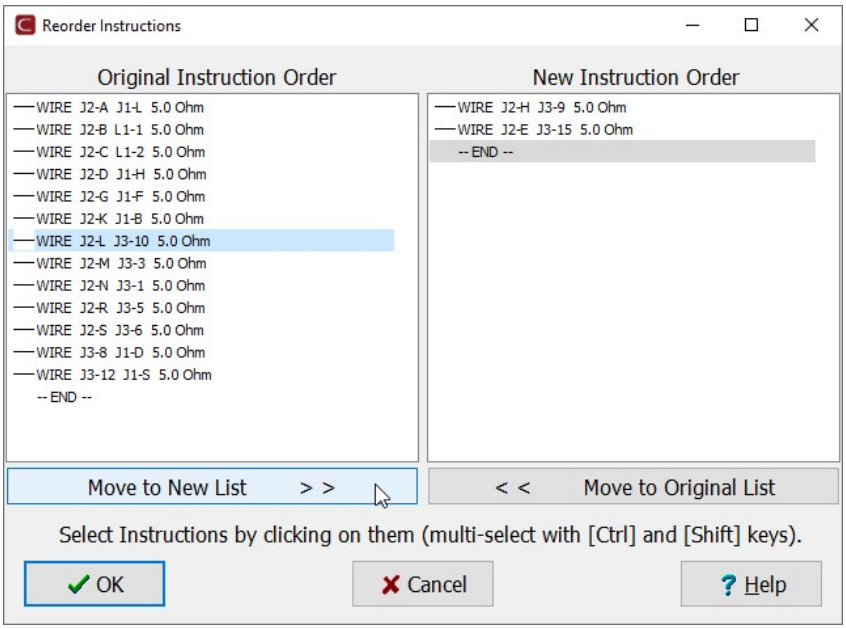


### Reordering Instructions

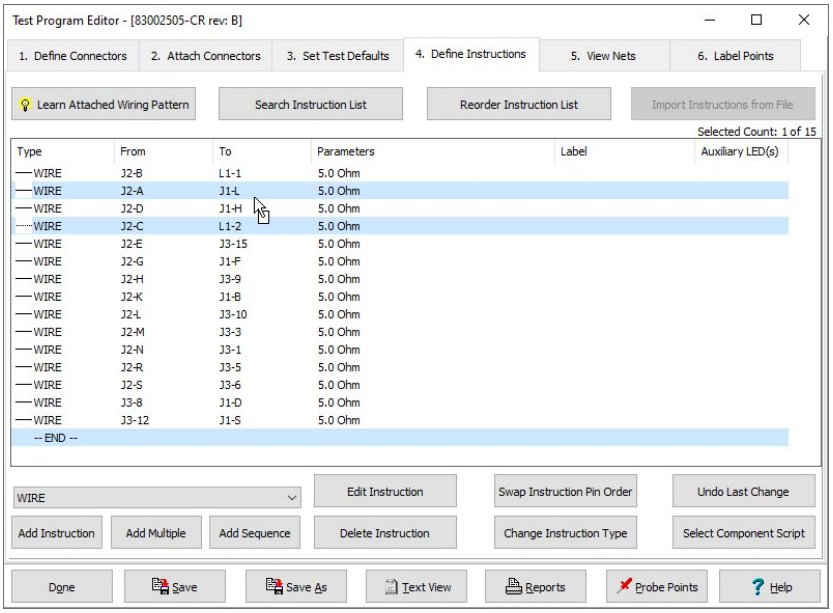
When using a Sequential Build Test Method, the instructions are presented to the assembler in the order set under the Define Instructions tab. Instructions can be arranged in the desired order by selecting **Reorder Instruction List**.




In the **Reorder Instructions Window,** highlight an instruction or a group of instructions in the **Original Instruction Order** pane and move them to the **New Instruction Order** list by selecting **Move to New List**. Continue until all the instructions have been moved.

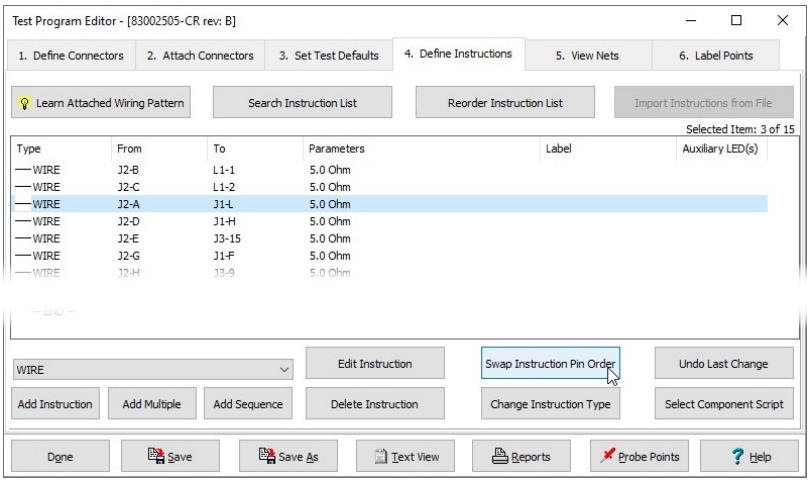



Instructions can also be moved under the Define Instructions tab using drag-and-drop.



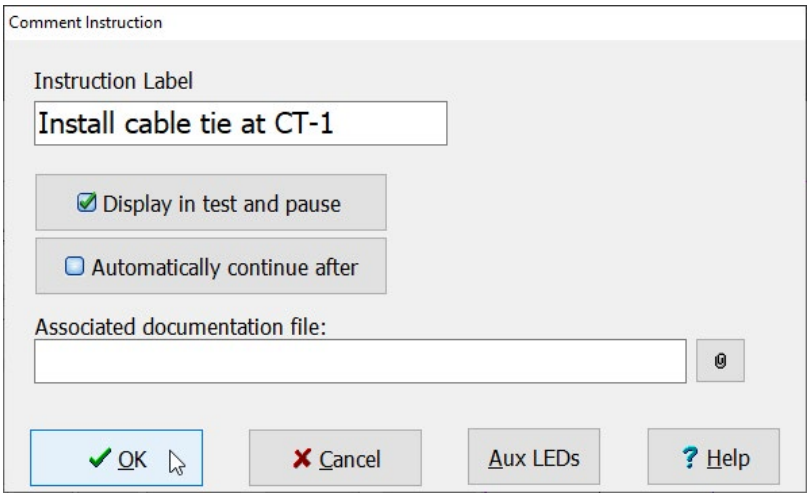
### Swapping the Pin Order

It's helpful for operators to be presented with a consistent instruction format. For that reason it's beneficial for the **FROM** point to be the first pinned end of an instruction and the **TO** point to be the second end. Electrically, it makes no difference to the tester, it only affects the guided assembly presentation. Pin order can be changed by highlighting an instruction or a group of instructions and selecting **Swap Pin Order**. The command is also available by right-clicking to open the fly-out menu.




### Comments

Comments can be used in Sequential Builds to provide instructions to assemblers. As there are no electrical tests associated with comments, they can't be brought up in a Random Build test after the operator touches a conductor. Therefore, comments only appear at the end of the assembly process in a Random Build.

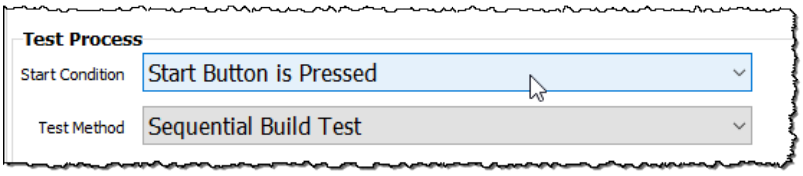



Like other instructions, Comments can be associated with auxiliary LEDs to guide assemblers to positions on a harness board, parts bins or other locations. Comments can also be programmed to open an associated file such as a graphic, text document, or video by clicking the paperclip icon and then navigating to, and selecting, the file.

Search **Auxiliary LEDs** in the Easy-Wire Help for more information the topic.

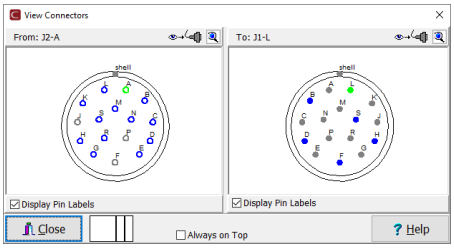
### Start Condition

Under the Set Test Defaults tab, the **Start Condition** for Guided Assembly tests is typically **Start Button is Pressed** as most often no connections exist at the beginning of the test so the tester can't recognize when an assembly is attached.



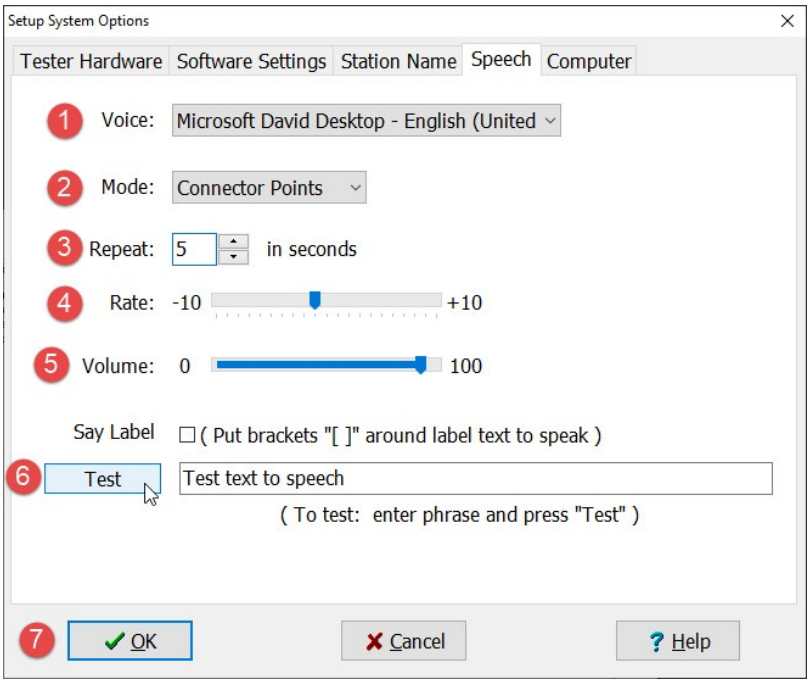

### Connector Graphics

Using connectors with graphics is indispensable for Guided Assembly. Pins associated with the active instruction are highlighted in green and errors are highlighted in red.



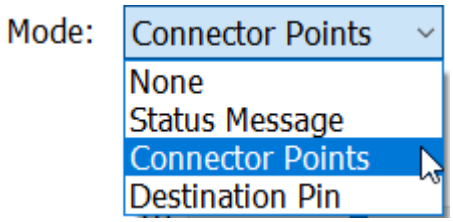
### Text to Speech

In noisy manufacturing environments, Bluetooth® earbuds can be a useful accessory as the tester provides immediate, audible feedback during the assembly process, including tones signifying “Good” and “Bad” connections. As an option, the software can also provide information about the active instruction using text-to-speech technology. To enable the capability, from the **Main Menu** > **Setup System Options** > **Speech** tab.




Under the **Speech** tab:

1. Select the desired **Voice** from the drop down menu.
2. Select the desired **Mode** from the drop down menu.



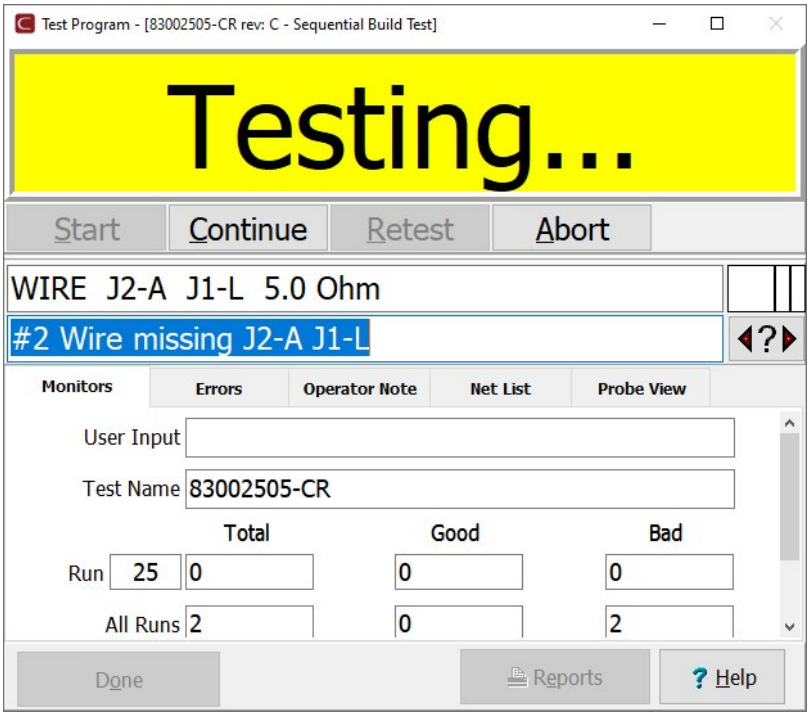

   **None** means that no voice prompts will be provided.

   **Status Message** repeats the test status of the active instruction - **Wire missing J2 Pin A  J1 Pin L** in the example shown.

   **Connector Points** repeats the FROM and TO points associated with the active instruction - **J2 Pin A to J1 Pin L** in the example shown.

   **Destination Pin** repeats the TO pin - **L** in the example shown.

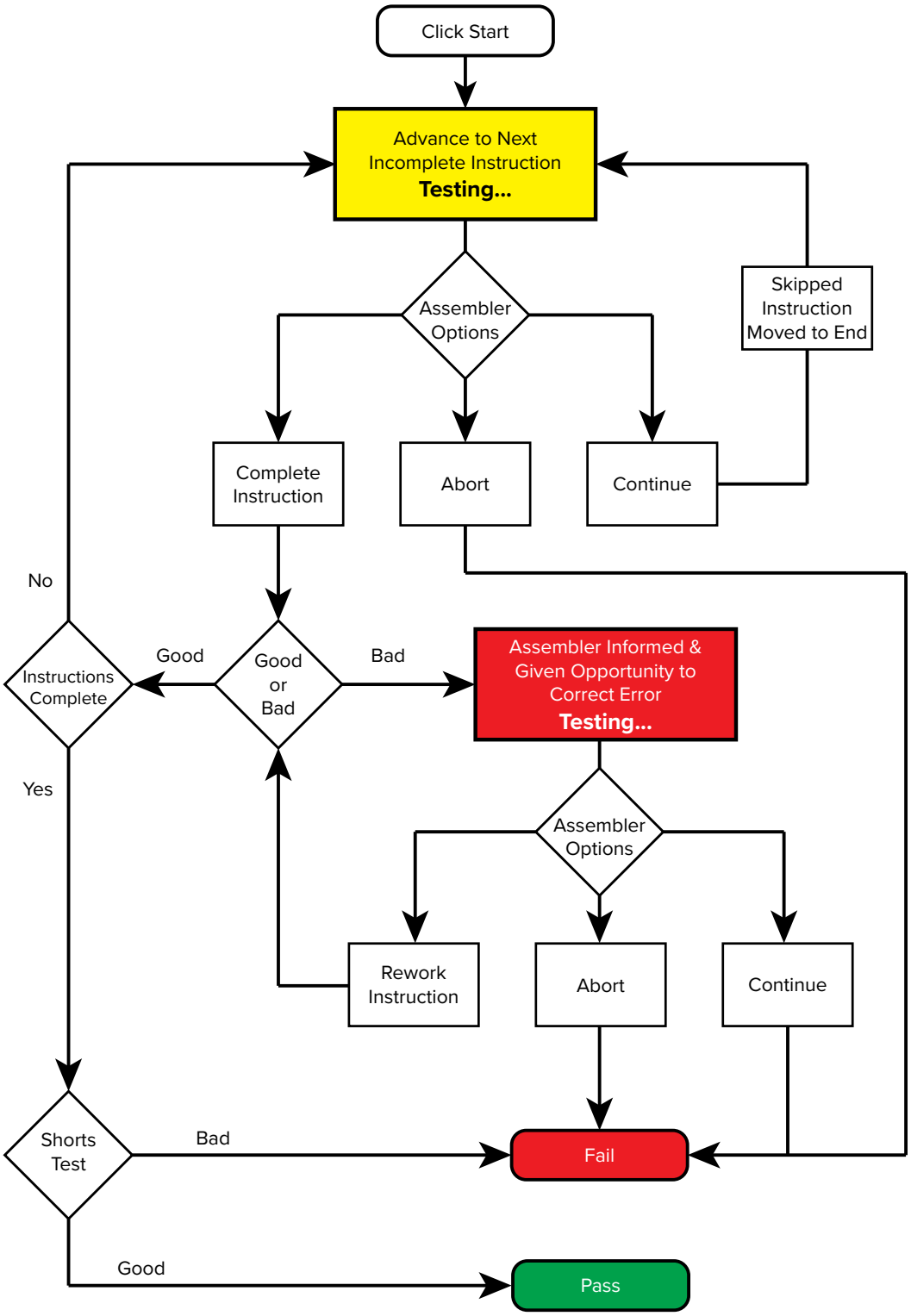
3. **Repeat** controls the time between the repeating instruction.
4. **Rate** controls the speed of the speech.
5. **Volume** controls the volume of the speech.
6. To try the settings, type a phrase in the text box and click **Test**.
7. Select **OK** to accept the settings.



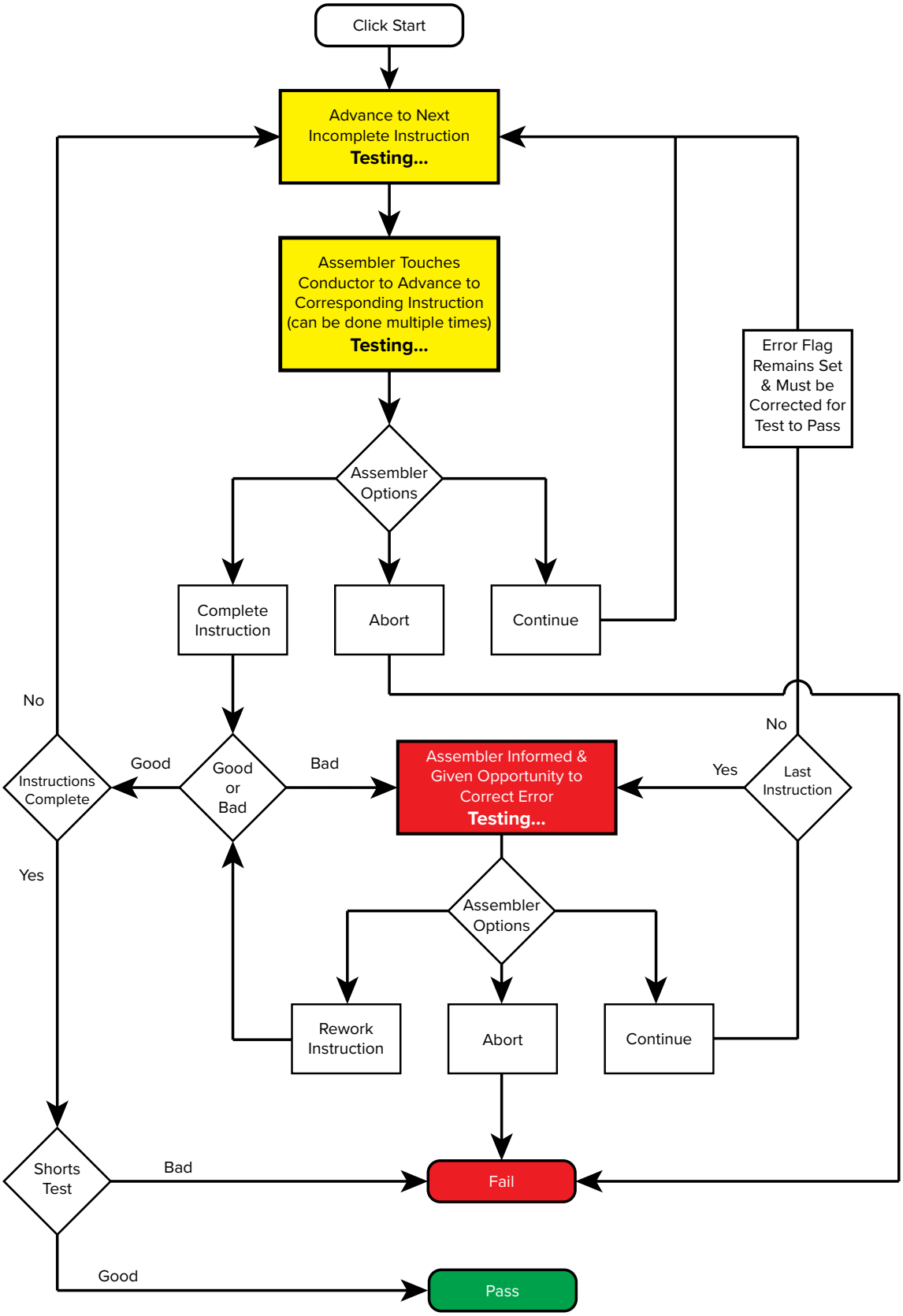
## 11.4.3 Build / Test Process

The fixturing and product connectors should be connected to the tester as described under the Testing Section, *page 68*. The Sequential Build Test Methods and the Random Build Test Methods have slightly different processes as shown in the following flowcharts.

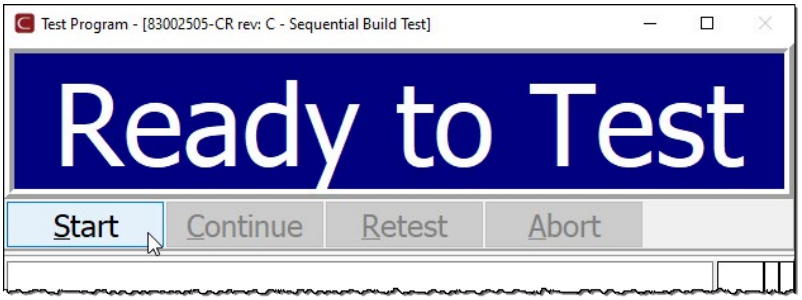
### Sequential Build Process



## Random Build Process



The test is started by selecting the **Start Button**. When performing a test that uses a Build Test Method, the test advances to the first incomplete instruction. If all the instructions are already accurately completed, the tester will perform a full test and report a Pass condition. If the tester encounters an error in an assembled product, it will pause and display the error as described below (*page 93*).

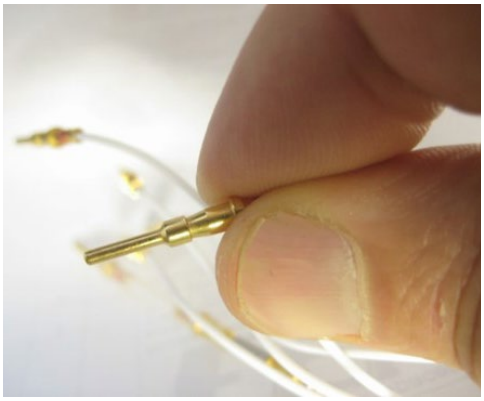



When using a **Sequential Build Test Method**, instructions are presented to the assembler in the order established in the test program.

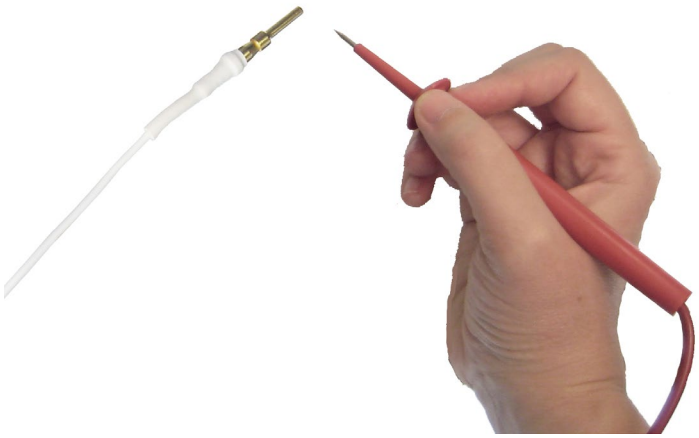
When using a **Random Build Test Method**, the assembler determines the order in which instructions are completed. In a Random Build the assembler touches a conductor using the probe or while wearing a wrist strap connected to the tester's probe port. With the first-end pinning complete, and the conductor connected through fixturing to the tester, the tester is able to identify the conductor and advance to its corresponding instruction.

The preference for using a probe to contact conductors or to touch conductors while wearing a wrist strap is set in the test program - see *page 85*

**Wrist Strap**.



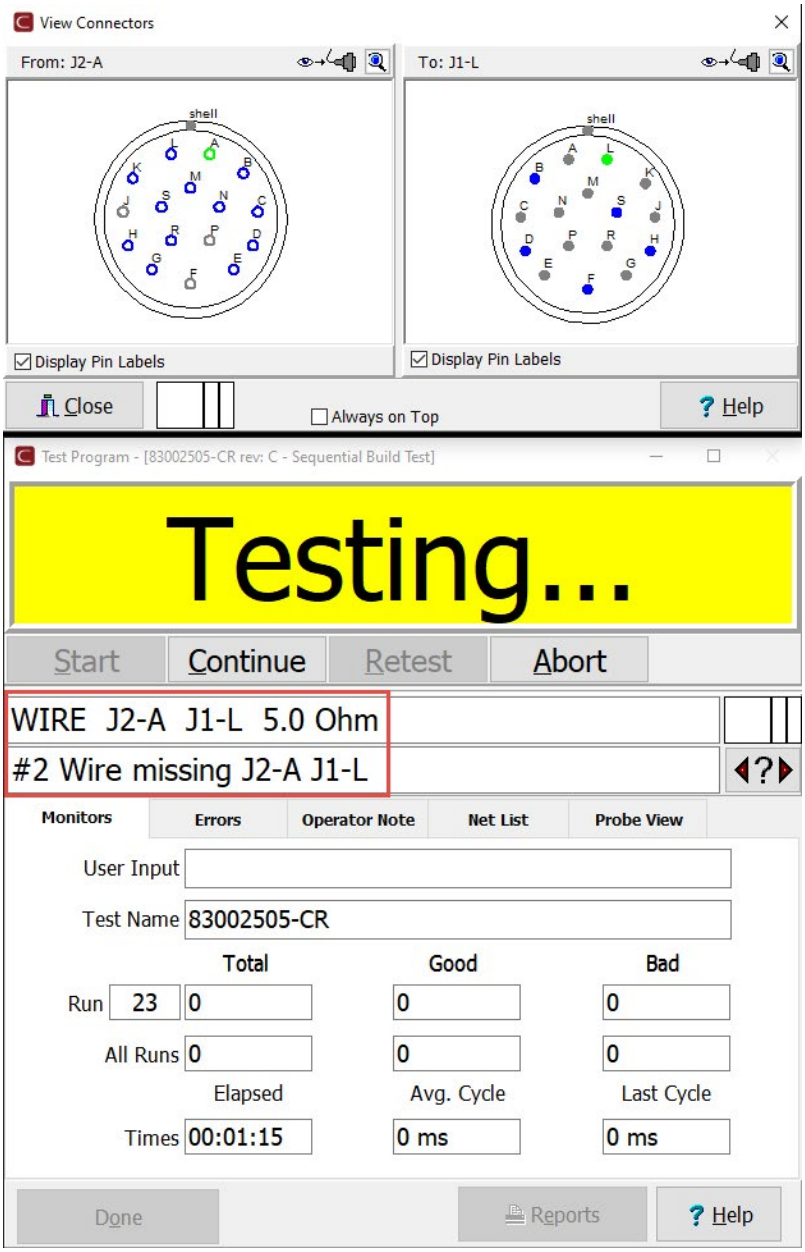
**...or Probe for Random Builds**



### Active Instruction

In a Sequential Build or Random Build, at the active instruction:

- The Test Window displays a yellow **Testing...** header.
- The active instruction is displayed - **WIRE J2-A J1-L 5.0 Ohm** in the example shown.
- The status of the active instruction is displayed - **#2 Wire missing J2-A J1-L** in the example shown.
- The connector graphics highlight the instruction **FROM** and **TO** pins in green. Pins associated with completed instructions are shown in blue.
- If Guided Assembly LEDs have been associated with the connectors, they will blink green.




### Active Instruction Performed Successfully

If the instruction is successfully completed, the program will emit a “Good” tone and advance to the next instruction. In a Random Build, the assembler can advance to a different instruction by contacting another conductor.

### Continue

In Sequential Build or Random Build, if **Continue** is selected before a connection is made, the test will advance to the next incomplete instruction. The skipped instruction will be presented again at the end of the test until it is successfully completed or **Abort** is selected.

### Abort

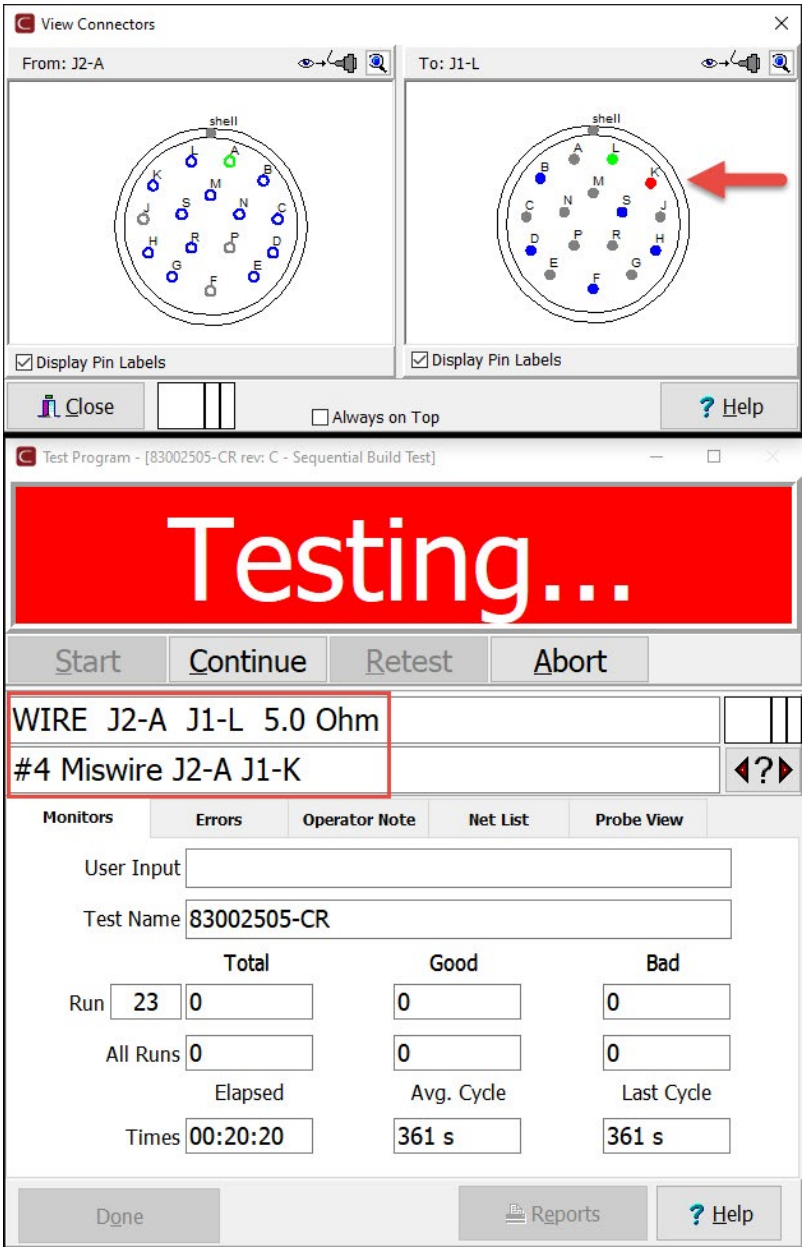
In Sequential Build or Random Build, **Abort** will end the test in a Failed condition.

### Active Instruction Performed Incorrectly

If an instruction is performed incorrectly:

- The Test Window header turns red.
- The tester emits a “Bad” tone.
- If the error is a miswire, the most common error condition, the **TO** pin associated with the error is highlighted in red.
- A description of the error is provided - ***#4 Miswire J2-A J1-K*** in the example shown.
- If Guided Assembly LEDs have been assigned to the connectors, they will blink red.

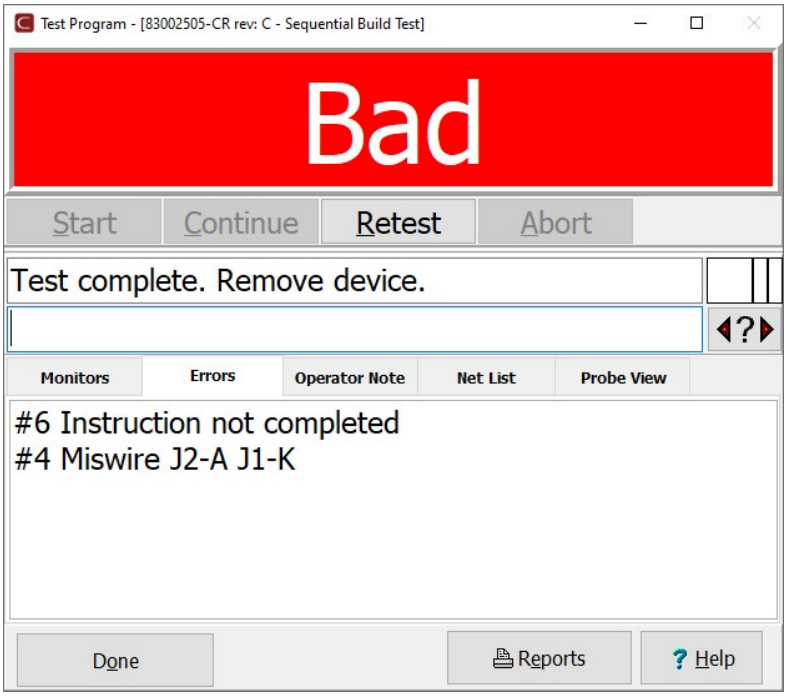
The tester will remain in this state giving the assembler the opportunity to correct the error. If the error is successfully corrected, the tester will recognize the changed state, emit a “Good” tone, and advance to the next instruction. In a Random Build, the assembler can then advance to a different instruction by contacting another conductor.



### Continue with Active Error

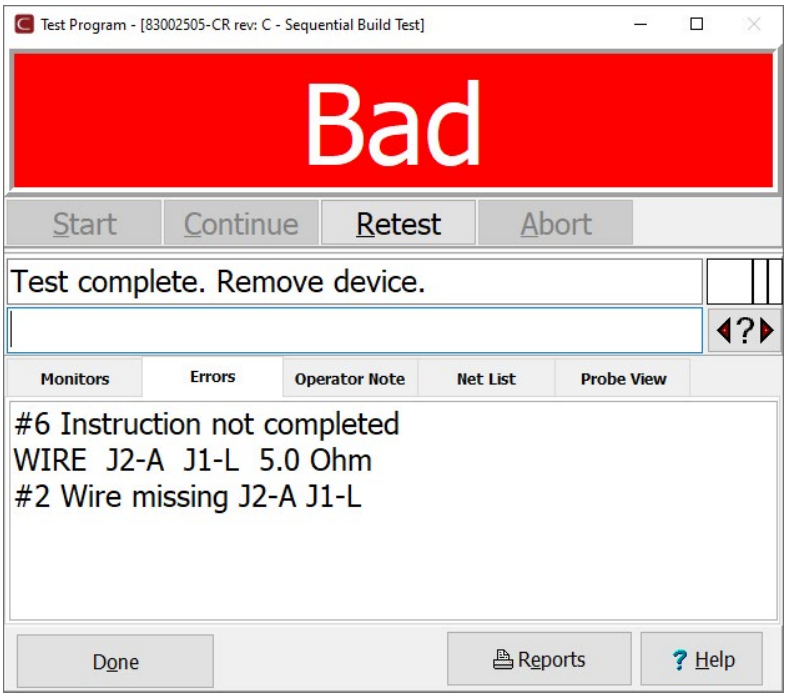
When using a Sequential Build Test Method, pressing **Continue** while the test is in an error condition, causes the test to fail and display the error condition(s).

When using a Random Build Test Method, pressing **Continue** causes the test to advance to the next incomplete instruction. The assembler can then advance to a different instruction by contacting another conductor. The instruction that was skipped by pressing **Continue** will remain incomplete and will reappear either when the operator contacts the associated conductor or at the end of the test. If the active instruction is the last incomplete instruction and the **Continue** button is pressed, the instruction will be presented again until either the instruction is accurately completed or **Abort** is selected.

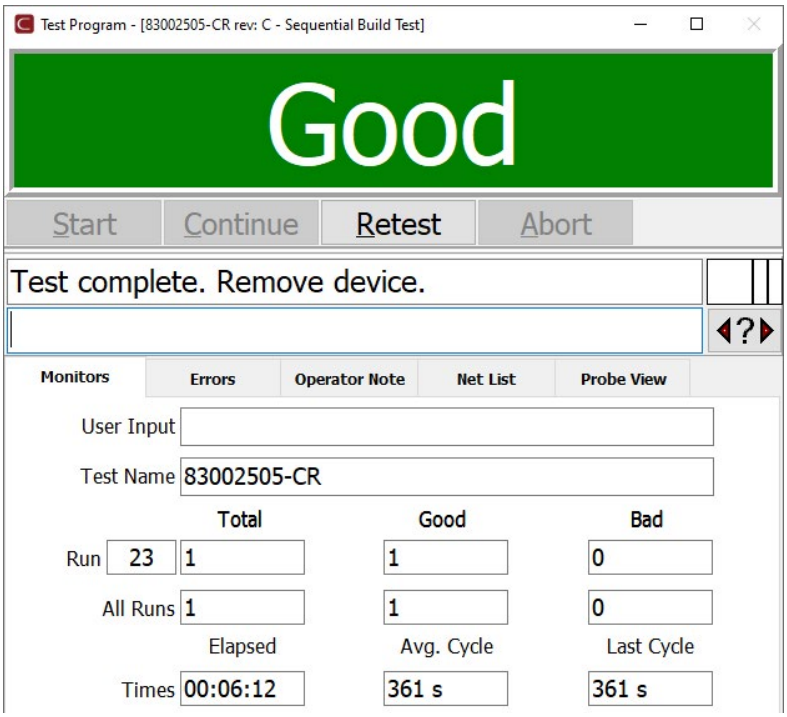



### Abort with Active Error

Pressing **Abort** while testing with incomplete instructions, or with error condition, will end the test in a failed state.



If/when all the instructions are completed successfully, the tester will perform a complete shorts test. If the shorts test passes, the test will end in a Pass (Good) condition.



# 12. Optional Advanced Features

## 12.1 OPC UA

OPC UA is a cross-platform, open-source, IEC62541 standard for data exchange. As an optional feature, the Easy-Wire software can act as an OPC UA Server for client applications. See the Easy-Wire Help for more information.

## 12.2 Cirris Tester Access (CTA)

Cirris Tester Access (CTA) is an optional Application Programming Interface (API) that facilitates control of Cirris testers using external applications by providing the functions needed to customize and automate the test process in programming environments such as LabVIEW, C/C++, Python, and Delphi. See the *Cirris Tester Access (CTA) User Manual* for more information.

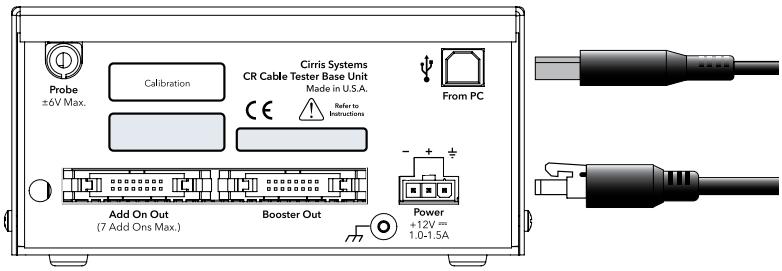
# 13. Maintenance & Troubleshooting

To avoid damage to the system hardware, close the Easy-Wire software before connecting or disconnecting units in the system daisy-chain.

## 13.1 Troubleshooting a Red Status Indicator

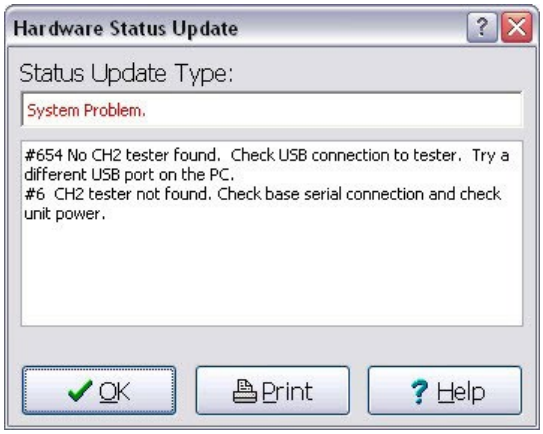
If a red status indicator on the Main Menu, try the following:

1. Verify that power is connected to the Base Unit.




2. Verify that the USB cable is connected between the PC and the Base Unit.

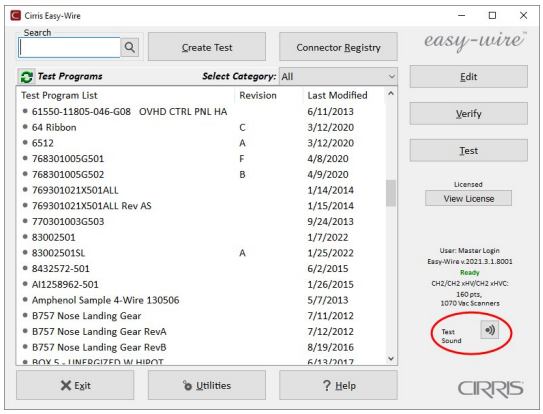
3. Restart the Easy-Wire software. If the problem persists, note the contents of the error message and contact Cirris for support.



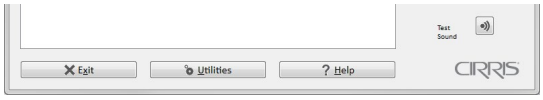
# 13.2 Checking the Sound

The Easy-Wire software provides sound prompts to provide feedback to the operator. If the sound isn't working, try the following.

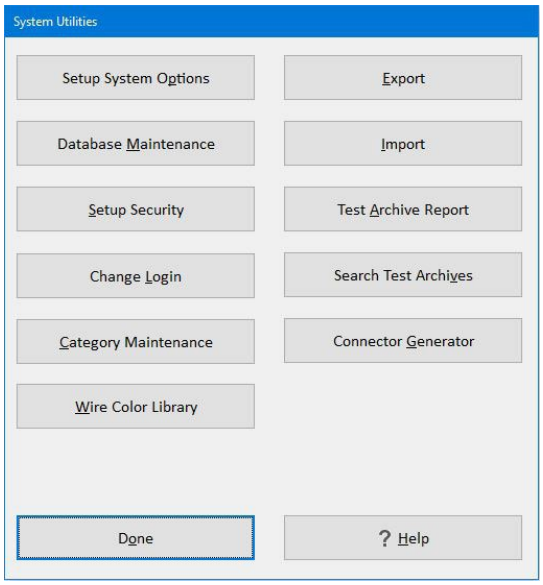
**1.** In the **Main Menu**, click **Test Sound**. If two trumpet sounds are heard the sound is working. If not, continue with the steps below.



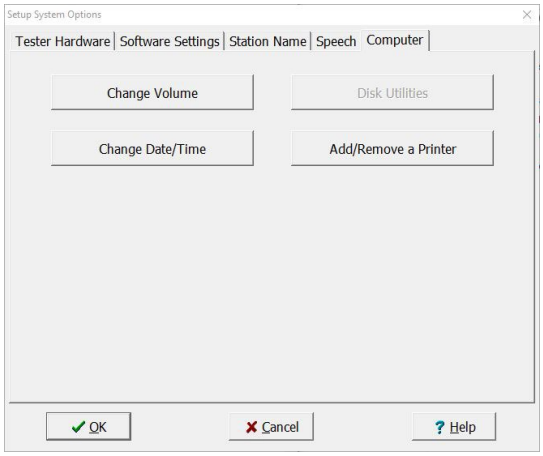

**2.** From the Main Menu, click **Utilities**.



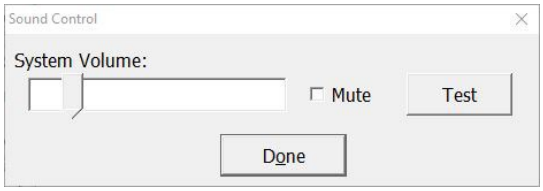

**3.** Click **Setup System Options**.



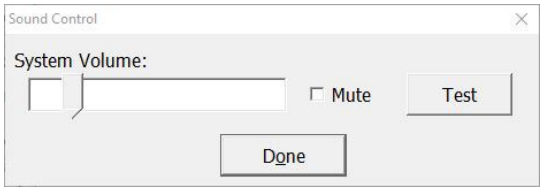
4. Open the **Computer** tab and click **Change Volume**.



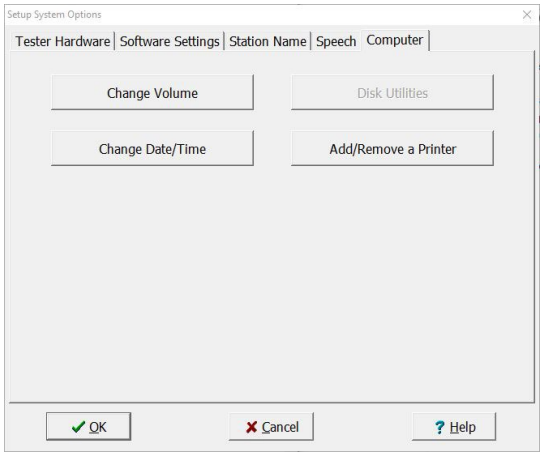

5. Adjust the volume slider and click **Test** to try the revised setting.



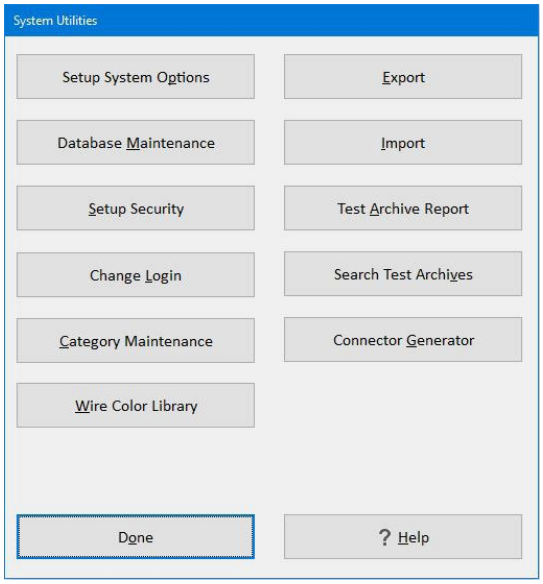

6. When the volume is at the desired level, click **Done**.




7. The **Setup System Options** window will be open. Click **OK**.



8. The **System Utilities** window will be open. Click **Done** to return to the Main Menu.




9. If you are still having sound problems, try the following:
   - Verify that speakers are connected to the PC and have power.
   - Verify that the speakers are on and that the volume is turned up.
   - Verify that the volume on your PC is turned up (the PC volume control can be found on your Windows task bar).
   - Verify that sound can be heard when using other applications.

If the sound problem persists, contact Cirris for assistance.

## 13.3 Routine Maintenance

The CR tester requires no routine maintenance. If desired, the outside surfaces of the CR tester may be dusted and/or cleaned. As some cleaning agents leave a conductive residue, take special care not to allow the cleaning agents to come into contact with the test point connectors or the circuitry inside the enclosure.

## 13.4 Test Fixture Maintenance

The connector contacts used in test fixtures may wear with repeated mating cycles, which can result in higher contact resistances. The increased contact resistance is included in the tester's standard 2-wire resistance measurements (see *page 34*). Therefore, it's recommended that users evaluate the expected life cycle of connector contacts and track the number of mating cycles experienced by test fixtures to determine maintenance intervals for testing and/or replacing test fixtures. Shorting blocks that mate with test fixture connectors can be used in conjunction with a test program that tests the resistance through all associated test points is an established method for evaluating the connection resistance of connector contacts. For more information on creating shorting blocks, see the article *Bad Cable or Bad Test Fixturing?* on the Cirris Web Site. The CR Performance Verification Kit includes a shorting block and documents the process used to validate the low contact resistance of the tester connectors.

## 13.5 Log Files

When contacting Technical Support for assistance, the support technician may ask for log files written by the Easy-Wire software and updated over time. Most often requested are the following files: z_easywire.txt, z_CirrisDataAccessService.txt, and z_DatabaseServices.txt. By default, these files are located under the path: C:\Users\Public\Documents\Cirris\Common. When any of these files reaches approximately 2 MB, the software starts a new file adding a sequence number to the end of the base filename (for example z_easywire1.txt). The technician will only need the latest version of the file.

## 13.6 Service

If the tester requires service, as directed by Cirris support personnel, it may be necessary to send a malfunctioning unit back to Cirris for repair. If needed during the repair period, a loaner tester can often be provided for an additional charge. The tester includes no user-serviceable parts and users should not attempt to service any internal components. Contact Cirris sales and support personnel for troubleshooting assistance or to request an RMA (Return Material Authorization) prior to shipping any hardware for service.

## 13.7 Warranty

Cirris Inc. warrants new products manufactured by Cirris Inc. to be free from defects in material and workmanship for a period of twelve months. Products not manufactured by Cirris Inc. are warranted by their manufacturer. Cirris Inc. at its option will repair or replace faulty goods and is not responsible for any consequential loss incurred due to faulty goods. This warranty does not cover normal wear, misuse or consumable items. The warranty does not include modifications or damages due to abuse by the user.

NO WARRANTY AGAINST INFRINGEMENT: Cirris Inc. makes no warranty whatsoever that the goods are delivered free of any rightful claim of any third person for infringement of patent.

# 14. Glossary

**Ampere (A):** The practical unit of electric current. Commonly shortened to Amp. Abbreviated as "A." A voltage of one volt will send a current of one Amp through a Resistance of one ohm. Other common measures of current are milliamps (mA), which is 10-3 A, and micro-Amps (µA), which is 10-6 A.

**Connection:** A continuous electrical path between two or more points through which current flows during a WIRE (continuity) test.

**Continuity (WIRE) Test:** A test that determines whether the two selected points are electrically connected. During a continuity test the tester applies a known, calibrated current to one point in the DUT (the Source or FROM point) while a second point is held at ground (the TO point). All other points float (they are connected to neither the current source or ground). The tester then measures the voltage drop between the Source point and the To point and calculates the resistance using Ohm's law. The measured resistance is compared to the programmed pass/fail threshold and if the measured value is less than or equal to the threshold the test passes. The Cirris term for a continuity test is a WIRE instruction. WIRE instructions ensure that all intended connections in the DUT are connected.

**Current (I):** The rate of transfer of electricity from one point to another, usually from the movement of electrons. Current is abbreviated as "I." In performing continuity tests, if current can easily be made to flow from one point in a DUT (Device-Under-Test) to another, then the two points are connected.

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

**Dielectric Withstand (DW) Test:** A high voltage DW test ensures that the DUT withstands a specified voltage for a required period of time. The test equipment is designed to identify transient conditions, like an arc, in which the current spikes rapidly. DW testing can be performed with AC or DC voltage and the pass/fail threshold is set as current value in as microamps or milliamps. The test passes if the measured value is less than the threshold.

**First-End Pinning:** Refers to the pinning process of the first connector in a harness or cable assembly. Wires with specific labels or colors are sometimes required to be placed designated positions. With a mating connector wired back to the tester, the Install Pin instruction can be used on the CR tester to confirm that a wire is placed in the specified connector position. The tester performs the test using a capacitance measurement. Both random order and forced sequential assembly methods are supported.

**Fast Attach Connectors** are identical Traditional test fixtures that are wired in the same pattern from the tester-mating connector to the product-mating connector. The wiring pattern is defined in the Connector Registry. Fast attach connectors speed programming as only the first position of the connector needs to be probed during the Attach process. Smart-Lights provides this benefit and more, therefore, the two features are not used together.

**Fixturing:** The hardware that connects the tester to the Device-Under-Test. Can also be referred to as test interface, test cables, adapter cables, or test fixtures.

**From Point:** The point to which the source is applied during a test measurement.

**Guided Assembly:** See Second-End Pinning.

**High Voltage (Hipot) Test:** Hipot is short for High Potential and is used interchangeably with "high voltage" testing. It's commonly used broadly to refer to Dielectric Withstand (DW) and Insulation Resistance (IR) testing. During high voltage testing, a high voltage source is connected to all points in one net while all other nets are held at ground. At the same time the current flowing from source to ground is measured. The measured current is used to determine the pass/fail status of the DW test while Ohm's law is used to calculate resistance for the IR test. The calculated resistance is then compared to the IR threshold to determine the pass/fail condition.

**Intermittent Error:** Error that occurs sporadically or inconsistently.

**Intermittents Test:** Low voltage test that quickly cycles instructions and isolation testing checking for errors during which the test operators flex the DUT or otherwise stress the unit.

**Insulation Resistance (IR):** A high voltage IR test ensures that the resistance between nets meets a required

minimum. High voltage IR testing is always performed with DC Voltage. The pass/fail threshold is set as a resistance value in megohms or gigaohms. The test passes if the measured value is greater than the threshold.

**Isolation Test (Low Voltage Insulation Resistance Test):** A low voltage test that determines whether nets and single points that should not be electrically connected are electrically isolated from one another. During an isolation test, the tester applies a known, calibrated current to one point in each net while it floats others in the net (connects them neither to the current source or ground) and holds all other points in the DUT at ground. The voltage drop from source to ground is measured and Ohm's law is used to calculate the resistance. The measured value is compared to the programmed pass/fail threshold and if the measured value is greater than or equal to the threshold, the test passes. The tester steps through this process by applying the source to one net/isolated point at a time. If any isolation tests fail, the tester initially knows only that the failure occurred between the source net and the group of nets held at ground. Therefore, it subsequently executes a search routine to identify the nets that are shorted.

**Learn:** The process in which the tester scans a sample DUT to create a test program.

**Low Voltage Testing:** Testing performed at low voltage, typically 10 VDC or less, including continuity, isolation and component testing.

**Miswire:** A combination of an open error and a short error in which the intended connection is missing and is wired to another point instead.

**Net (Network):** Two or more interconnected points.

**Ohm (Ω):** The standard unit of Resistance. One volt across a Resistance of one ohm produces one amp of current.

**Ohm's Law:** The current (I) in a circuit is directly proportional to the total voltage (V) in the circuit and is inversely proportional to the total Resistance (R) of the circuit. Depending on the unknown, expressed as: I = V/R, V=IR, or R = V/I

**Open:** An error in which the intended electrical path contains a gap across which electric current cannot flow.

**Overcurrent error:** See *page 74*.

**Prefix Multipliers:** Common prefix multipliers for electrical measurements include:

pico- 0.000000000001 (one-trillionth)

nano- 0.000000001 (one-billionth)

micro- 0.000001 (one-millionth)

milli- 0.001 (one-thousandth)

kilo- 1,000 (one thousand)

mega- 1,000,000 (one million)

giga- 1,000,000,000 (one billion)

**Resistance (R):** The opposition that a device or material offers to the flow of direct current. Measured in Ohms.

**RESISTOR Test**: Similar to a continuity test in method except the pass/fail parameter is set as a percentage tolerance band around a nominal value.

**Second-End Pinning (Guided Assembly):** With the First-End connector(s) assembled and all connectors in the assembly wired back to the tester through fixturing, the Easy-Wire software can guide the user with on-screen graphics, instructions, and voice commands for proper pinning of Second-End connectors. Connections are tested as they're made, immediate feedback is given to the operator, and errors can be corrected for a zero-defect assembly process.

**Short:** An unintended connection between two or more nets or single points.

**Smart-Adapters:** Smart-Adapters use Smart-Lights to store the fixture identification (ID). The ID is associated with configuration information stored in the Connector Registry. The ID is scanned by a CR or CH2 tester when opening the editor or a test session and the characteristics of the connector and its wiring pattern are applied automatically in

the programming or testing application.

**Test Point:** Provides access to the tester's measurement capabilities through the connectors on the front panel of the tester. Between the tester's measurement hardware and the front panel connectors is a relay matrix. The state of these relays, as directed by the active, programmed test instruction, determines the function of each test point at any given moment during a test. Test points can be connected to source, to ground or can float (connected to neither source or ground).

**Test Session:** The continuous time during which a lot of devices is tested. The session begins when a test is selected on the Main Menu and the Test button is clicked and ends when Done is clicked on the Test window to return to the Main Menu.

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

**To Point:** The point held at ground during a test measurement.

**Traditional Fixtures:** A term used to differentiate between standard test adapters and Smart-Adapters that use Smart-Lights.

**UUT (Unit-Under-Test):** The cable, harness, or other electrical assembly that is being tested. Same meaning as DUT. (Device-Under-Test).

**Volt (V):** The practical unit of voltage. One volt will send one amp through a Resistance of one ohm.

**Voltage (V):** The term used to designate the electric pressure between two points. Abbreviated as "V." Voltage is capable of producing a flow of current when a closed circuit is connected between the two points. When performing high voltage Dielectric Withstand (DW) and Insulation Resistance (IR) testing, very little current flow is excepted between isolated nets/points.

**WIRE Test:** See Continuity Test above.

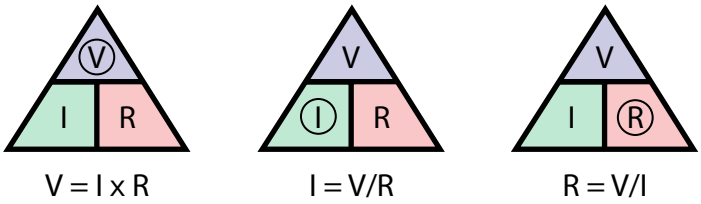
# 15. Appendix - Testing Basics

Understanding test processes provides context that can help users assimilate the information included in this manual. This is readily accomplished because the basics are very straightforward and can be seen in three measurements - continuity, low voltage isolation, and high voltage testing. At the foundation of all three is one of the most basic formulas in electronics, Ohm's Law, which describes the relationship between voltage (V), current (I), and resistance (R) in a simple circuit with the equation, V=IR.

## 15.1 Ohm's Law

For our purposes here, it's adequate to understand the mathematical relationship between the variables. As in all similar equations with three variables, the third can be calculated if the other two are known. Some find the triangle visual helpful as it makes it easy to find the appropriate formula for calculating the unknown by covering its symbol. When doing the math, it's important to remember that the unit of measure for voltage is Volts, for current is Amps, and for resistance is Ohms.

*Ohm's Law*



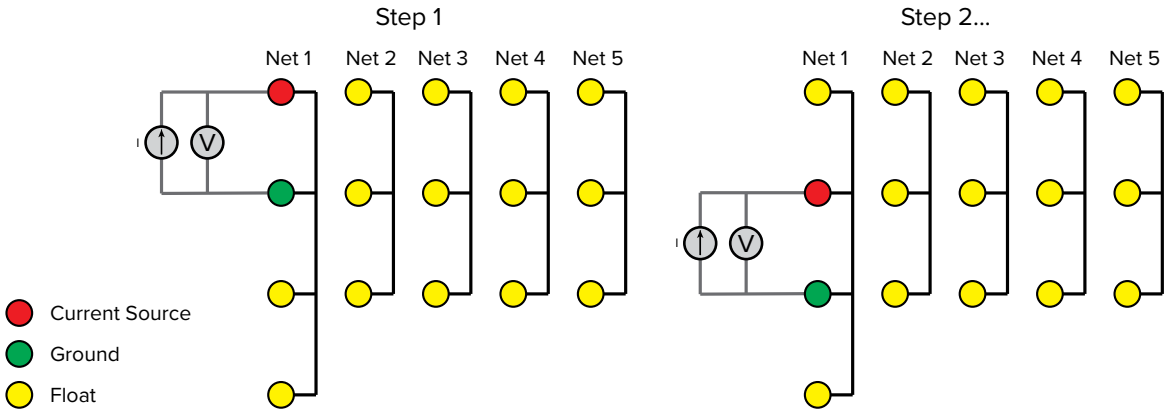

It's also useful to understand that in a simple series DC circuit, the current at any given point is the same as the current at any other point. In the same circuit, the potential difference (voltage drop) across an unknown resistance can be measured. In the case of Cirris testers, the unknown resistance is the device-under-test (DUT).

## 15.2 Continuity Testing

When performing a continuity test, the quality of the connection is evaluated by its resistance with the acceptance criteria set in Ohms or fractions of an Ohm. Generally, the lower the resistance of a connection, the better. Therefore, the test passes if the measured value is less than or equal to the specified value. Sometimes, this is referred to as a "pass-if-under" test.

The tester performs continuity tests two points at a time, regardless of the size of the circuit (more commonly called a network, or simply net) by connecting a current source to one point in the net while holding one other point in the net at ground and floating all remaining points by connecting them neither to the current source nor to ground. If the net includes more than two points, the process for stepping through all the points in the net is dependent on how the test is written. The same source point can be used for each continuity test in a net or the test can step through the net using the ground point in the preceding test as the source point for the subsequent test, as shown in the simple example below. Either method is acceptable. In Cirris programming the Source point is the FROM point and the Ground point is TO point.

*Continuity Testing*



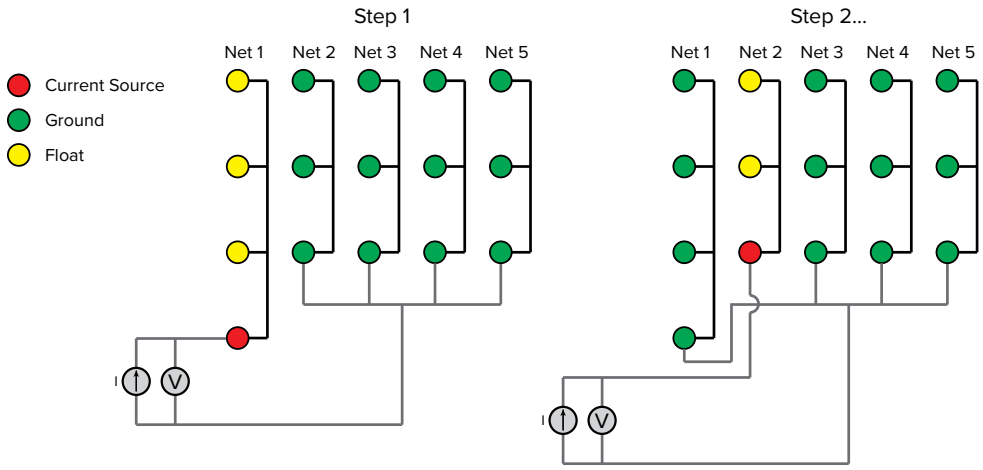

To perform each step, the tester applies a steady, calibrated current to the DUT then measures the voltage drop from the source to ground through the circuit. The resistance is calculated using Ohm's law by dividing the measured voltage drop by the known current (R=V/I). The result is compared to the specified threshold to determine the pass or fail condition.

## 15.3 Low Voltage Isolation Testing

When performing low voltage isolation testing to ensure no unintended connections (shorts) exist, the acceptance condition is again set as a resistance value, except the pass/fail threshold is set in kilohms or megohms with the test passing if the measurement exceeds the threshold. The "pass-if-over" test is used as the greater the resistance between isolated nets the better.

To ensure that no shorts exist, all nets must be tested against all others. Cirris testers apply the current source to one point in each net while it floats others in the net (connects them neither to the current source or ground) and holds all other points in the DUT at ground. The voltage drop from source to ground is measured and Ohm's law is again used to calculate the resistance. The tester steps through this process by applying the source to one net/single point at a time. If any isolation tests fail, the tester initially knows only that the failure occurred between the source net and the group of nets held at ground. Therefore, it subsequently executes a search routine to identify the nets that are shorted.

*Isolation Testing*



# 15.4 High Voltage Testing

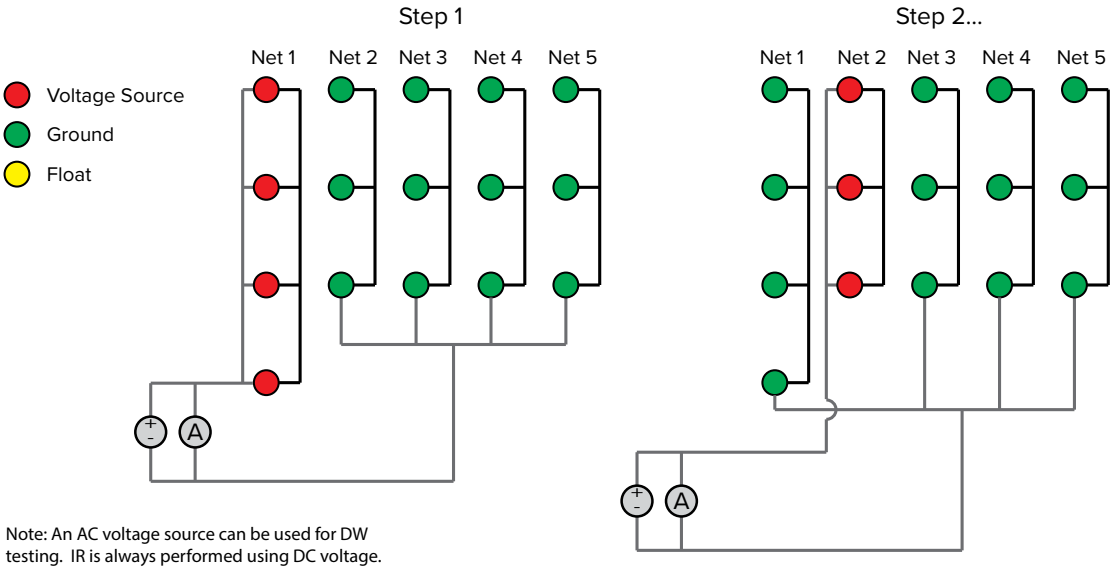
**Note**: *The CH2 performs high voltage testing but the CR tester does not.*

A similar process applies to high voltage testing. However, high voltage testing typically includes two separate tests – Dielectric Withstand (DW or DWV) and Insulation Resistance (IR). A DW test ensures that the DUT withstands a specified voltage for a required period of time. The tester is designed to identify transient conditions, like an arc, in which the current spikes rapidly. An IR test ensures that the resistance between circuits meets a required minimum.

A DW test can be performed using AC or DC voltage and the pass/fail threshold is set as a maximum current in microamps or milliamps. DW is a "pass-if-under" test meaning that the test passes if the current measurement remains below the threshold for the duration of the test (lower current flow between isolated nets is better). An IR test is always performed using DC voltage with the pass/fail threshold set as a resistance in megohms or gigaohms. IR is a "pass-if-over" test meaning that the test passes if the measurement is greater than the threshold (greater resistance between isolated nets is better). It's typical to perform both a DW test and an IR test in which case the DW test is performed first. In both cases the measurement is made between nets that are expected to be electrically isolated.

Like low voltage isolation testing, each net must be tested against all others. Cirris testers use one of two possible high voltage test processes depending on the program setting - the typical, conventional process or a high speed process. For simplicity sake, consider the conventional process in which the test is performed by connecting a high voltage source to all points in one net while all other nets are held at ground. At the same time the current flowing from source to ground is measured. The measured current is used to determine the pass/fail status of the DW test and Ohm's law is used to calculate resistance for the IR test by dividing the voltage by the measured current (R=V/I). The calculated resistance is then compared to the IR threshold to determine the pass/fail condition. Very little current is expected to flow between nets that are electrically isolated.

*High Voltage Testing*




Note: An AC voltage source can be used for DW testing. IR is always performed using DC voltage.

As with a low voltage isolation test, if a failure occurs, the tester initially only knows it occurred between the net at high potential and the group of nets held at ground. If the Diagnose Hipot Faults is selected on the High Voltage Parameters window, the tester will perform a search to determine between which nets/single points the fault occurred.

CR User Manual
Version 2022.4.0

401 North 5600 West
Salt Lake City, Utah 84116
USA.
www.cirris.com