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Introduction
Use this guide to setup the CH2 tester, install the easy-wire software, check the system, get an overview of the test system, and set up CH2 expandability features.

You Should Have Received
Check to make sure you have received the following:

- **Base Unit**
  One required per system.
  Provides up to 800 points in 160 point increments.

- **Hand Held Probe**

- **Easy-wire Software CD**

- **Power Cable**

- **USB Cable**

- **HV Interlock Override**

You May Have Received
A CH2 multi-box system requires some or all of the following parts.

- **Scanner Chassis**
  Provides up to 800 points in 160 point increments.

- **Box-to-Box Cable**
  One for every Scanner Chassis.

- **Power Cable**
  Varies according to the country of receipt.

If you need assistance at any time, call your Cirris Customer Support representative. In the U.S.A. Cirris Sales and Customer Support may be reached at 1-800-441-9910.
System Requirements

- **Computer CPU**
  - Minimum: 1.6 GHz processor speed or better

- **CD ROM Drive**
  - Required

- **Free Disk Space**
  - Minimum: 5 GB
  - Recommended: 10 GB

- **RAM Memory**
  - Minimum: 512 MB
  - Recommended: 1 GB
  - For larger systems

- **Monitor**
  - Minimum: 1024 X 768

- **Video Card**
  - 64 MB On Board Memory

- **Windows Environment**
  - Windows 7
  - Windows XP Home or Pro

- **USB Port**
  - 1 Required – 2.0 compatible
  - 2 Required if you have the xHV Power Supply

- **Mouse**
  - Required for installation and test setup.
  - Can be replaced with a barcode reader on the production floor

- **RAM Memory**
  - Minimum: 512 MB
  - Recommended: 1 GB
  - For larger systems

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Network Server Requirements

Accessing test data from a network is a way to make sure that all stations on the production floor use the same test information. The Networking Software is an option that can be purchased from Cirris and is required to run a network. Additional requirements for a network server are the same as a workstation with the exception that the server must use either 2000 or 2003 Windows Server software. The computer that runs the network database should be dedicated to running the database software. The network database server should not be used as a workstation.

You may want to add these optional accessories

These accessories can be purchased through computer and office supply stores. Each accessory is easy to integrate with your computer and CH2 test system.

- **Sheet Printer**
  - Used to print test reports and fixtureing information

- **Label Printer**
  - Allows printed labels to be applied to the device-under-test

- **PC Network Card**
  - Allows the CH2 test stations to share test information with each other (requires purchase of easy-wire networking software)

- **Barcode Scanner**
  - Used on the production floor instead of the mouse
Warning!

Possible electric shock!

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

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

For ideas on improving hipot safety visit:

www.cirris.com/testing/guidelines/hipot_safety.html
Before you Begin
It is important to understand the information below before you install the software.

- **Stand-Alone or Network**
  If this is a new installation, decide whether you are going to set it up as a stand-alone station, or a network installation. The stand-alone installation is intended for stations that seldom need to exchange information with each other. Installing on a network is a good way to ensure all the stations on the production floor have the same test information. To install on a network you must have a computer that you can dedicate as a network server that meets the requirements described on page 2.

- **Changing previously installed stand-alone stations to a network installation**
  If you are changing from stand-alone stations to a network, keep in mind the following limitation. You can convert the test information from only one of the stand-alone stations to the network installation. The test information from the other standalone stations will have to be exported to a thumb drive and then imported to the network database. You will get more direction on how to handle this situation during the install process.

- **Updating an existing station with the software you’ve received**
  There are special steps for updating previous easy-wire software versions. If you are using the new software you received to update existing easy-wire software stations, you will need to vary the installation process as described in the following pages.
Using the Correct Installation Process
Choose the appropriate installation procedures depending on your requirements.

If you are installing a new stand-alone station or stations:
1. At each station, complete the “Installing the Software” section on page 6.
2. Set up the tester(s) as directed in the “Setting Up the CH2 Tester” section on page 7.
3. When you first run the easy-wire software at a station refer to the “Checking the System” section on page 11.

If you are updating an existing stand-alone station or stations:
1. At each station complete the “Updating a Previous easy-wire Installation” section on page 6.
2. At each station complete the “Installing the Software” section on page 6.
3. When you first run the easy-wire software at a station, refer to the “Checking the System” section on page 11.

If you are installing a new Network Database Server Installation:
1. On each station and on the server, complete the “Installing the Software” section beginning on page 6.
2. Set up the tester(s) as directed in the “Setting Up the CH2 Tester” section on page 7.
3. On the server, complete the “Updating the Server Configuration” section on page 14.
4. At each network station, complete the “Checking the System” section on page 11 and “Attaching a Station to the Network Database Server” on page 14.

If you are upgrading an existing Network Database Server Installation:
1. At one workstation, complete the section on the next page entitled “Installing the Software” section beginning on page 6.
2. At the workstation with the updated software, open the easy-wire software to make sure it correctly runs and accesses the network database (See the “Checking the System” section beginning on page 11).
3. After you have verified that the software is working correctly at one station, install the software at the other station(s) and again verify that they work correctly.
4. Make sure all stations have exited the easy-wire software. On the Database Server, complete the “Installing the Software” section beginning on page 6.
   **Note:** The stations will not be able to access the server until you complete the next two steps.
5. After installing the software, on the server complete the “Updating the Server Configuration” section on page 14.
6. Complete the “Attaching a Station to the Network Database Server” section on page 14 to complete the installation at each network station.
Back up the database
Before updating a previous easy-wire installation, it is important that you have a current backup of the easy-wire database. A good way to make a backup is to use File Explorer to copy the easy-wire database file (easywire.fdb or easywire.gdb depending on the software version). The database file is found on the path C:\Program Files\Cirris\easywire\Database. If possible, backup to a drive other than the one where the easy-wire database is stored, such as a network or thumb drive.

Special instructions for updating previously installed versions
Depending on the easy-wire version that was previously installed, you may need to perform special steps before installing the current version. If you are unsure of the previously installed version, before proceeding, start your easy-wire software and check the version information on the easy-wire main menu.

If your easy-wire software version is from 2.0 to 9.0, call Cirris Technical Support before attempting to install the new version.

Install the Software
When you install the easy-wire software, you will also be prompted to install a driver and the software for the Composite Device in the hardware.

1. Close all Windows applications on the computer. Make sure the USB cable between the computer and the CH2 tester is disconnected.

2. Make sure you use the appropriate CD.

   - Use the Station CD for a stand-alone station or a network station.
   - Use the Server CD only on the network server.

3. Place the CD into the CD-ROM drive. After a moment the CD should auto load.
   If the software does not auto-load, from the Windows taskbar, click Start, Run. Type: d:\install.exe (where d: is the CD-ROM drive), then click OK.

4. Follow the installation steps as they appear on the screen.

   Note: When you are prompted to choose the destination location, use the default location provided.
Setting Up the CH2 Tester

Important! Before setting up the tester, select a test area where you can keep 2 feet (60 cm) between the test system and noise emitting electronics.

CRT video monitors, florescent lights, and equipment motors are electrically noisy devices and should be kept at least 2 feet from the test system (including the test fixturing and device-under-test); otherwise measurement accuracy may be compromised.

Note: LCD monitors (flat screens) do not emit excessive noise and will not negatively affect the tester.

Electrical Assembly

1. Insert one end of the USB cable into the USB port on the back of the Base Unit. Insert the other end into a USB port on your computer.

2. Connect the HV Interlock Override to the Digital I/O Connector on the Base Unit.

   Note: All CH2 testers made after March of 2007, have HV interlock capability. An interlock is a device such as, dual palm switches or a light curtain helps protect operators from high voltage during the high voltage test. For more information on interlocks, search the word “interlock” in the easy-wire help system. If you do not have an interlock, you must connect the HV Interlock Override to the Digital I/O port on the back of the tester. Otherwise, the tester cannot output high voltage.

3. Plug the power cord into the Base Unit’s power connector. Make sure the back panel power switch is in the ON position.
4. Plug the other end of the power cord into the same grounded outlet or plug strip that is used for the computer.

The power supply auto adjusts to line voltages of either 120 VAC 60 hertz or 240 VAC 50 hertz.

For optimum measurement accuracy, the CH2 must have a consistent earth ground to the entire system. Make sure to use a grounded (3-prong) outlet or plug strip.

5. On the front of the tester, insert the probe into the probe port on the CH2 Node Module. Probes can be plugged into any or all node modules in a system.
Connecting Additional CH2 Scanners
Consider the information below before connecting multiple CH2 scanner chassis.

Close together
This is the standard configuration. The system is less susceptible to electrical noise in the environment, and therefore generally more accurate when stacked like this.

Additional scanner chassis can be stacked or distributed.

Scanner chassis need to be attached to the base unit using a box-to-box cable. If the units are to be stacked, you can use the supplied box-to-box cable. Longer box-to-box cables can be ordered if units are to be separated by some distance.

Spaced apart
Units can be spaced apart, to allow for shorter interface cable to the device-under-test.

For this type of configuration you must order custom box-to-box cables from Cirris. The following restrictions apply to cable lengths between chassis:

- Two hundred feet (60m) max total length of all box-to-box cables.
To connect an additional scanner chassis:

1. Connect the box-to-box cable from the OUT connector on the base unit to the IN connector on the next unit.

You may also connect a box-to-box cable from a BRANCH connector to the IN connector of another unit.

2. Plug the power cord into the additional scanner. A power connection is needed for each scanner chassis.
The steps below demonstrate if easy-wire is working correctly or not.

If you disconnected the USB cable while updating the software, reconnect it.

The easy-wire software icon should be on the desktop. You will also find an easy-wire folder in the programs menu. If you don’t see the icon on the desktop you can run the program from the task bar. Click Start button, select Programs, easy-wire Software, then click easy-wire.

1. Double-click on the easy-wire icon.

2. If this is your first time opening the software, this dialog box will appear on your screen.
   a) Enter the name used to identify this station or server. The station name will be used on reports generated by this station.
   b) Select the type of tester(s) that will be attached to this station.
   c) Select the line frequency that will be used.
   d) Click Ok.

The User Login screen appears. Unless this is a network station where password security has previously been setup, the default is no password.

3. Click Ok.

Passwords can be set up to identify users and prevent unauthorized changes.
4. Click **OK** to all Hardware Status Updates. After the first time you run the software, the **Hardware Status Update** screens should not reappear unless the system has changed.

5. Check the color of the status indicator.

   **If the indicator is green,** go to step 5.
   **If the indicator is red,** see the heading “Troubleshooting a Red Status Indicator” on the next page.

   A green status indicator means the tester is working.

6. Click the green status indicator. You should hear a tone.

   If you do not hear the tone, see “If the Sound is Not Working” on the next page.

   It is important that sound is working on your computer. The easy-wire software relies heavily on sound prompts to provide test feedback to the operator.

   For any other unresolved problems, see “Startup and Verify” in the help system, or call Cirris Technical Support at 1-800-441-9910.
Troubleshooting a Red Status Indicator
If you have a red status indicator on the main menu of the software, check that:

1. There is power to the Base Scanner and all other Scanners.

2. The USB cable is connected between the port of the computer and Base Scanner.

If the Sound is Not Working
If system sound is not working or is not loud enough, check that:

- The speakers are connected to the PC, and if required, plugged into a power outlet.
- The speakers are turned on and the volume turned up.
- The Windows sound mute box is not checked, and the volume is adjusted.

Note: To access the Windows sound control, click on the speaker symbol in the bottom right corner of the Windows screen.
Completing a Network Install

Updating the Server Configuration
If you have installed or updated the network server:

1. Click Start, Programs, Cirris Systems Corporation, easy-wire Server, Update easy-wire Cirris Server Configuration.

You will see the “Updating Configuration...” message. After a moment this message will disappear meaning the server configuration is complete.

Attaching a Station to the Network Database Server
You must complete the following procedure at each station computer (not at the network database server). Before performing this process you should have previously installed the Cirris software on the station and on the Network Database Server.

To attach a station to the Network Database Server:
1. Click the windows Start button.

2. If you are attaching the easy-wire software, click Programs, Cirris Systems Corporation, easy-wire, Attach Station to Network.

If you are attaching the SPC Made Easy software, click Programs, Cirris Systems Corporation, SPCME, Attach Station to Network.
3. When this window appears, click **Find Server Location** to locate the database configuration file.

This server location will be located on the Network Database Server at:
*C:\Documents and Settings\All Users\Documents\Cirris\Common\database.ini*.

If the server is running Vista the location is:  *C:\Users\Public\Public Documents\Cirris\Common*.

If you have previously created tests on stand-alone stations, you can copy the test programs from only one stand-alone station to the network database. Check this box if this is the station that has the test programs you wish to copy to the network database. This will overwrite the network database.

Checking this box allows you to test locally if the network is unavailable.

4. Click **Convert**.

If installing easy-wire software, the conversion process may take anywhere from a few minutes to several hours depending on how much data is being converted to the network database. After the conversion process completes, you should see a Conversion Complete Window. Before attaching other stations, run the installed software on this station by double clicking the software icon on the desktop. Make sure the main menu is displayed along with any converted test programs.
Using the On-line Manual/Help System
In addition to this getting started guide, the complete easy-wire manual is available from the Help/About button in the easy-wire software. Sections of the on-line manual may be printed if desired.

To access the on-line manual/help system:

1. In the easy-wire software, click the Help button at the bottom of any window.
   Information for that window will appear on the screen.

2. To view the entire on-line manual by chapter, click Contents at the bottom of the window.
3. In the Help Contents window, you can click any link to view that specific section of the on-line manual.

Overall, at the bottom of each page in the easy-wire on-line manual/help system you can:

- Click **Search** to find information using key words.
- Click **Contents** to view the easy-wire manual by topic.
- Click **Contact** to view the contact information for all Cirris locations, reps, and distributors.
- Click **Website** to view the Cirris website if your PC has an internet connection.
**Maintenance**

**Tester Maintenance**
The CH2 tester requires no maintenance. If desired you may clean the outside surfaces of the CH2 tester. Since some cleaning agents leave a conductive residue, take special care to not allow the cleaning agents to come into contact with the test point connectors or the circuitry inside the casework.

**Fixture Maintenance**
The contacts on the fixtureing that mate to the device under test may wear due to repeated insertion cycles. Contact wear can result in higher connection resistances which in turn will increase the measured resistances for the device-under-test. For this reason Cirris recommends that customers evaluate the number of mating cycles and the cycle life of fixture contacts to determine maintenance intervals for testing and/or replacing fixture contacts. A good way to check fixture contact resistance is to construct and use a shorting block. For more information on creating shorting blocks, see [http://www.cirris.com/adapters/test-adapt.html](http://www.cirris.com/adapters/test-adapt.html).

**Service**
Cirris Testers are modular in design for easy servicing. Should your Cirris tester require service, as directed by Cirris support personnel, you may need to send the affected module or the entire tester back to Cirris for repair. If needed during the repair period, a loaner tester can be sent to you. You should not attempt to service any circuit board at the component level. All component-level service should be performed by Cirris technicians.

**Calibration**
With your CH2 tester you should have received a Certificate of Calibration. Before leaving the factory every CH2 tester is calibrated in compliance with ANSI/NCSL Z540-1-1994 and MIL-STD-45662A to standards traceable to the NIST in the United States. The tester should thereafter be calibrated annually.

To verify calibration and functionality, you can purchase the CH2 Performance Check Kit. In addition to the performance check kit, you need a calibrated volt meter and high voltage probe capable of measuring up to 1500 VDC.

**Note:** In the event a Cirris tester is found to be out of calibration there are no adjustable controls; the tester, or the affected portions of the tester, must be sent back to a Cirris facility for repair.
Tester Symbols
The symbols with a yellow lightning bolt on the front of the CH2 tester inform operators that high voltage is involved with the scanner modules and that there is risk of electric shock. The yellow exclamation mark means to use caution and see the manual for more information. See more details below.

When performing a high voltage test, the CH2 tester limits the Total Current to 2.5 milliamps and the applied charge to 45 micro coulombs. These electrical levels are considered safe for adults; however, some people could be adversely affected even at these levels. If you are using an xHV supply, the applied current limit is 22 milliamps. For these reasons, Cirris recommends that you keep the Real Current setting as low as possible (1 milliamp or smaller), and avoid touching the cable during the hipot test. Using a DC voltage for high voltage testing also provides an added level of operator safety. See the Cirris website for more hipot safety information.

The symbols with a white exclamation mark on the back of the tester, inform operators that more information about the Digital I/O, Auxiliary HV input, and Auxiliary Input Supply Connections can be found in the CH2 Getting Started Guide and in the easy-wire on-line manual/help system.

The Digital I/O Connector will allow the tester to respond to inputs and create outputs without the use of a PLC. Easy-wire software version 8.80 or higher has Digital I/O capability. See the easy-wire help system for more information.

The Auxiliary HV Input and Auxiliary Supply Connections are for non-standard features. You can call Cirris for more information on the intended function of these features.

Conditions for Operation
Your CH2 Tester is intended to be used indoors at a temperature of 50 to 104 degrees Fahrenheit (10 to 40 degrees Celsius). Best performance can be obtained at a relative humidity less than 70%. Insulation Resistance Measurements will degrade at over 70% relative humidity. The unit can be mounted in a ventilated compartment. Be sure not to block the vents on the sides and back of the tester.

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. If you use a Cirris product in a manner not specified in this manual and the accompanying help system, the protection provided by the product may be impaired.
Adding or Removing Scanner Modules
Units can hold up to five 160 point Scanner Modules. You can easily add or remove scanner modules.

To access Scanner Modules:

1. Disconnect cables from the back panel of the unit.

2. Remove the four screws, two on each side, from the chassis. Lift the chassis top straight up and off the unit.

Pictured here are the parts of the CH2 system. There is a Base Box Assembly only in the Base Unit. However every unit has a Power Supply, Node Module, and one to five Scanner Modules.

3. Lift the scanner and node modules partially out of the chassis to expose the wiring.
4. Unplug all of the connectors from the Node/Scanner assembly.

5. Remove the Node/Scanner assembly. Set this assembly so the Node Module is facing down.

To Separate Scanner Modules:

1. Remove the Terminator from the last scanner in the assembly.
2. While holding the scanner to be removed with one hand, press the retaining latch INWARD.

3. Insert a flat blade screw driver in the slot next to the retaining latch. Twist the screw driver to slightly separate the scanner.

4. Repeat steps 2 and 3 on the other three latches.
5. Lift the assembly straight up to remove it.

To add a scanner:

1. Carefully align each tab on a Scanner Module with the corresponding slots in the previous module.

2. Carefully press the two assemblies together until the retaining catches lock.

3. Place the TERMINATOR into the last scanner in the stack.
To reassemble the unit:

1. Align the Scanner/Node assembly with the mounting pins in the chassis.

2. Attach all of the power cables to each of the modules.

3. Make sure the TERMINATOR is in place on the last scanner in the stack.

4. Route the base control cable through the notch in the casework.
Building Traditional Fixturing
Traditional fixturing is one way to connect the device-under-test to the tester using two-wire or four-wire fixturing. Fixtures can be built for Fast Attach, which allows you to quickly attach connectors (see Fast Attach Overview in the on-line help system for more information).

Two-wire Fixturing

Required Items
32 pin male Eurodin connectors with certain pins removed. Cirris offers a six-foot cable with a 32 pin Eurodin connector attached to one end. Ask for part number AC61-KF.

Optional: Cirris Screw Terminal Transition Boards (p/n ETB-ST), Screwless Terminal Transition Boards (p/n ETB-SLT), or High Voltage Transition Boards (p/n ET-SHV). For details, contact your Cirris sales representative.

Optional: Bi-color LEDs for guided assembly. You can either purchase discrete LEDs from a distributor or a strip of ten LEDs mounted on card stock from Cirris. Ask for p/n ELED-01.

Connector Saver
Sacrificial CH2 Connector Savers protect the pins in the CH2 tester from wear and damage. One CH2 Connector Saver covers one CH2 scanner module (160 points).

Cirris recommends purchasing CH2 Connector Savers if you frequently plug and unplug mating connectors to and from the CH2 tester.
When to build fixtures
Best practice is to build the mating fixture connecting the device-under-test (DUT) to the tester before creating the Test Program used for the test setup. **Why?** If you use Defined Connectors you can create connector and pin documentation by probing the pins of the fixture’s connectors while the fixture is attached to the tester, greatly speeding up test creation.

Wiring order of the mating fixture
While fixturing can be wired to the tester in any pin order, taking the time to wire your fixturing to match the system point order can save time in the long run. During the test program creation process you will “attach” your fixtures so that system points are mapped to the fixture points in the software. If the points in the fixture are in the same numeric order as the tester points, attaching can proceed very quickly.

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 system pins of the tester.

- 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- requires two test points for each point in the mating connector. 4-wire adapters must be wired in a specific order, see the online manual/help system for more information.

- Label each system mating connector of the fixture with the name of the Scanner Box and the 32-pin connector it plugs into. **Why?** For all test sessions, the connection path of fixture connectors to specific 32 pin connectors on the tester must be the same as when the harness was learned or initially created. If you plug the fixture in differently, you will have to create a new Test Program for that configuration to avoid getting confusing errors.

Building Fixturing for Fast Attach
Fast Attach is a method you can use to attach (map) connectors by just probing the first pin of the mating connector as opposed to all the pins as required by the other attachment methods. All other pins in the connector will be automatically attached so you do not have to probe each one individually.
**Requirements for using Fast Attach**

Fixture connectors that mate to the device-under-test must be wired in the same relative pattern to the system pins of the tester's scanner connectors.

What makes Fast Attach Connector Types different than the others?

A Fast Attach Connector Type requires one more step in its construction, which is to set a wiring pattern describing the relative position of its pins to the pins on the scanner connectors of the tester. You do this by wiring a connector to the tester and then by probing the pins in the counting order of the connector.

The following image shows the proper wiring of several connectors that could be used with Fast Attach.

![Image of proper wiring](image)

Example of connectors that are not suited to the Fast Attach feature:

![Image of connectors not suited](image)

**Fast Attach is a five-step process:**

1. Build a fixture containing the desired connector. Connect the fixture to the tester.
2. In the Connector Type Library, create a connector type that matches the connector you are going to configure for Fast Attach. It must be complete and cannot be In Use.
3. While in the Connector Type Library, right-click on the newly created connector type. Select **Wiring Pattern - Set**.
4. Right-click on the same connector type and select **Wiring Pattern – Verify**. Use the probe to verify the wiring order as it is connected to the tester.
5. When creating a Test Program in the easy-wire Editor, after defining connectors, attach connectors by probing the first pin of each Defined Connector described by a Fast Attach Connector Type.
**Four-wire Fixturing**
Four-wire testing allows you to measure resistances down to .001 Ohm. It also allows you to eliminate the resistance of your interface wiring.

<table>
<thead>
<tr>
<th>Two-wire Test</th>
<th>Four-wire Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Two-wire Test Diagram" /></td>
<td><img src="image2" alt="Four-wire Test Diagram" /></td>
</tr>
</tbody>
</table>

- Two-wire testing measures resistance at the face of the CH2.
- Adds test lead resistance ($R_{\text{Lead}}$) to the resistance of the device-under-test ($R_{\text{DUT}}$).
- Uses two wires per measurement.
- Tests wires to different resistance values using Wire Instructions.
- Measurement resolution ($V_M$): 0.1 Ohm from 0.1 Ohm to 100.0 Ohms

- Four-wire testing measures resistance at the point where the 4-wire pairs come together.
- Only measures the resistance of the device-under-test ($R_{\text{DUT}}$).
- Uses four wires per measurement.
- Tests wires to different resistance values using 4-wire instructions.
- Measurement resolution ($V_M$): 0.001 Ohm from 0.01 Ohm to 80 Ohms

**How to place Kelvin points in four-wire fixturing**
A Kelvin point is a place that makes a Y junction by joining three parts:

- One of the end points of the device-under-test.
- Visible point wire of a 4-wire pair.
- Hidden point wire of a 4-wire pair.

**Note:** The Y junction can be a solder joint or it can be where a paired wire on one side of the measurement is closest to a paired wire on the other side (see below - DUT #3).
Requirements for Kelvin Points
Each 4-Wire measurement requires two Kelvin pairs, one at each end. Place Kelvin pairs as close to the device-under-test as possible. WHY? The 4-Wire Test measures from Kelvin pair to Kelvin pair, so any contact and lead resistance between the Kelvin pairs is added to the resistance measurement of the device-under-test.

Examples of how Kelvin pairs placement affects 4-wire measurement:

DUT #1: The measurement is only of the device-under-test. This is the ideal, but in real-world situations it may be nearly impossible to achieve.

DUT #2: The measurement includes part of the fixture. Warning! If a lot of the fixture is between a Kelvin Point and the device-under-test, the 4-Wire Test will be considerably compromised.

DUT #3: The measurement tests only part of the device-under-test. For example, by using probe pins, you can eliminate the resistance of a connector from the measurement.

Finding Visible and Hidden Point Mates
Unlike conventional fixtures that require two wires per measurement, 4-Wire fixtures require four wires in two pairs per measurement. In order to fixture four-wire to the CH2, the two wires in each 4-Wire Pair must connect to two different kinds of test points called Visible and Hidden. Each Visible point has one specific Hidden mate and the two must go together.
How to - Map the Visible points to Hidden mates

From any visible point, the next vertical point is its hidden pin mate.

Now that you have built your fixturing, you are ready to Define Four Wire Connectors in the easy-wire software. Refer to the online manual/help system for more information on setting up a four-wire test program.
Introduction
The easy-wire CH2 xHV Power Supply allows the CH2 to test up to 1500VAC when used with
1500VAC capable scanners. The xHV Power Supply also allows higher “real current” and “total
current” settings. When using this supply, Cirris strongly recommends that you use an interlock
safety device and an emergency shutoff (or E-stop) device to ensure operator safety. You may
purchase safety switches from Cirris as a low cost solution or purchase your own devices to
meet your requirements. For more information on interlock safety devices, call Cirris at 1-800-
441-9910. This section is a step by step guide on how to build a safety interlock and how to set
up and use the xHV power supply.

Before you Begin
The CH2 tester should be set up and working before you set up the xHV Power Supply (see
“Setting up the CH2 Tester” on page 7 for more information).

You Should Have Received
In addition to what you received with the CH2 tester, check that you have received the following:

- xHV Power Supply Unit
- Safety Ground Wire(s)
- 25 pin D-sub Female Connector (for wiring your own safety device)
- D-sub Connector Housing
- Red HV Cable
- White Shield Cable
- Black Ground Cable
- USB Cable
- Power Cable

You May Have Received
- E-stop Safety Switch (optional)
- Interlock Safety Device (optional)
Building an HV Interlock

On the rear panel of your xHV Power Supply is a connector called, “Safety Switches.” This connector can be used to wire Interlock Safety switches and an Emergency Shutoff switch to the xHV Power Supply. The switches provided by Cirris are identified as Interlock Safety 1, Interlock Safety 2, and Emergency Shutoff (E-Stop).

The diagram below displays the “Safety Switches” connector pinout.

Each safety switch has four signals: Drive+, Drive-, Sense+, and Sense-. The table below displays the switch name, signal, and pin number of the HV Safety Interlock.

<table>
<thead>
<tr>
<th>Switch Name</th>
<th>Signal</th>
<th>Pin #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlock Safety 1</td>
<td>Drive+</td>
<td>19</td>
</tr>
<tr>
<td>Interlock Safety 1</td>
<td>Drive-</td>
<td>6</td>
</tr>
<tr>
<td>Interlock Safety 1</td>
<td>Sense+</td>
<td>18</td>
</tr>
<tr>
<td>Interlock Safety 1</td>
<td>Sense-</td>
<td>5</td>
</tr>
<tr>
<td>Interlock Safety 2</td>
<td>Drive+</td>
<td>14</td>
</tr>
<tr>
<td>Interlock Safety 2</td>
<td>Drive-</td>
<td>1</td>
</tr>
<tr>
<td>Interlock Safety 2</td>
<td>Sense+</td>
<td>2</td>
</tr>
<tr>
<td>Interlock Safety 2</td>
<td>Sense-</td>
<td>15</td>
</tr>
<tr>
<td>Emergency Shutoff</td>
<td>Drive+</td>
<td>13</td>
</tr>
<tr>
<td>Emergency Shutoff</td>
<td>Drive-</td>
<td>25</td>
</tr>
<tr>
<td>Emergency Shutoff</td>
<td>Sense+</td>
<td>12</td>
</tr>
<tr>
<td>Emergency Shutoff</td>
<td>Sense-</td>
<td>24</td>
</tr>
</tbody>
</table>
**Wiring the Interlock Safety Switches**

The safety switch signals can be wired to single pole or double pole switches. Choose the diagram below that matches your switch type and wire the switch as shown. If you are not using Cirris safety switches, assure that your safety switch has normally open contacts. When the operator wants to prevent hipot, the switch contacts must be open. To allow hipot, the switch contacts must be closed. If the contacts open during a hipot test, the test will abort.

Wire Interlock Safety Switch 1 like this:

**Single Pole**

Drive + (pin 19)

Drive - (pin 5)

Sense - (pin 5)

**Double Pole**

Drive + (pin 19)

Drive - (pin 6)

Sense + (pin 18)

Sense - (pin 6)

Note: If you have a double pole interlock device that requires only one switch, connect the unused Drive + to the unused Drive - and the unused Sense + to the unused Sense -.

Wire Interlock Safety Switch 2 like this:

**Single Pole**

Drive + (pin 14)

Drive - (pin 1)

Sense - (pin 15)

**Double Pole**

Drive + (pin 14)

Drive - (pin 2)

Sense + (pin 2)

Sense - (pin 15)

**Wiring the Emergency Shutoff Switch**

Wire the pins to the emergency switch using one of the following diagrams. To allow hipot, the e-stop switch contacts must be closed. To abort hipot, the contacts must be open.

Wire a Single Pole emergency shutoff switch like this:

Drive + (pin 13)

Drive - (pin 25)

Sense - (pin 24)

Wire a Double Pole emergency shutoff switch like this:

Drive + (pin 13)

Drive - (pin 25)

Sense + (pin 12)

Sense - (pin 24)
Set Up

In order to use the xHV Power Supply the PC running your CH2 must have 2 USB ports. The xHV Power Supply requires the current version of the easy-wire software (version 2009.2.0 or higher) and a driver (see below). Prepare all cords to be assembled.

The version of your easy-wire software is found on the easy-wire Main Menu.

If you need to install the current version of the easy-wire software, go to www.cirris.com. A password will be needed to access the software. To obtain your password, please call Cirris customer support at 1-800-441-9910.

To install the driver:
Ensure that easy-wire version 2009.2.0 or higher is installed on your PC, then go to C:\Program Files\Cirris\easywire\xHVAC Supply, double-click on USBXpressInstaller.exe, and follow the installation steps provided. Note: This may take a few minutes to install.

The electrical assembly of the CH2 Base should already be completed.

To set up the xHV Power Supply:

1. Place the CH2 Base on top of the CH2 xHV Power Supply aligning the back panels of both units as shown.
**Electrical Assembly – Part 1**

Follow the instructions below to complete the first part of the electrical assembly.

---

**Electrical Assembly – Part 2**

The CH2 Base unit must be grounded to the xHV Supply. Check to see if there is a ground lug with a male Faston on the back of your CH2 Base unit next to the power switch.

**If there is a ground lug on your CH2 Base:**

Using the ground wire supplied by Cirris or using one of your own, slide the female Fastons onto the male Fastons located on the CH2 tester and the xHV Power Supply as shown.

**Note:** If you are using your own grounding wire(s), make sure the length of the wire is as short as possible when connected.

**If there is not a ground lug on your CH2 Base:**

A screw on the CH2 base can be grounded to a screw on the xHV Power Supply as an alternative method. Make sure to use the side screws that are located nearest the power supply:

Remove both screws, attach the ground wire to the screws using ring terminals, replace the screws, and tighten.

See the Grounding Requirement Guide on the next page for more information.
xHV/CH2 External Grounding Requirement Guide

xHV/CH2 External Grounding (Rear Panel Ground Lug)
Preferred Method

Suggested Materials List (or equivalent):

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Manufacturer Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-10G33 - Wire, bare tinned copper</td>
<td>Custom Wire</td>
<td>60-10G33</td>
</tr>
<tr>
<td>26-80026 - Faston, female right</td>
<td>Molex, Inc</td>
<td>16008-0006</td>
</tr>
<tr>
<td>26-80029 - Faston, male left 26/30</td>
<td>AMP, Inc</td>
<td>42214-18</td>
</tr>
<tr>
<td>26-80030 - Ring terminal, #6 crimp</td>
<td>Panduit</td>
<td>PN18-1R</td>
</tr>
<tr>
<td>26-80031 - Shrink sleeving</td>
<td>AlphaWire</td>
<td>FIT-221-9/32</td>
</tr>
<tr>
<td>26-82026 - Screw, 5-32 X 3/8 SEMS</td>
<td>MCI, Inc</td>
<td>940-258LX</td>
</tr>
<tr>
<td>26-82027 - Ring terminal, #10 crimp</td>
<td>Panduit</td>
<td>PN16-1R</td>
</tr>
</tbody>
</table>

Note:
All wires as short as possible.

Preferred
- Add 6'1/2 for each additional CH2 chassis in system
- Continuous bus with fastons on ground lugs

1st Alternate
- Individual ring terminal segments on ground lugs
- Wire cut length is always 3'1/2 longer than the sum of all segments spanned
- Sizing do protect bare copper (pipe) ALL PLACES

2nd Alternate
- Individual ring terminal segments on chassis cover screws
- Wire cut length

xHV Power Supply 36
Using the xHV Power Supply

Once the xHV Power Supply is installed, the High Voltage Test Parameters in easy-wire will have new capability. The Dielectric Withstand Voltage Test (DWV) can deliver up to 1500 VAC RMS, the “total current” and “real current” limits can deliver up to 22mA RMS and 5mA RMS respectively, and Ramp Up/ Ramp Down setting options are now available. Setting these options correctly will maximize operator safety.

When you are editing a test in easy-wire, click on the “Set Test Defaults tab” (tab 3), then click **Set Standard High Voltage Parameters.**

High Voltage Test Parameters

In the “High Voltage Test Parameters” window, you can verify that the xHV Power Supply is working if “External Supply” is available in the “Options” section. If “External Supply” is unavailable, go through the set up steps again to correct errors that may have occurred. If needed, call Cirris for assistance at 1-800-441-9910.

To set the HV Test Parameters for the xHV Power Supply:

1. Ensure that the options **External Supply, DW Test,** and **IR Test** are selected in the “Options” section.

2. In the “Dielectric Withstand Test” section, set the DW Voltage to the value your test requires, and set the “Frequency” to 50 or 60 Hz to enable the AC option.

3. Set the Total Current high enough to withstand the capacitance of your cable, and set the Real Current as low as your specification allows.

4. In the “Voltage Ramp” section, set the Ramp Up Time and Ramp Down Time to 20ms or more.

5. Set the IR Voltage and IR Resistance to the values that your test requires.

6. When the High Voltage Test Parameters are set, click **OK,** and save the test.

To run the xHV Power Supply, the “External Supply” option must be enabled.
Custom Instructions

Introduction
Custom Instructions are designed to accommodate specific or unique testing needs to extend easy-wire’s capability. With Custom Instructions, you can now test transformers and control the voltage and current used in a test. They also allow you to use a wide range of external instruments that expand the capabilities of your CH2 test system. These instructions have all the benefits of the standard easy-wire commands: measured values, custom reporting, import/export, and easy-wire editor and test interfaces. In order to use Custom Instructions, the current version of the easy-wire software (version 2009.2.0 or higher) must be installed and a license file is required (see below).

The version of your easy-wire software is found on the easy-wire Main Menu.

If you have a current version of easy-wire, call your Cirris salesman to get your license file.

If you do not have a current version of easy-wire, go to www.cirris.com. A password will be needed to access the software. Call your Cirris salesman to obtain your password and get your license file.

You will receive your license file via email.

To add a custom instruction:
1. From the easy-wire Main Menu, highlight the test program you wish to add an instruction to, and then click Edit/View.
2. In the “Test Program Editor,” click on the drop down box in the bottom left corner, and select Custom.
3. After “Custom” is highlighted, click Add New Instruction.
Category Overview
Custom Instructions are grouped by categories. For example, all instructions for one type of external instrument are grouped under one category. There are two Custom Instruction Categories that come with the easy-wire software, “Common” and “Cirris CH2.” Additional categories are added to the list when you purchase a license file.

“Custom Instruction” Window:
The “Custom Instruction Category” list that determines which custom instructions you can select in the “Custom Instruction Name” drop down list. Each category has its list of custom instructions.

After you select a Custom Instruction Category and a Custom Instruction Name, the Edit Parameters button will appear in the window. Click this button to setup the selected instruction.
Category Descriptions
The following information describes the custom instructions for each category.

Common
The custom instructions for this category are Comment Response and User Information.

- **Comment Response** allows you to enter a question that will display during a test in the order that it appears in the test sequence, primarily to prompt the operator to check something.

  **EXAMPLE:** If the user selects “Yes” the test will pass. If the user selects “No” the test will fail. The comment response instruction was set up to check if the red LED is on or off.

- **User Information** allows you to enter a reminder or task for the operator to perform, which will display during a test in the order that it appears in the test sequence.

  **EXAMPLE:** The Information Instruction was set up to prompt the user to power on the external instrument.

Cirris CH2
The instructions for this category are Compliance Limited 2W Resistance, Verification, Zero Ohm, Attach Transformer Primary, and Measure Transformer Secondary.

- **Compliance Limited 2W Resistance** allows you to control the voltage and current used in a test.

  **EXAMPLE:** In the “Current Voltage Editor,” you will be able to enter a specific number for the amount of the Source Voltage and Source Current used in the test.

- **Verification** and **Zero Ohm** are found in the CH2 Performance Verification Manual; refer to that manual for more information.

- **Attach Transformer Primary** and **Measure Transformer Secondary** is a two step process that allows you to test the polarity and turns ratio of power and/or signal transformers. Ensure that “Attach Transformer Primary” comes before “Measure Transformer Secondary” in the test.
The two types of external instruments used are measuring devices and programmable power supplies. Varying measuring devices can measure complex components in your test and provide greater accuracy. Power supplies allow you to power several components in your test. You can purchase external instruments from their manufacturer or you can purchase them through Cirris. If you have an external instrument that is not supported, call Cirris for assistance at 1-800-441-9910.

To attach these instruments to a CH2 scanner it is recommended you purchase:

- A GPIB Interface Converter
- OR
- A Null Modem RS-232 Cable

The following measurement devices are now supported:

- Entire Keithley 2400 SourceMeter® series
  AND
- Agilent/HP 34401 and 34410 DMMs

The following power supplies are now supported:

- Agilent E3645A & 6674 Power Supplies (used with CH2 Energization Box)

**Keithley 2400 Series:** The Keithley meters are called SourceMeters® because they combine a digital voltmeter with a precision voltage-current source. The 2400 SourceMeters® can address difficult tasks such as measuring breakdown voltages, leakage currents, and very high resistance values.

**Agilent/HP 34401, 34410 DMMs:** These digital multi-meters provide high accuracy voltage, current, and resistance measurements. Both of these multi-meters have the same functions as the CH2 with accuracy better than 2% (giving 5-6 digits). The 34410 DMMs can also make capacitance measurements.

**Agilent 3645A and 6674A:** These power supplies are used with the CH2 Energization Box (EBox), which allows you to actuate and energize lamps and LED lights in a test. They are also useful for testing assemblies that contain two or more different voltage relays, and testing parameters that require variable voltages, such as relay pull-in voltages and drop-out voltages. They allow you to set any voltage from 0 to 60 VDC and both can be programmed to change voltage during a test.
The **Keithley** and **Agilent** external instruments have their own custom categories and instructions. The examples below display the currently supported instruments.

### Supported Keithley Instruments

- **Keithley 2400**
- **Keithley 2400LV**
- **Keithley 2410**
- **Keithley 2420**
- **Keithley 2425**
- **Keithley 2430**
- **Keithley 2440**

### Supported Agilent Instruments

- **Agilent 34401**
- **Agilent 34410**
- **Agilent 34415**
- **Agilent 6674**
- **Cirris CH2**
- **Keithley 2400**
- **Keithley 2400LV**

### Required Items

- The external instrument
- An External Instrument Interface Cable (from Cirris)
- A GPIB Converter or RS-232 Cable
- A Power Cable (comes with instrument)
Set Up
The following steps illustrate how to physically attach an external instrument to a CH2 tester and how to attach the instrument to the software. Your CH2 tester should already be set up, if not see page 7.

Note: External instruments vary in appearance and are set up differently than EBox related Power Supplies. See the instructions below to attach a meter, see Set Up on page 46 to attach a power supply.

To attach a Volt/Source Meter:
1. Plug the GPIB Converter or RS-232 Cable into the connector on the back of the external instrument, and plug the other end into a USB port on your PC.

2. Plug one end of the power cord into the back of the external instrument and plug the other end into a grounded outlet.

3. Place the external instrument near the CH2 base. On the front of the meter plug in the two sense wires and the two force wires of the External Instrument Interface Cable.

4. Plug the connector end of the External Instrument Interface Cable into the last set of test points on the CH2 base.
5. If you purchased a GPIB Convertor, insert the GPIB Installation CD into your PC and follow the installation steps to install the driver.

6. Turn off the Power.

To Access External Instrument Instructions in the easy-wire Software:

1. Make sure your license file is in the same location as the easy-wire executable on your PC.

Usually, the file path of the location is:

C:\Program Files\Cirris\easywire

To Attach an External Instrument to the CH2 Tester in the easy-wire Software:

1. Select the name of your external instrument as the “Custom Instruction Category.”

2. Select either **Attach 2 Wire** or **Attach 4 Wire** as your first instruction.

   **Note:** The first instruction you select must be an attach instruction or the other instructions will not work.
**Introduction**
The CH2 Energization Box (EBox) allows you to provide external power to points in your device under test. It provides the CH2 with the capacity to test relays, lamps, LED lights, and other similar components needing external power. The EBox provides 160 points of power and can be upgraded with additional 160 point modules to a maximum of 800 points per EBox. CH2 systems can have an unlimited number of EBox units. The CH2 EBox has the ability to accommodate a wide variety of external power requirements. The two types of power supplies that can be used with your EBox are a Fixed Voltage Power Supply or an External Programmable Power Supply.

---

**You Should Have Received**
- At least one EBox
- One “Box to Box Cable” per EBox
- At least one 160 point module
- One Power Cable per EBox

---

**You May Have Received**
- One Fixed Voltage Power Supply per EBox

**Note:** You will receive a fixed voltage power supply if you are not using an external programmable power supply to change the voltage in your test. The available Fixed Voltage Power Supplies are 5, 12, 15, 24, or 48 VDC. The voltage of the Fixed Power Supply should match the voltage needed to energize your device.

---

**You May Have**
- A Programmable Power Supply

**Warning!** When you are using an External Programmable Power Supply, do not apply more than 60 V peak to the EBox. Energization voltages greater than 60 V can damage your CH2 tester!
Set Up

1. Place the CH2 EBox on top of the CH2 Base. Adjust the EBox until the front, back, and sides are aligned with the Base, and attach any additional point modules to the front of the EBox.

2. Attach the CH2 Base to the CH2 EBox using the box-to-box cable.

3. On the back of the EBox, plug the power cable into the power connector and plug the other end into a grounded outlet.

4. To the left of the power cable, plug in your “Fixed Voltage Power Supply” or “External Programmable Power Supply” into the Energization Voltage socket.

5. Press the power switch on the back of the EBox to turn on the power.
Using the CH2 Energization Box
Relay energization is accomplished by attaching test points on the CH2 base to energization points on the EBox. The energization points are selected in a test program using the “Actuate” instruction in the easy-wire software. They are powered on and off using the “Energize” instruction.

Setting Up the Test
When you set up a test to use the EBox, in the “Set Test Defaults” tab, turn “Hipot Testing Voltage” off and change the Test Method to **Energize Test**.

The Actuate Instruction
After you add the “Actuate” instruction, you can select an Actuation Point and connect it to the positive or negative side of the energization supply.

**Note:** Whenever you see a **Try It** button, you can click on it to execute that instruction. This can be useful for debugging test programs.

The Energize Instruction
The Energization instruction controls a switch inside the EBox, which connects the energization supply to the energization switch point matrix.

Use the Activate commands to connect the E-points of the device to be powered, and then turn on the power using the Energize “On” command. You must turn off the power using the Energize “Off” command before changing the E-point connections using Actuate. At the end of a test, Energize is automatically turned off and all actuation points are disconnected.
Energization Box Performance Verification
The Energization Box (EBox) Performance Verification test will verify the EBox is supplying the correct voltage and the Overcurrent circuit is working correctly. You will test the EBox at one-half its power rating and then again at twice its power rating using power resistors.

Items needed for the Performance Verification Test

- A Voltmeter (you supply)
- A Mating Connector (purchase from Cirris)
- 2 Power Resistors (you supply; see below)

Selecting Power Resistors
The EBox power test uses specific load resistors. The correct value (Ohms) and power rating (Watts) of the resistors depends on the maximum voltage supplied by your EBox power supply. Use the table below to select the appropriate resistors. Make sure your selected resistor’s power rating is at least as high as the value specified in the table. You will be instructed to connect these resistors to the EBox during the test. Cirris recommends using power resistors from the TMC series by Huntington Electric Inc. from digikey.com.

<table>
<thead>
<tr>
<th>EBox Power Supply Max Voltage</th>
<th>2 * V Ohm Power Resistor</th>
<th>V / 2 Ohm Power Resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ohms</td>
<td>Watts</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>12</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>28</td>
<td>56</td>
<td>14</td>
</tr>
<tr>
<td>48</td>
<td>96</td>
<td>24</td>
</tr>
<tr>
<td>Variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(set power supply to 5V)</td>
<td>10</td>
<td>2.5</td>
</tr>
</tbody>
</table>
To run the EBox Performance Check test:

1. Import the CH2EBoxPerformanceCheck.TXT text file into your easy-wire software.

2. From the easy-wire main menu, highlight the test, and click Test.

3. When the first custom instruction displays in the test, attach a resistor between Energization points 1 and 2 on the EBox. Attach the resistor that has an Ohm value equivalent to two times the test voltage and click OK.
4. Use your voltmeter to measure the voltage between Energization points 1 and 2. If the voltage is less than 10mV, click Yes. Otherwise, click No.

5. Use the voltmeter to measure the voltage between the same two points to check if it is within 20% of the EBox supply.

6. Attach the second power resistor between Energization points 3 and 4. Attach the resistor that has an Ohm value equivalent to the power supply voltage divided by 2 and click OK.

If the test passes, your EBox is working correctly. If the test fails, call Cirris at 1-800-441-9910 for assistance.
Warranty

Cirris Systems Corporation warrants the CR / CH+ / CH2 analyzer to be free of defects in materials and workmanship for a period of one (1) year from the date of delivery to you, as evidenced by receipt of your warranty registration form. In the event a defect develops due to normal use during the warranty period, Cirris Systems will repair or replace the analyzer with a new or reconditioned unit of equal value. For this warranty to be valid you must complete and return the warranty registration card.

In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original analyzer. Replacement units will be returned by the same method shipped; generally within one (1) working day.

If analyzer failure results from accident, abuse, or misapplication, Cirris Systems Corporation shall have no responsibility to replace the analyzer or refund the purchase price. Defects arising from such causes will be considered a breach of this warranty. Cirris Systems Corporation is not responsible for special, incidental, or consequential damages resulting from any breach of warranty, or under any other legal theory, including lost profits, downtime, goodwill, damage to or replacement of equipment and property, and any costs of recovering materials used with the CR / CH+ / CH2 Analyzer.

ANY IMPLIED WARRANTIES ARISING OUT OF SALES OF THE CR / CH+ / CH2 ANALYZER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO THE ABOVE STATED ONE (1) YEAR PERIOD. Cirris Systems SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE, EXPENSES, OR ECONOMIC LOSS.

Some states do not allow limitations on length, or implied warranty, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

Cirris Systems Corporation
Salt Lake City, Utah.

PLEASE RECORD PURCHASE DATE AND SERIAL NUMBER BELOW.

DATE: ____________________________
SERIAL NUMBER: ____________________