

Model 302

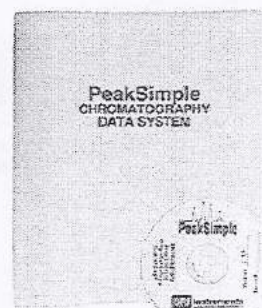
Six Channel USB PeakSimple Data System

The **Model 302** may be used with any brand or model of GC or HPLC offering an analog detector output signal ranging from -5V to +5V. It includes three independent, programmable controls (0V to +5V analog output) for temperature & pressure or HPLC gradient formation. The Model 302 has six channels, which can be randomly assigned to one of four time bases, which allows independent start and stop times for four separate instruments. Four remote start inputs compatible with 2-wire switch closures (typically output by GCs and HPLCs as a remote start signal) are also included for your use. Two pulse stretchers are provided to accommodate instruments with remote start signals shorter than one second (such as Hewlett Packard GCs).

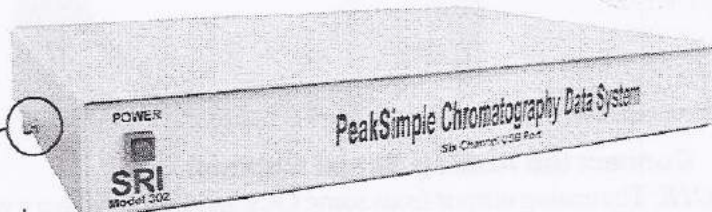
The computer to which you connect the Model 302 must support USB (it must have at least one USB port—rev 2.0 or higher—and use Windows™ 98, 98SE, ME, 2000, XP or newer).

With your purchase of the Model 302, you should receive the following items:

- 1 - Model 302 Data System box (front and rear views shown below)
- 2 - USB cable for connection to your computer's USB port
- 3 - Manual (either the PeakSimple Chromatography Data Systems or the SRI general product manual)
- 4 - PeakSimple for Windows™ software (inside the manual cover)



The Model 302 comes in a sturdy aluminum box consisting of top and bottom halves, secured together with two brass thumbscrews for easy interior access.



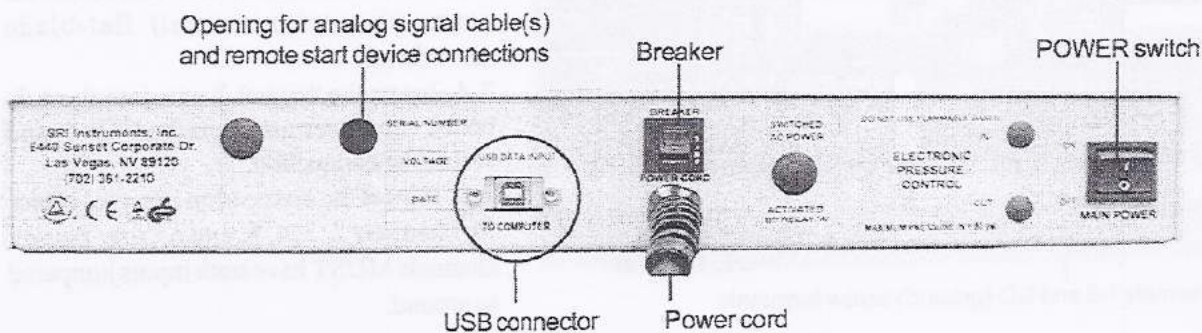
The brass thumbscrews are on the left- and right-hand panels of the Model 302 box.

Front View



POWER Indicator LED

Rear View

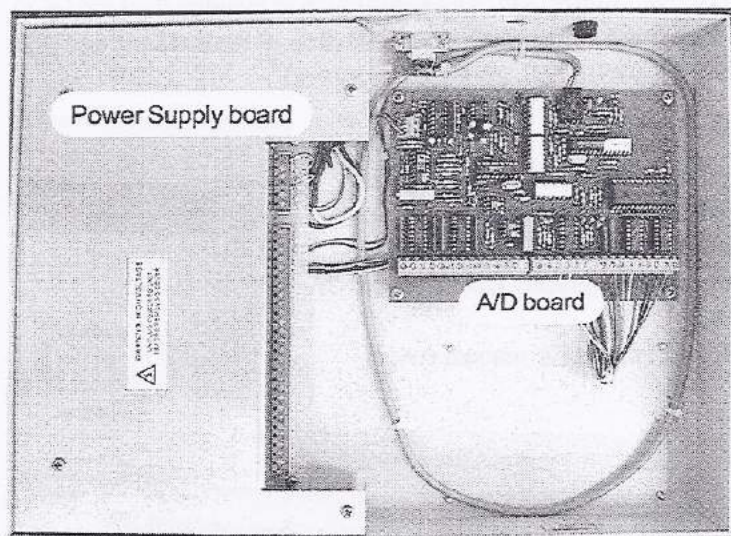


Model 302

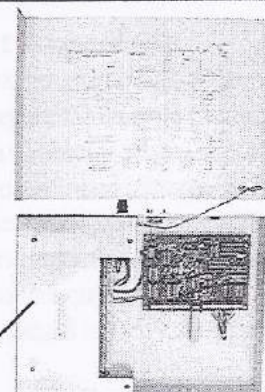
Six Channel USB PeakSimple Data System

1. Open the Model 302

Verify that the Model 302 is powered OFF and unplugged. Remove the thumbscrews on both sides of the Model 302 box and slide the top cover up and off. It is connected to the bottom of the box by a ground wire, so just set it next to the bottom half of the box.



High voltage aluminum safety cover

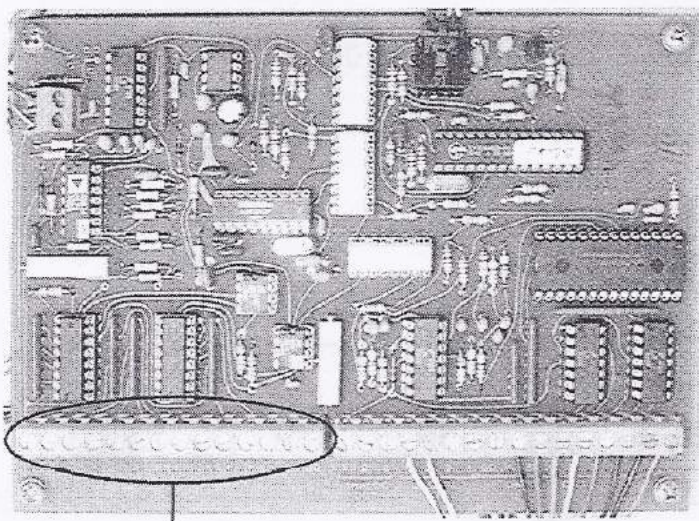


The Model 302 box contains two circuit boards. The board on the right-hand side is the A/D board. The board on the left-hand side under the removable high voltage aluminum safety cover is the Power Supply board. **If you need to remove the high voltage aluminum safety cover, ALWAYS unplug the Model 302 from the wall power outlet first (you do not need to remove it for the wiring connections described here).**

2. Connect the Analog Signal Cable(s)

NOTE: The analog output from some GCs and LCs can have a range of up to 10 volts DC. The Model 302 can tolerate this voltage input, but signals above 6 volts will generate unwanted noise and signals above 5 volts will be "clipped" (the tops of the waveforms will be cut off). Use the 1 volt output typically available on the back of your instrument.

2-1. Route the analog signal cables from your instrument through the open hole in the back of the Model 302.



Channels 1-6 and GD (ground) screw terminals

2-2. Strip 1/4" of insulation from the "signal+" and "signal-" wires of your instrument's signal cables.

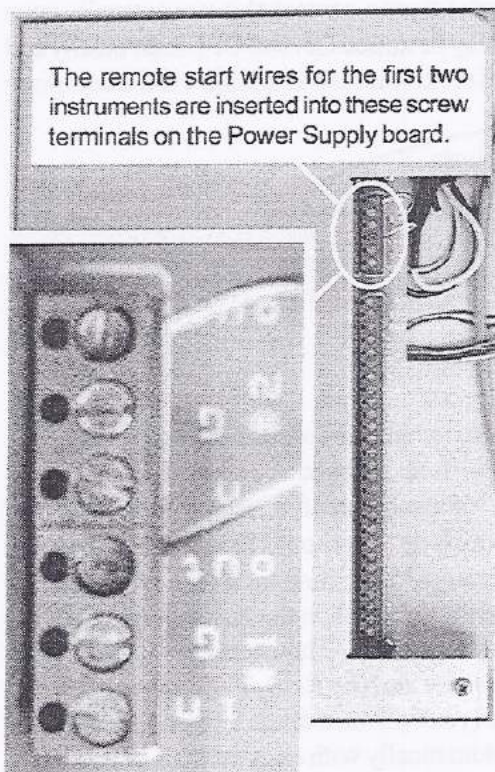
2-3. Remove any jumpers placed in the Channels 1-6 screw terminals at the factory. Insert the "signal+" wire into the A/D board screw terminal marked "1 +" and secure the connection with a small flat-blade screwdriver.

2-4. Insert the "signal-" wire into the A/D board screw terminal marked "1 -" and secure the connection.

2-5. Repeat the connection of signal cables for channels 2, 3, 4, 5, and 6. Any unused channels **MUST** have both inputs jumpered to ground.

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3. Connect the Remote Start Cables (OPTIONAL)

The Model 302 remote start capability allows you to start the data system by means of a switch closure. Four separate remote start circuits permit the user to individually start TIMEBASE 1, 2, 3, and 4 of the data system. In some applications, the chromatograph being used with the Model 302 may offer a remote start signal output or switch closure output that permits starting an integrator or other device when the START button is pressed on the chromatograph's on-board control panel. Typically, this signal can be used to start the Model 302. TIMEBASES 1 and 2 are equipped with pulse stretchers.

3-1. Route the remote start cable from your instrument through the open hole in the back of the Model 302.

3-2. Strip 1/4" of insulation from the "+" and "-" wires of your remote start cable(s).

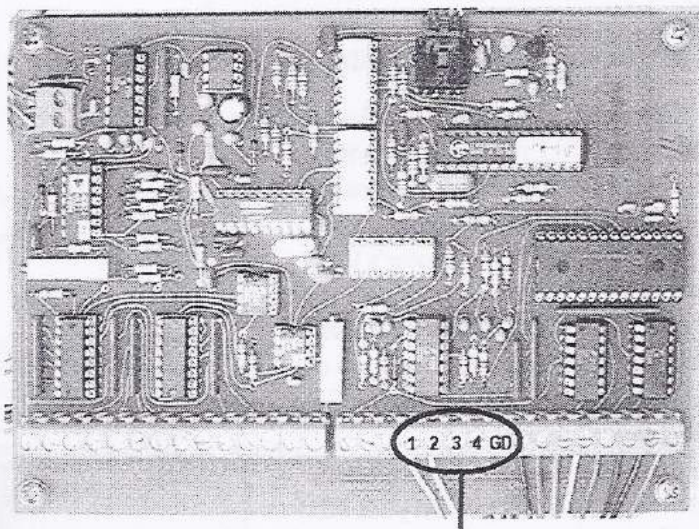
3-3. Insert the "+" wire into the Power Supply board screw terminal marked "#1 IN" and secure the connection.

3-4. Insert the "-" wire into the Power Supply board screw terminal marked "#1 G" and secure the connection.

3-5. For a second instrument, insert the "+" wire into the "#2 IN" terminal, and the "-" wire into the "#2 G" terminal.

3-6. The screw terminals for the third and fourth instruments' remote starts are on the A/D board. The bank of screw terminals is labeled "DIGITAL IN" under "1 2 3 4." Connect the "+" wires for the third and fourth instruments to screw terminals 3 and 4, respectively. Connect both "-" wires to the "GD" screw terminal next to the "4" screw terminal (on the right-hand side).

NOTE: TIMEBASES 3 and 4 require a remote start signal that persists longer for than one second. Check your instruments' specifications (for example, Hewlett Packard GCs produce a very short remote start pulse, so you should connect one of these to TIMEBASE 1 or 2, which are equipped with pulse stretchers).



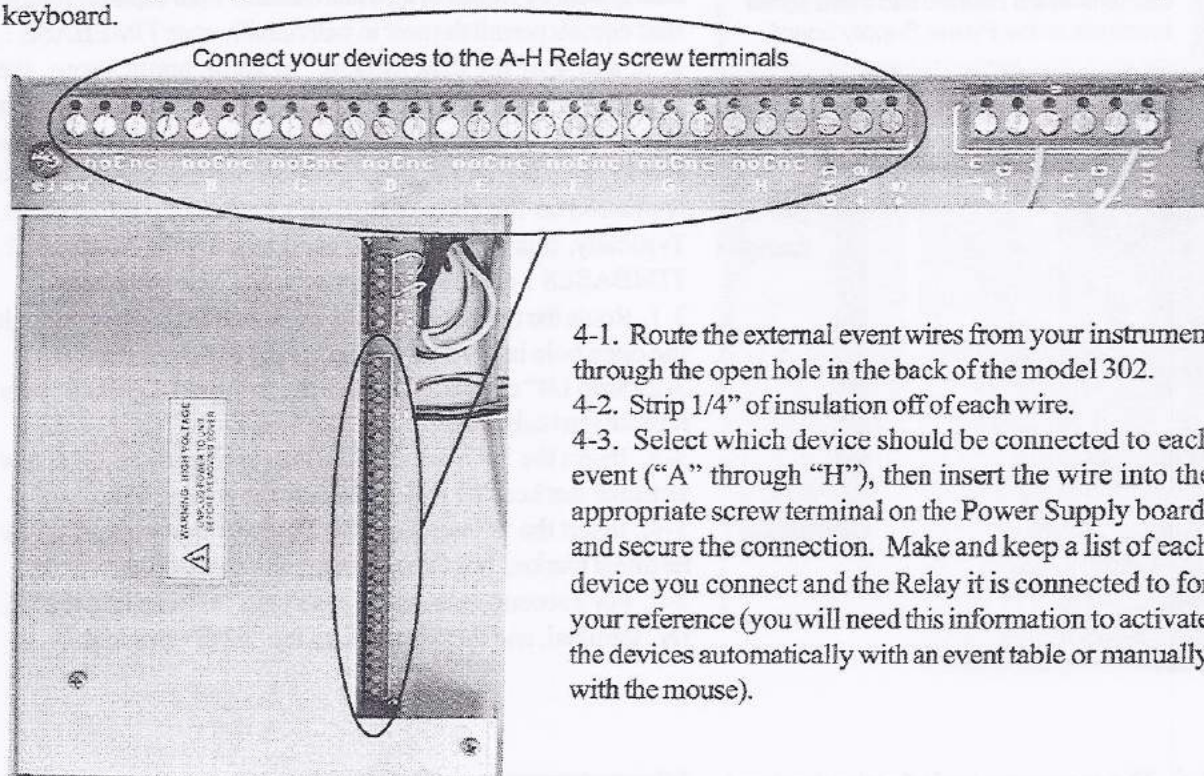
Connect the remote start "+" cables to screw terminals "3" & "4," and the "-" cables to "GD".

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4. Connect the External Event Relay Wires (OPTIONAL)

The Model 302 has eight 0-5 volt TTL level outputs that are wired to a bank of mechanical relays with screw terminals for easy connection to any device which may be operated from a contact closure (normally open [NO] and normally closed [NC] contact closures). These relays may be turned ON and OFF individually and automatically through a PeakSimple timed event table. Manual control is also available via the computer keyboard.



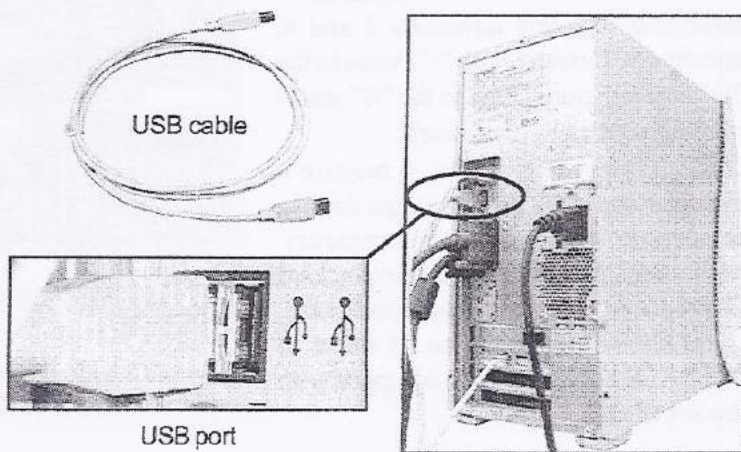
- 4-1. Route the external event wires from your instrument through the open hole in the back of the model 302.
- 4-2. Strip 1/4" of insulation off of each wire.
- 4-3. Select which device should be connected to each event ("A" through "H"), then insert the wire into the appropriate screw terminal on the Power Supply board, and secure the connection. Make and keep a list of each device you connect and the Relay it is connected to for your reference (you will need this information to activate the devices automatically with an event table or manually with the mouse).

5. Replace the cover on the Model 302 and secure it with the thumbscrews.

6. Connect the USB Cable to Your Computer

The Model 302 is equipped with a USB connector. A USB cable (provided) connects the Model 302 to your Windows™ computer's USB port. This plug and play interface permits the Model 302 to be loaded onto and operated from a desktop or laptop computer that supports USB (rev. 2.0 or higher).

- 6-1. Secure one end of the USB cable to an available USB port on your PC.
- 6-2. Secure the other end to the USB connector on the back of the Model 302.



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7. Connect Power to the Model 302

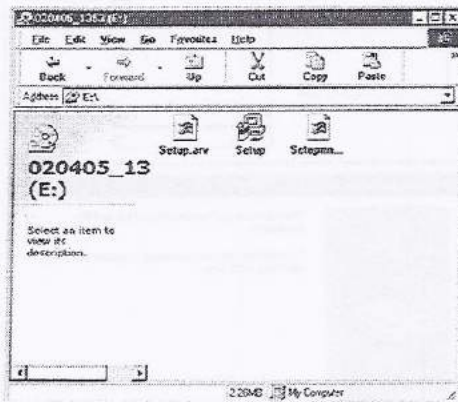
The Model 302 is provided with a power cord which plugs into a standard 110 (or 220) volt outlet. Plug the Model 302 into the wall outlet. Turn ON the power switch and verify that the POWER LED on the front of the Model 302 is lit.



The power LED is lit when the Model 302 is connected to a power source & switched ON.

8. Install PeakSimple Chromatography Software

8-1. Locate your copy of PeakSimple, which is shipped inside the front cover of your manual. Insert the CD or floppy disk(s) into your computer's appropriate drive.



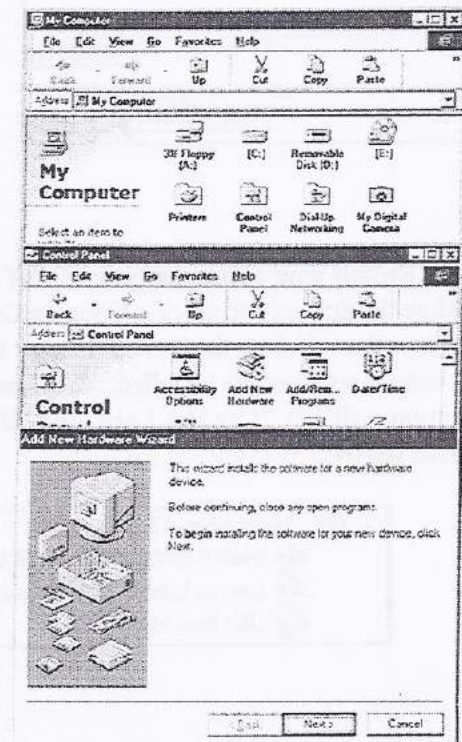
8-2. Open the appropriate drive through My Computer, then double click on "Setup.exe" and follow the instructions. By default, the setup program places the PeakSimple application directory on the hard drive: c:\peak2000. If you put the application directory elsewhere, take note of the path as you may have to enter it in a dialog box during the USB driver installation procedure.

9. Install the USB Drivers

There are three important files saved to the PeakSimple application directory at the conclusion of the software installation: LL_USB.inf, LL_USB.sys, and LL_USB2K.sys. These files are required for Windows to recognize the A/D board connected to the computer's USB port.

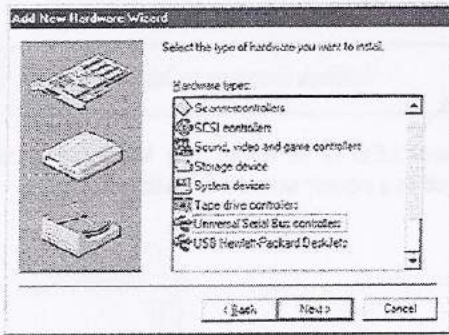
9-1. Double-click on the My Computer icon on your desktop, then on Control Panel, then on Add New Hardware, which should open the Add New Hardware Wizard.

9-2. Click the Next button twice, until you get to the screen that gives you a choice between letting Windows find the new hardware, or selecting it yourself from a list. Click the radio button to choose the hardware from a list and click the Next button.

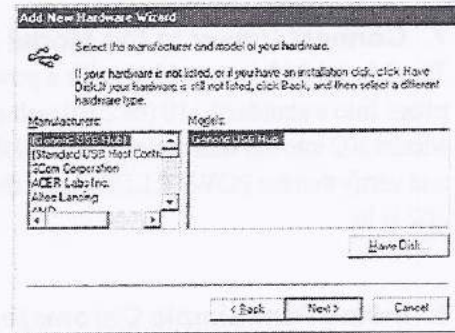


Model 302

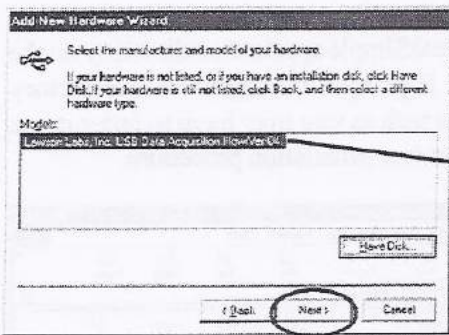
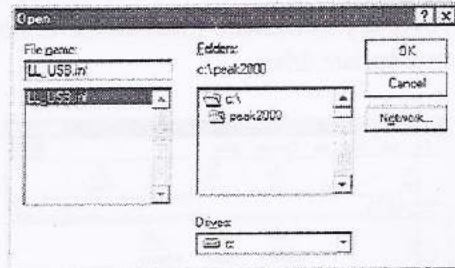
Six Channel USB PeakSimple Data System



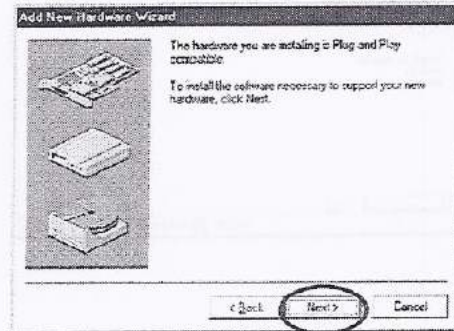
9-3. Scroll down the hardware list, click on Universal Serial Bus controllers, then click Next. From the following screen click the Have Disk button.



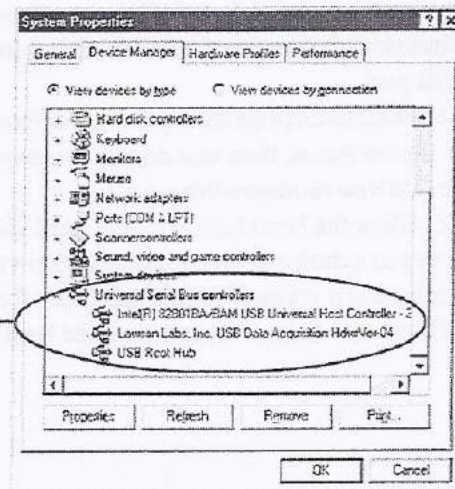
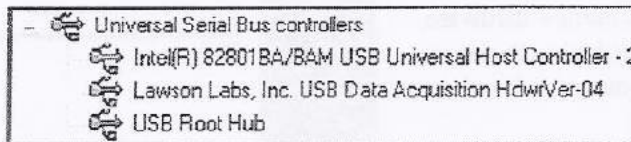
9-4. Click Browse and navigate to the PeakSimple application directory, or type in the path ("c:\peak2000" or the name you have chosen). The Wizard should find the LL_USB.inf file. When you click OK, the Wizard will verify that you want to copy files from the PeakSimple directory ("Copy manufacturer's files from: c:\peak2000").



9-5. When you click OK again, the Wizard will confirm that the drivers are for Lawson Labs. Click Next on this screen and the following screen, and Windows will finish installing the software for the Model 302. Click Finish.



9-6. Restart your computer (you MUST restart your computer before the drivers will work). Open the Control Panel again, then System, then click on the Device Manager tab. If the USB drivers have been successfully installed, the Universal Serial Bus controllers section will list "Lawson Labs, Inc. USB Data Acquisition HdwrVer-04."

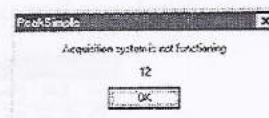


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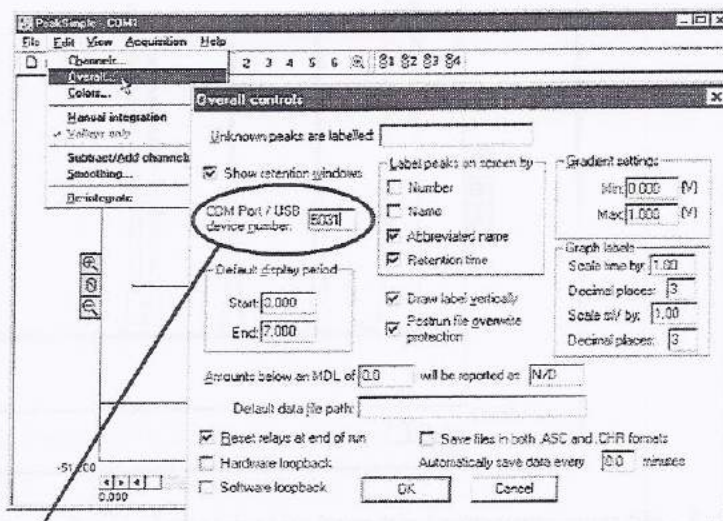
10. Launch PeakSimple

10-1. Double-click on the PeakSimple icon to launch the program. Verify that communication has been established between your computer and the Model 302. An error message will appear if communication is not established. This is normal until you complete the following step.



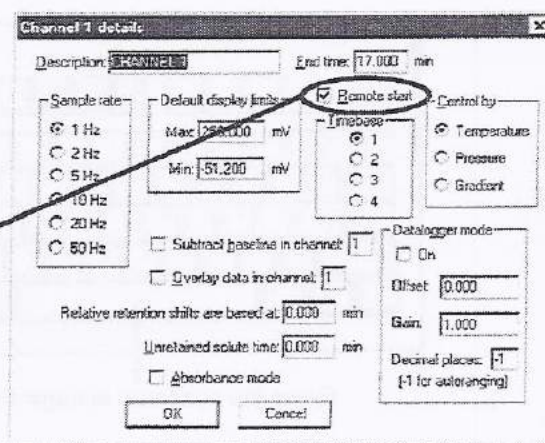
10-2. Each SRI USB data system has a unique 4-digit USB device number beginning with "5" (5031, 5032, etc.). This I.D. number is printed on the back of your Model 302, and on your PeakSimple disk. Open the PeakSimple Edit menu and choose Overall. Enter your Model 302 I.D. number in the box labeled "Com port / USB device number." Click OK, and PeakSimple will attempt to "wake-up" the data system. Click the

Save All  icon so you don't have to re-enter the USB device number.



Enter the 4-digit USB device number here

10-3. For the remote start option: Open the Edit menu and choose Channels. Click on the Details button for channel 1. Verify that Remote start is enabled (the box should be checked). Repeat this step for channels 2-6 if necessary.



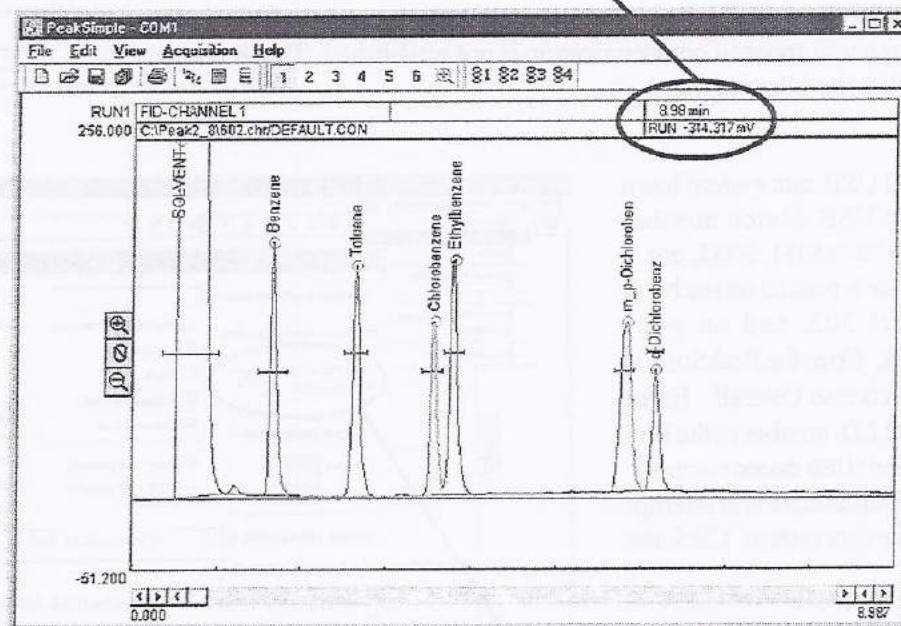
10-4. For information about using Event tables, manual Relay activation, etc., see the "PeakSimple Tutorials" and the "PeakSimple Software" sections in the manual (and online at www.srigc.com—click on the "Download Our Documents" button on the homepage).

Model 302

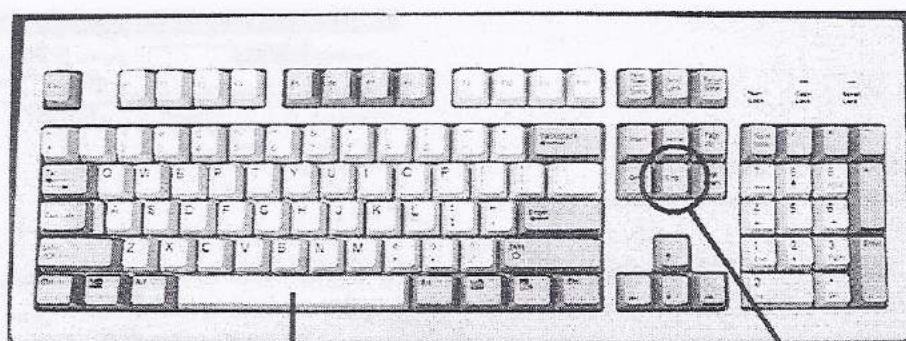
Six Channel USB PeakSimple Data System

11. Starting an Analysis

10-1. The upper right corner of the PeakSimple chromatogram window contains real-time information pertinent to your analysis in progress. The status of the run (STAND BY, RUN) is displayed in capital letters next to the millivolt (mV) reading, underneath the amount of time into the run.



11-2. Hit your computer keyboard spacebar to begin the run, and the data is plotted onscreen in the chromatogram window.



Press the spacebar to begin the run

Press the End key to stop the run

11-3. Hit the End key on your computer keyboard to stop the run.

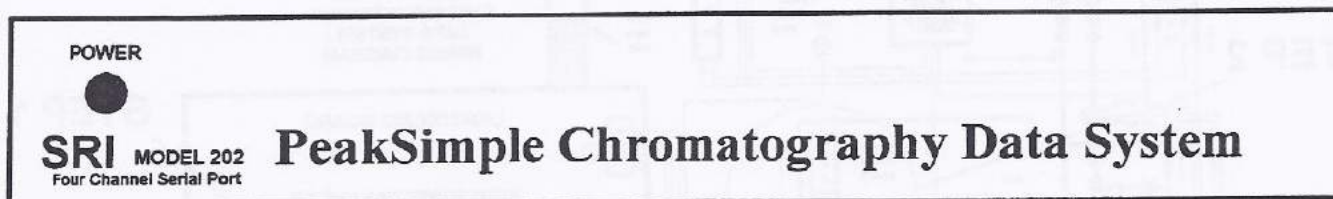
Technical Support:

If you have questions or problems, call SRI for free technical support at 310-214-5092, 8am - 5pm California time.

The SRI Model 202 PeakSimple Chromatography Data System is a four channel, analog to digital converter, controlled by our powerful PeakSimple Software. The Model 202 may be used with any brand or model of HPLC or gas chromatograph offering an analog detector output signal.

The Model 202 also features two independent, programmable controls which can be used for temperature and pressure ramping or HPLC gradient formation. There are also two Remote Start inputs that are compatible with two-wire switch closure signals typically output by GCs and LCs as a remote start signal.

Eight TTL outputs (0 to 5 volts) for computer control of external events come standard with the Model 202. If TTL outputs are not adequate for your application, the Model 202 also contains relay circuits offering normally open (NO) and normally closed (NC) switch closures. Electronic Pressure Control (EPC) and a switched AC power output may be ordered as an option for the Model 202.



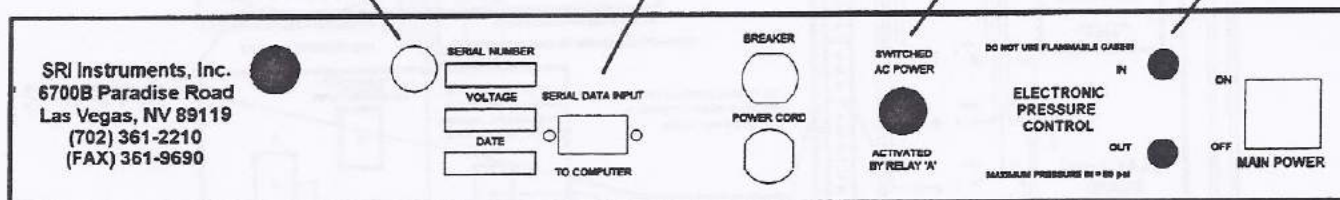
(front view)

Opening for an analog signal cable and remote device connections

RS232 serial port connector

Optional switched AC power output

Optional Electronic Pressure Control



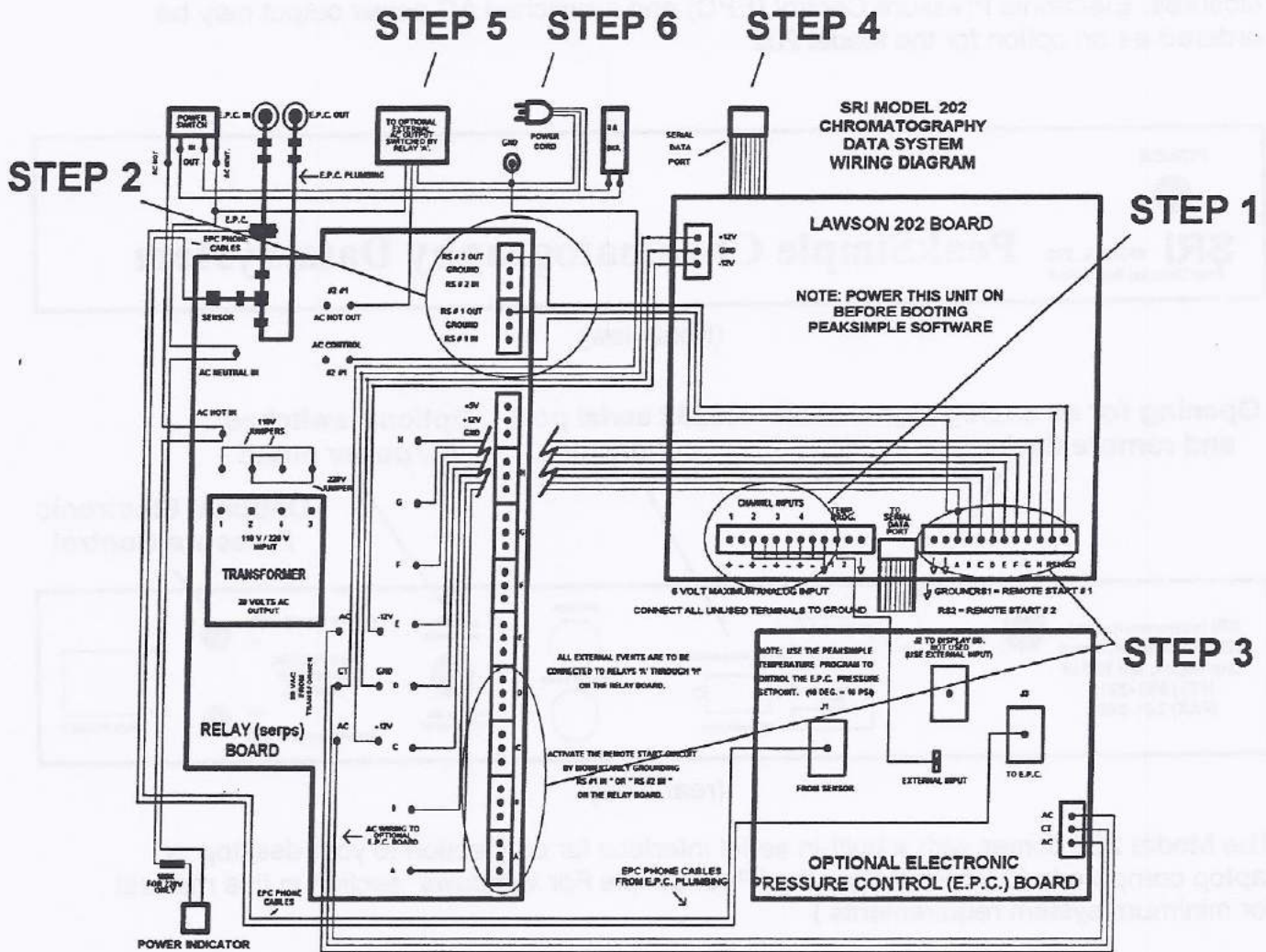
(rear view)

The Model 202 comes with a built-in serial interface for connection to your desktop or laptop computer's COM Port. (See the "PeakSimple For Windows" section in this manual for minimum system requirements.)

You should have received the following with your Model 202 purchase:

- (1) Model 202 PeakSimple Chromatography Data System Box
- (1) Serial Data Interface Cable for connection to your computer's COM Port
- (1) PeakSimple For Windows software package
- (1) PeakSimple Chromatography Data System Manual

To connect the Model 202 to your computer it will be necessary to access connection terminals inside the Model 202 Box.
 Verify that **NO POWER** is applied to the unit before performing the following procedure!!
 Remove the thumbscrews on either side of the Model 202 Box and carefully slide up the top cover and set it aside. Figure 1, (below), depicts the layout of the Model 202 circuit boards and all wiring connections. To connect your system to the Model 202 Data System; please complete Steps 1 Through 7 as shown below and described on the following pages.



STEP 7 — Install PeakSimple For Windows software.

FIGURE 1

STEP 1: Connecting the analog signal cable(s):

NOTE: The analog output from some GCs or LCs can have a range of up to 10 volts dc. Although the Model 202 will allow high voltage inputs such as this; be advised that signals above 6 volts will generate unwanted noise and signals above 5 volts will be "clipped". (The tops of the waveforms will be cut off.)

Route the analog signal cables from your instrument through the open hole in the back of the Model 202.

Strip 1/4" of insulation off of the 'signal +' and 'signal-' wires of your signal cables. Insert 'signal +' into the Lawson 202 board screw terminal marked 'CH1 sig +' and secure the connection using a small screwdriver.

Insert 'signal -' into the Lawson 202 board screw terminal marked 'CH1 sig -' and secure the connection using a small screwdriver.

Repeat the connection of signal cables for channels 2, 3 and 4.

Any unused channels **MUST** have both inputs jumpered to ground.

STEP 2: (OPTIONAL) Connecting the remote start cable(s):

NOTE: The Model 202 offers remote starting capability as a standard feature. Two separate remote start circuits permit the user to start the MAIN and ALTERNATE Trigger Groups of the data system by means of a switch closure, such as a footswitch. In some applications, the chromatograph being used with the Model 202 may offer a remote start signal output or switch closure output that permits starting an integrator or other device when the START button is pressed on the chromatograph's on-board control panel. Typically, this signal can be used to start the Model 202.

Route the remote start cable from your instrument through the open hole in the back of the Model 202.

Strip 1/4" of insulation off of the '+' and '-' wires of your remote start cable. Insert '+' into the RELAY (serps) board screw terminal marked '#1 IN' and secure the connection using a small screwdriver.

Insert '-' into the RELAY (serps) board screw terminal marked '#1 G' and secure the connection using a small screwdriver.

NOTE: Be sure to check the "Remote Start" box in the PeakSimple For Windows EDIT - CHANNELS - DETAILS screen for the appropriate channels. Refer to the "PeakSimple For Windows" section of this manual.

STEP 3: (OPTIONAL) Connecting the external event relay wires:

The Model 202 features eight 0-5 volt TTL Level outputs that may be turned on and off individually and automatically by means of a timed event table.

Manual control is also available via the keyboard.

These outputs may be used to control external events or devices. If TTL level outputs are not adequate for your application, the Model 202 is also equipped with eight relay circuits offering normally open (NO) and normally closed (NC) contact closures.

STEP 3: (Continued)

Route the external event wires from your instrument through the open hole in the back of the Model 202.

Strip 1/4" of insulation off of each wire. Select which device should be connected to events 'A' through 'H' and insert the wire into the appropriate screw terminal and secure the connection using a small screwdriver.

Refer to the "PeakSimple For Windows" section of this manual for setting up event tables, keyboard activation, etc.

STEP 4: Connecting the Serial Data Interface cable to your computer:

The Model 202 is equipped with a RS-232 serial port. A DB-9 type serial cable (provided) connects the Model 202 to your personal computer through the PC's COM port. This simple interface permits the data system software to be loaded onto, and operated from, either a desktop or notebook PC for portability in field operations.

Secure one end of the Serial Data Interface cable to an available COM port on the Back of your PC. Secure the other end to the DB-9 connector on the back of the Model 202. (Refer again to Figure 1 for location of the Serial Data port.)

STEP 5: (OPTIONAL) Connecting to the switched AC output:

Connections for the switched AC output are pre-wired at the factory.

All you need to do is plug your device into the cord provided; activate relay 'A' using PeakSimple software and the outlet will be powered. (1 AMP maximum)

NOTE: The switched AC output must be specifically requested at the time you order the Model 202.

STEP 6: Connecting power to the Model 202:

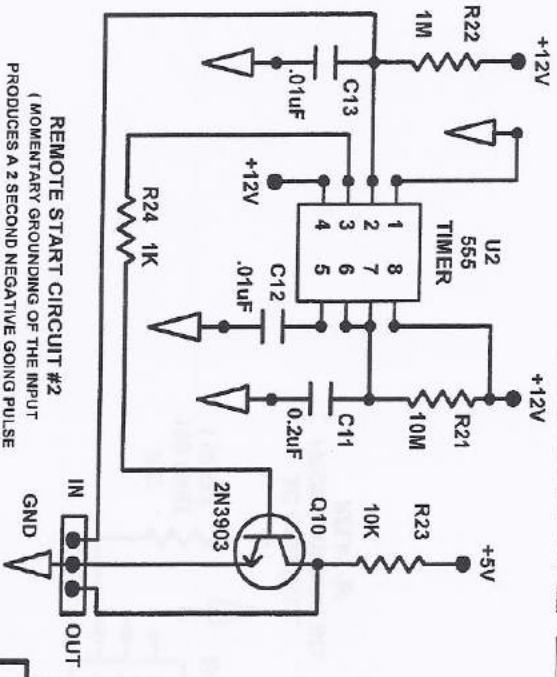
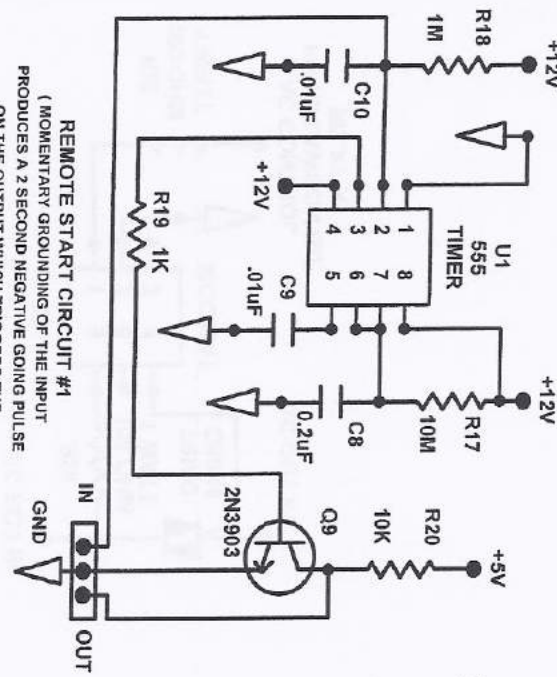
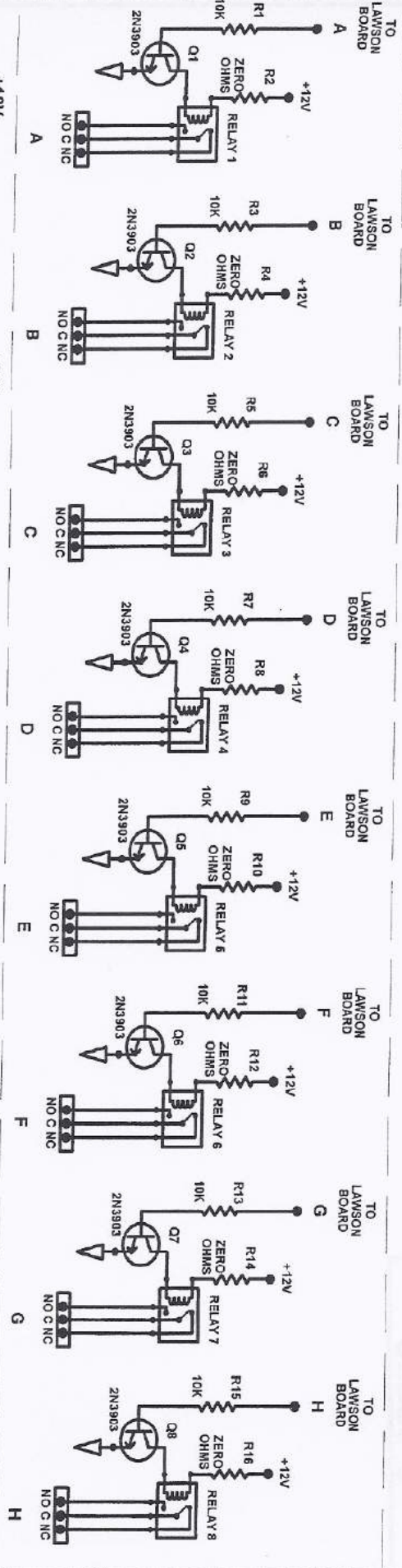
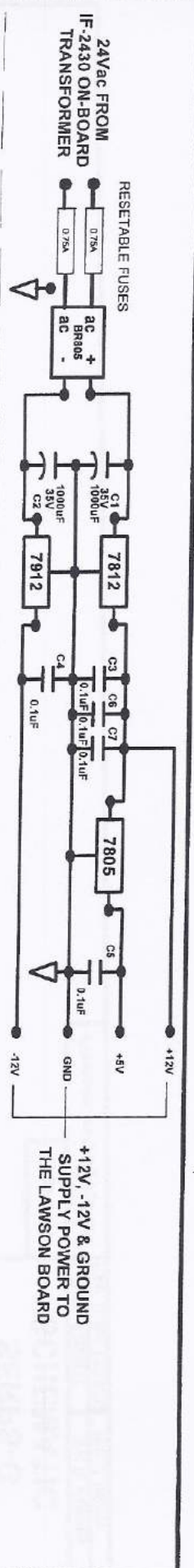
Slide the top cover back onto the Model 202.

Secure the cover with the two thumbscrews.

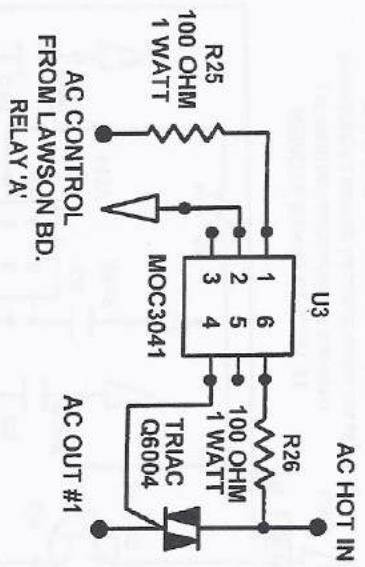
Model 202 units are equipped with a power cord which plugs into a standard 110 (or 220) volt outlet. Plug the Model 202 into the outlet and verify that the POWER indicator on the front of the Model 202 is lit.

STEP 7: Installation of PeakSimple Software:

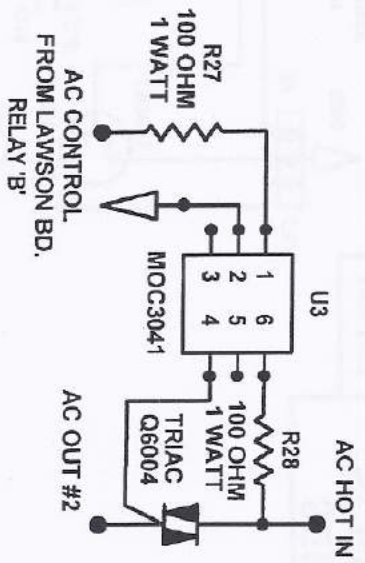
Refer to the "PeakSimple For Windows" section of this manual for details on proper installation and operation.



OPTIONAL AC OUTPUT CIRCUIT #1



OPTIONAL AC OUTPUT CIRCUIT #2



SERPS-G SCHEMATIC

Page 2 of 2

Filename: serps-g pg2.kwr

Date: 12/20/97
Rev. Date: 12/16/03
By: R. Fenske
By: M. Watts

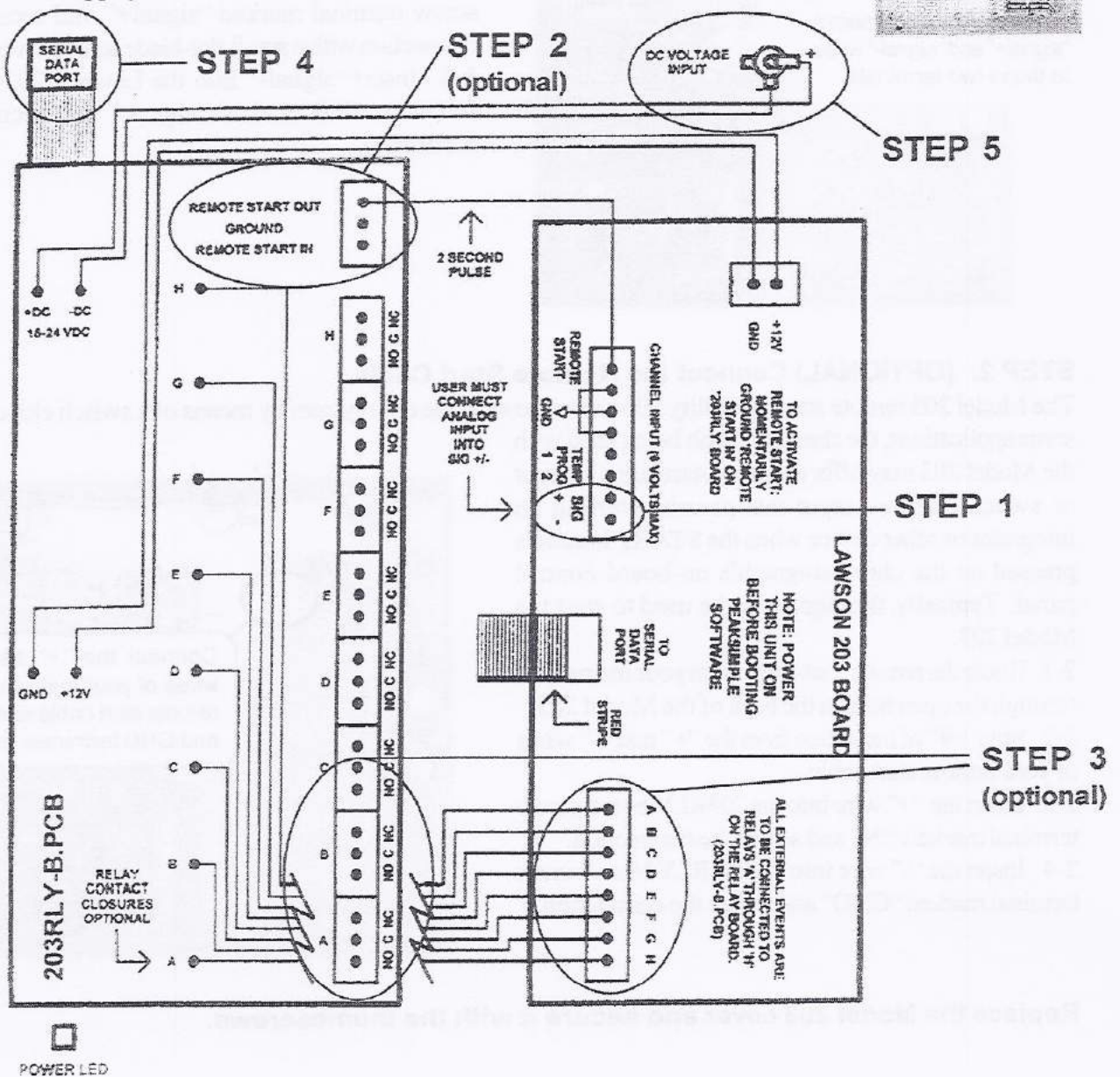
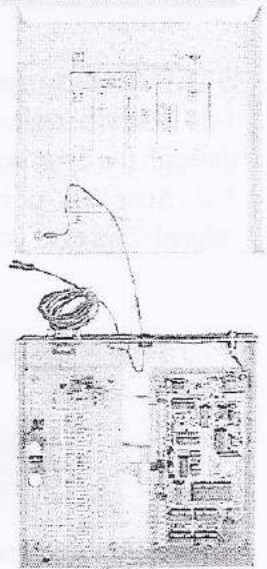
Quick Start

Model 203 Single Channel PeakSimple Data System

The Model 203 may be used with any brand or model of GC or HPLC offering an analog detector output signal ranging from 0-5V. It includes two independent, programmable controls (0-5V analog output) for temperature & pressure or HPLC gradient formation. A remote start input compatible with 2-wire switch closures (typically output by GCs and HPLCs as a remote start signal) is also included for your optional use.

Open the Model 203

Verify that the Model 203 is not plugged into a wall socket and is therefore powered OFF (no power switch). Remove the thumbscrews on both sides of the Model 203 box and slide the top cover up and off. It is connected to the bottom of the box by the ground wire, so just set it next to the bottom half of the box. There is a wiring diagram of the Model 203 circuit boards and all wiring connections on the inside of the top cover. Use this wiring diagram (shown below) to complete steps 1-5 as described on the following pages.

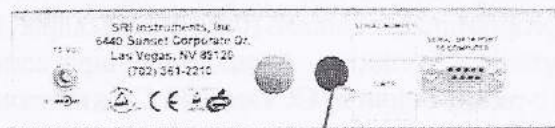


Quick Start

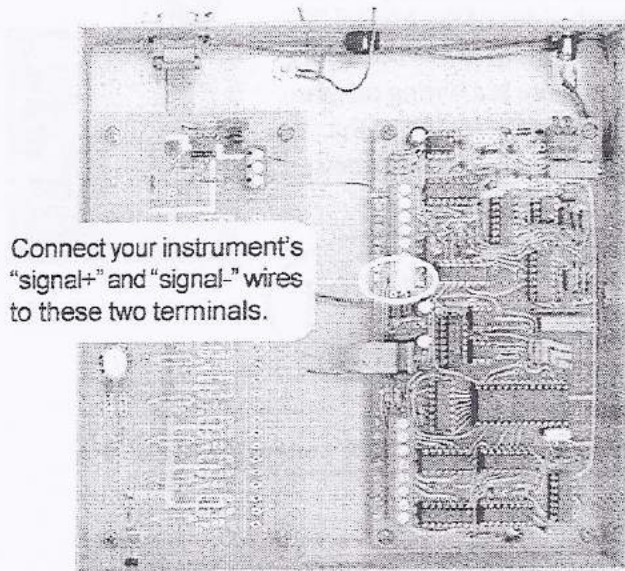
Model 203 Single Channel PeakSimple Data System

STEP 1: Connect the Analog Signal Cable

- 1-1. Route the analog signal cable from your instrument through the open hole in the back of the Model 203.
- 1-2. Strip 1/4" of insulation from the "signal+" and "signal-" wires of your instrument's signal cable.



Route wires through this hole



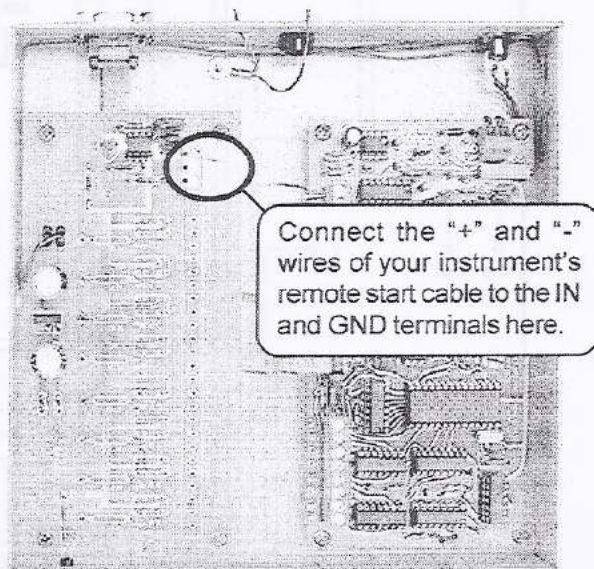
Connect your instrument's "signal+" and "signal-" wires to these two terminals.

- 1-3. Insert "signal+" into the Lawson 203 board screw terminal marked "signal+" and secure the connection with a small flat-blade screwdriver.
- 1-4. Insert "signal-" into the Lawson 203 board screw terminal marked "signal-" and secure the connection.

STEP 2: (OPTIONAL) Connect the Remote Start Cable

The Model 203 remote start capability allows you to start the data system by means of a switch closure. In some applications, the chromatograph being used with the Model 203 may offer a remote start signal output or switch closure output that permits starting an integrator or other device when the START button is pressed on the chromatograph's on-board control panel. Typically, this signal can be used to start the Model 203.

- 2-1. Route the remote start cable from your instrument through the open hole in the back of the Model 203.
- 2-2. Strip 1/4" of insulation from the "+" and "-" wires of your remote start cable.
- 2-3. Insert the "+" wire into the 203RLY board screw terminal marked "IN" and secure the connection.
- 2-4. Insert the "-" wire into the 203RLY board screw terminal marked "GND" and secure the connection.



Connect the "+" and "-" wires of your instrument's remote start cable to the IN and GND terminals here.

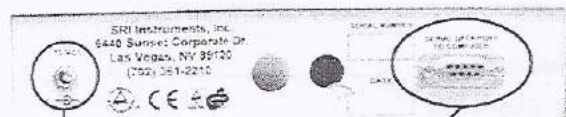
Replace the Model 203 cover and secure it with the thumbscrews.

Quick Start

Model 203 Single Channel PeakSimple Data System

STEP 3: Connect the Serial Cable to Your Computer

The Model 203 is equipped with a RS-232 serial port. A DB-9 type serial cable (provided) connects the Model 203 to your Windows™ computer through the PC's COM port. This simple interface permits the Model 203 to be operated from a desktop or laptop computer.



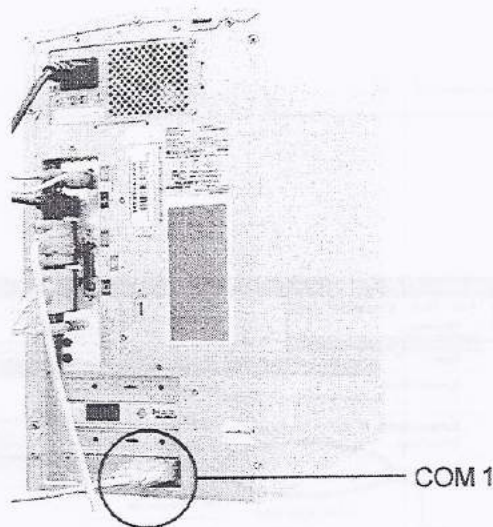
DC power input

RS-232 serial port

3-1. Secure one end of the serial cable to an available COM port on your PC.

3-2. Secure the other end to the RS-232 serial port on the back of the Model 203.

Serial cable (DB-9 type)



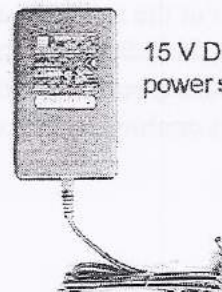
STEP 4: Connect Power to the Model 203

Model 203 units are provided with a 15 V DC power supply which plugs into a standard wall volt outlet. Plug the power supply output plug into the back of the Model 203 and plug the power supply into the wall outlet. Verify that the POWER LED on the front of the Model 203 is lit.

POWER LED



15 V DC
power supply

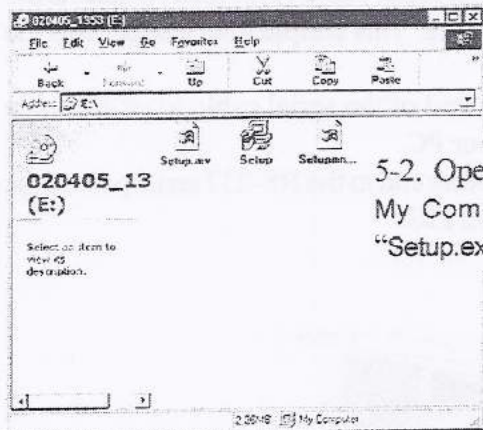


Quick Start

Model 203 Single Channel PeakSimple Data System

STEP 5: Install PeakSimple Chromatography Software

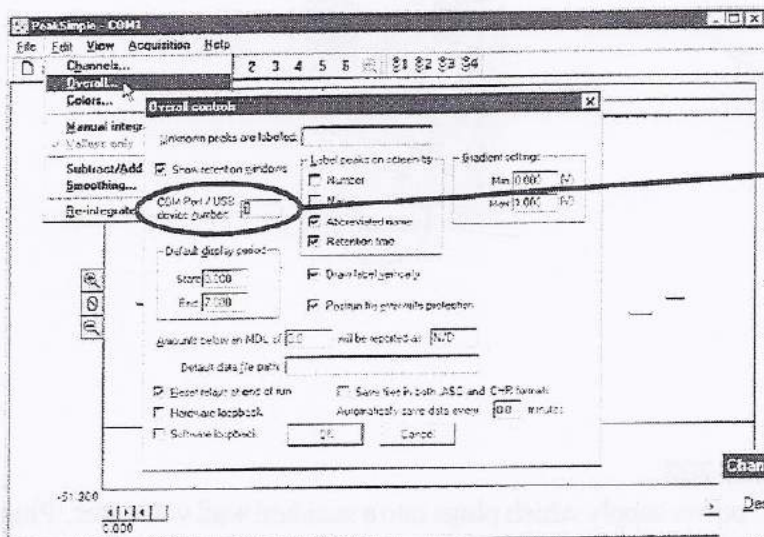
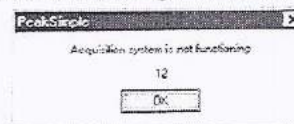
5-1. Locate your copy of the PeakSimple software, which is shipped inside the front cover of your SRI manual. Insert the CD or floppy disk(s) into your computer's appropriate drive.



5-2. Open the appropriate drive through My Computer, then double click on "Setup.exe" and follow the instructions.

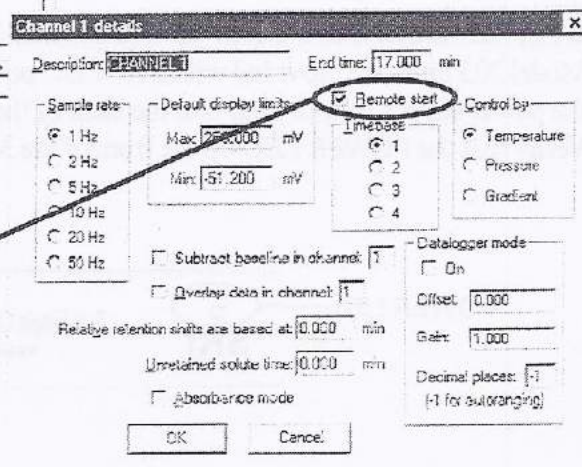


5-3. Double-click on the PeakSimple icon to launch the program. Verify that communication has been established between your computer and the Model 203. An error message will appear if communication is not established.



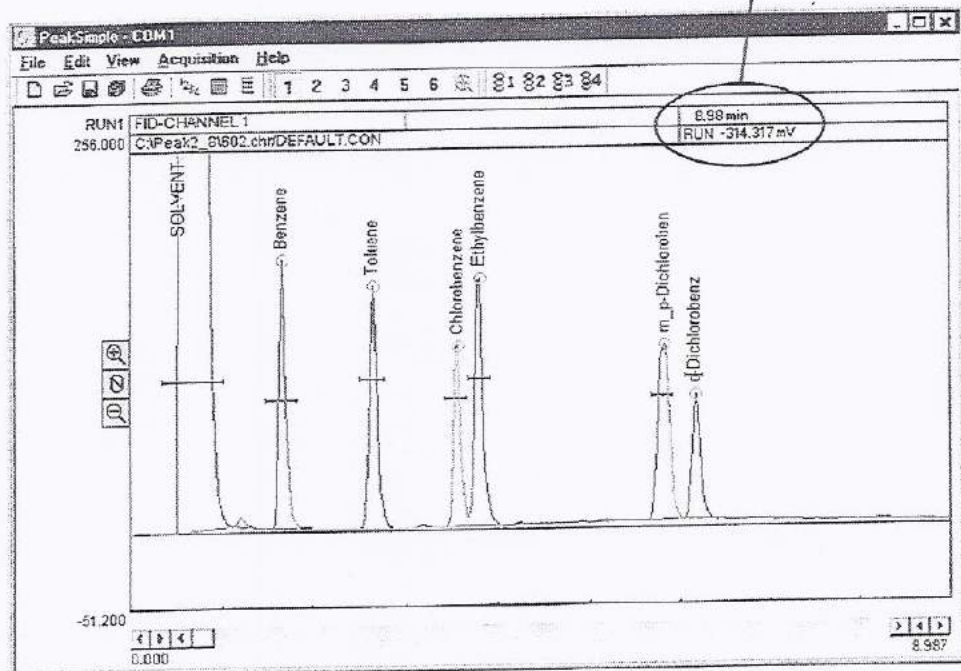
5-4. PeakSimple defaults to COM 1. If you did not connect the Model 203 to COM 1, you will get the error message. Open the Edit menu and choose Overall. In the dialog box that appears, enter the number of the COM port to which you have connected the Model 203. If you do not know the number of the COM port to which you connected the 203, use the process of elimination: try different numbers until you find one that works.

5-5. For the remote start option: Open the Edit menu and choose Channels. Click on the Details button for channel 1. Verify that Remote start is enabled (the box should be checked).



STEP 6: Starting an Analysis

6-1. The upper right corner of the PeakSimple chromatogram window contains real-time information pertinent to your analysis in progress. The status of the run (RUN, STAND BY) is displayed in capital letters next to the millivolt (mV) reading, underneath the amount of time into the run.



6-2. Hit your computer keyboard spacebar to begin the run, and the data is plotted onscreen in the chromatogram window.

6-3. Hit the End key on your computer keyboard to stop the run.

More on PeakSimple:

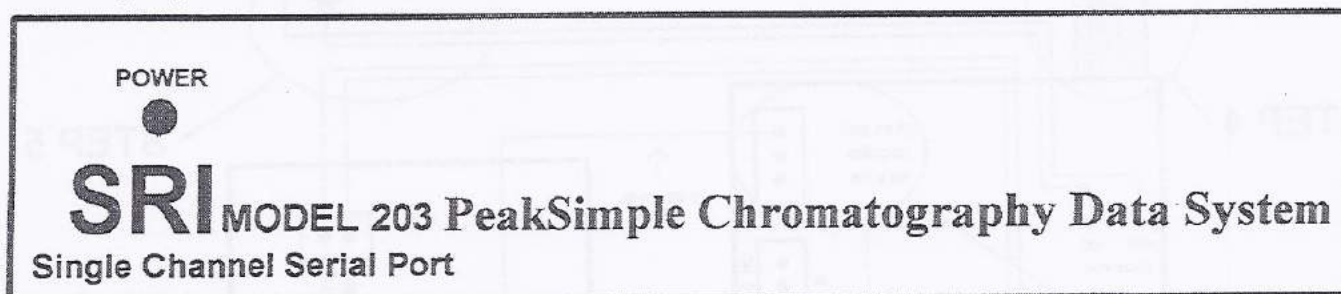
This Quick Start guide presents a very brief introduction to PeakSimple. There are tutorials in the manual and online at www.srigc.com (click on the "Download Our Documents" button) that will acquaint you with PeakSimple's basic functions.

If you have questions or problems, call SRI for free technical support at 310-214-5092, 8am - 5pm California time.

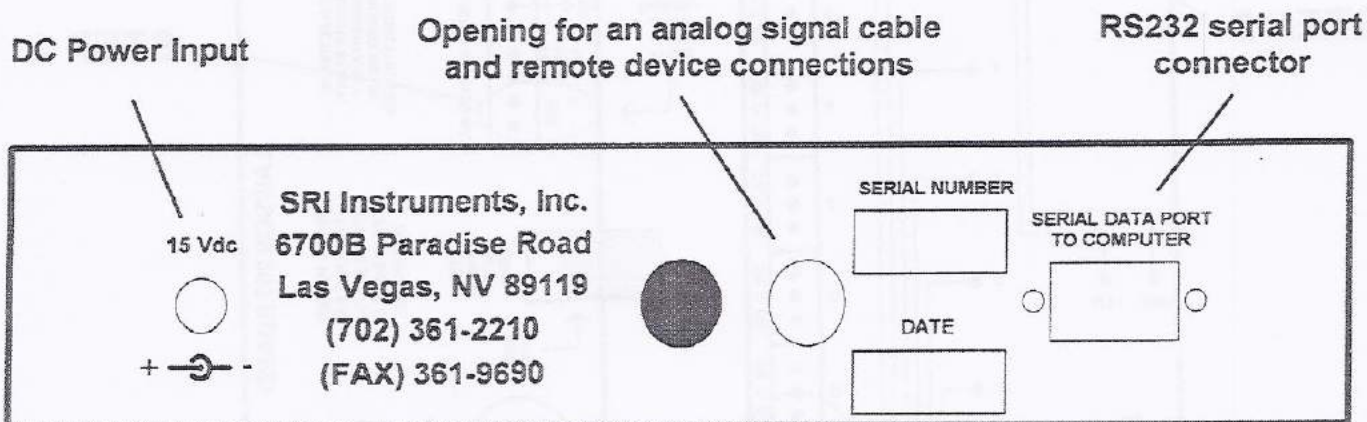
The SRI Model 203 PeakSimple Chromatography Data System is a single channel, analog to digital converter, controlled by our powerful PeakSimple Software. The Model 203 may be used with any brand or model of HPLC or gas chromatograph offering an analog detector output signal.

The Model 203 also features two independent, programmable controls which can be used for temperature and pressure ramping or HPLC gradient formation. There is also a Remote Start input that is compatible with two-wire switch closure signals typically output by GCs and LCs as a remote start signal.

Eight TTL outputs (0 to 5 volts) for computer control of external events come standard with the Model 203. If TTL outputs are not adequate for your application, the Model 203 can also be ordered with optional relay circuits offering normally open (NO) and normally closed (NC) switch closures.



(front view)



(rear view)

The Model 203 comes with a built-in serial interface for connection to your desktop or laptop computer's COM Port. (See the "PeakSimple For Windows" section in this manual for minimum system requirements.)

You should have received the following with your Model 203 purchase:

- (1) Model 203 PeakSimple Chromatography Data System Box
- (1) Serial Data Interface Cable for connection to your computer's COM Port
- (1) 15 Volt dc Wall Transformer
- (1) PeakSimple For Windows software package
- (1) PeakSimple Chromatography Data System Manual

To connect the Model 203 to your computer it will be necessary to access connection terminals inside the Model 203 Box. Verify that **NO POWER** is applied to the unit before performing the following procedure!! Remove the thumbscrews on either side of the Model 203 Box and carefully slide up the top cover and set it aside. Figure 1, (below), depicts the layout of the Model 203 circuit boards and all wiring connections. To connect your system to the Model 203 Data System; please complete Steps 1 Through 6 as shown below and described on the following pages.

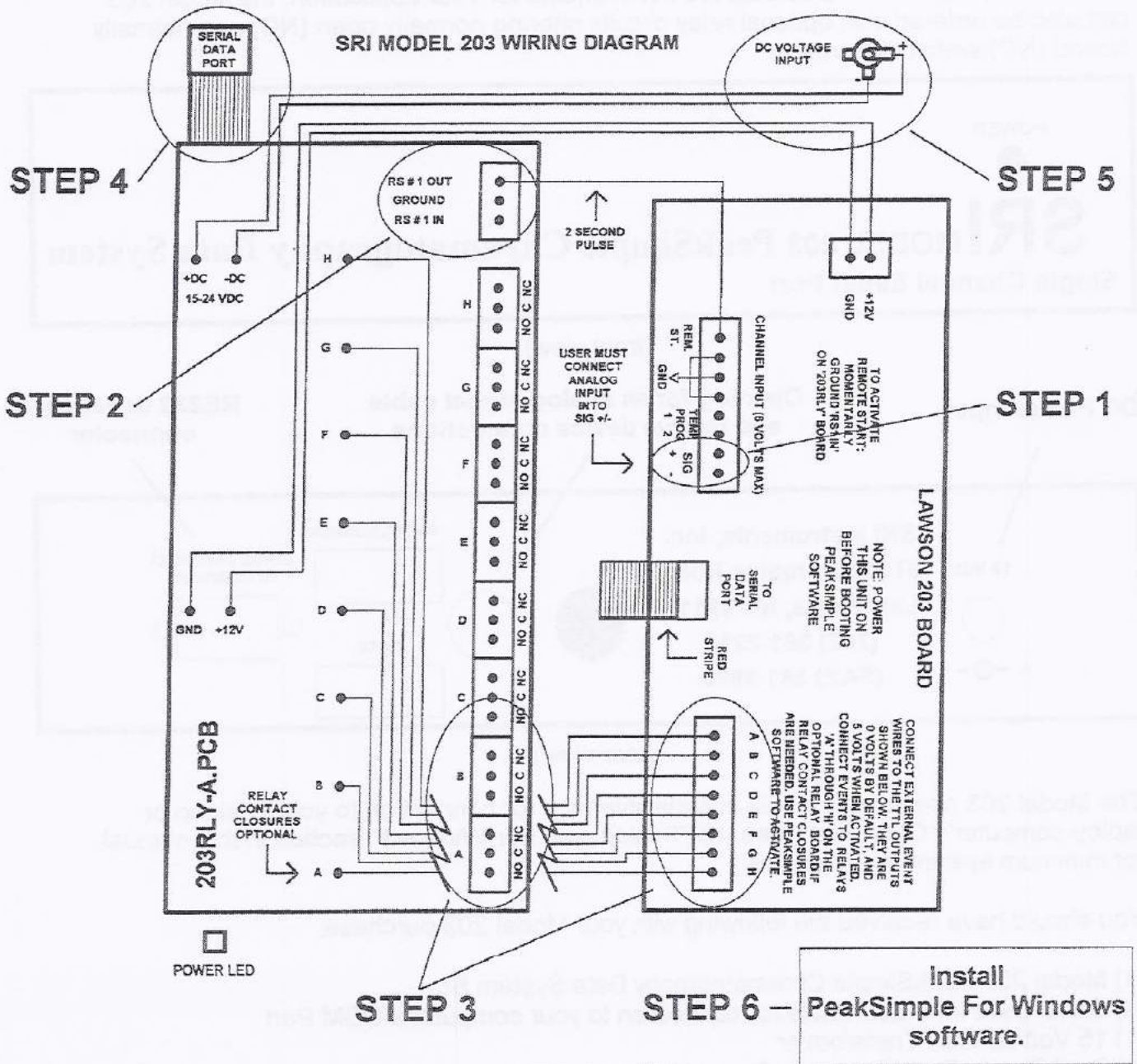


FIGURE 1

STEP 1: Connecting the analog signal cable:

NOTE: The analog output from some GCs or LCs can have a range of up to 10 volts dc. Although the Model 203 will allow high voltage inputs such as this; be advised that signals above 6 volts will generate unwanted noise and signals above 5 volts will be "clipped". (The tops of the waveforms will be cut off.)

Route the analog signal cable from your instrument through the open hole in the back of the Model 203.

Strip 1/4" of insulation off of the 'signal +' and 'signal-' wires of your signal cable. Insert 'signal +' into the Lawson 203 board screw terminal marked 'sig +' and secure the connection using a small screwdriver.

Insert 'signal -' into the Lawson 203 board screw terminal marked 'sig -' and secure the connection using a small screwdriver.

STEP 2: (OPTIONAL) Connecting the remote start cable:

NOTE: The Model 203 offers a remote starting capability as a standard feature. This permits the user to start the data system by means of a switch closure, such as a footswitch. In some applications, the chromatograph being used with the Model 203 may offer a remote start signal output or switch closure output that permits starting an integrator or other device when the START button is pressed on the chromatograph's on-board control panel. Typically, this signal can be used to start the Model 203.

Route the remote start cable from your instrument through the open hole in the back of the Model 203.

Strip 1/4" of insulation off of the '+' and '-' wires of your remote start cable. Insert '+' into the 203RLY board screw terminal marked 'IN' and secure the connection using a small screwdriver.

Insert '-' into the 203RLY board screw terminal marked 'GND' and secure the connection using a small screwdriver.

NOTE: Be sure to check the "Remote Start" box in the PeakSimple For Windows EDIT - CHANNELS - DETAILS screen for channel 1.

Refer to the "PeakSimple For Windows" section of this manual.

STEP 3: (OPTIONAL) Connecting the external event relay wires:

The Model 203 features eight 0-5 volt TTL Level outputs that may be turned on and off individually and automatically by means of a timed event table.

Manual control is also available via the keyboard.

These outputs may be used to control external events or devices. If TTL level outputs are not adequate for your application, the Model 203 can be fitted with eight relay circuits offering normally open (NO) and normally closed (NC) contact closures. **NOTE:** Relay contact closures must be specifically requested at the time you order the Model 203.

STEP 3: (Continued)

Route the external event wires from your instrument through the open hole in the back of the Model 203.

Strip 1/4" of insulation off of each wire. Select which device should be connected to events 'A' through 'H' and insert the wire into the appropriate screw terminal and secure the connection using a small screwdriver.

Refer to the PeakSimple Software section of this manual for setting up event tables, keyboard activation, etc.

STEP 4: Connecting the Serial Data Interface cable to your computer:

The Model 203 is equipped with a RS-232 serial port. A DB-9 type serial cable (provided) connects the Model 203 to your personal computer through the PC's COM port. This simple interface permits the data system software to be loaded onto, and operated from, either a desktop or notebook PC for portability in field operations.

Secure one end of the Serial Data Interface cable to an available COM port on the Back of your PC. Secure the other end to the DB-9 connector on the back of the Model 203. (Refer again to Figure 1 for location of the Serial Data port.)

STEP 5: Connecting power to the Model 203:

Slide the top cover back onto the Model 203.

Secure the cover with the two thumbscrews.

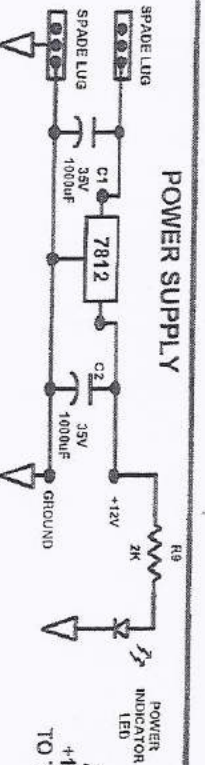
The Model 203 requires a minimum input of 14.8 V dc to operate.

110 volt units are provided with a 15 V dc transformer which plugs into a standard 110 volt outlet. To avoid damaging the unit; plug the transformer output plug into the back of the Model 203 first and THEN plug the main transformer into the wall outlet. Verify that the POWER LED on the front of the Model 203 is lit.

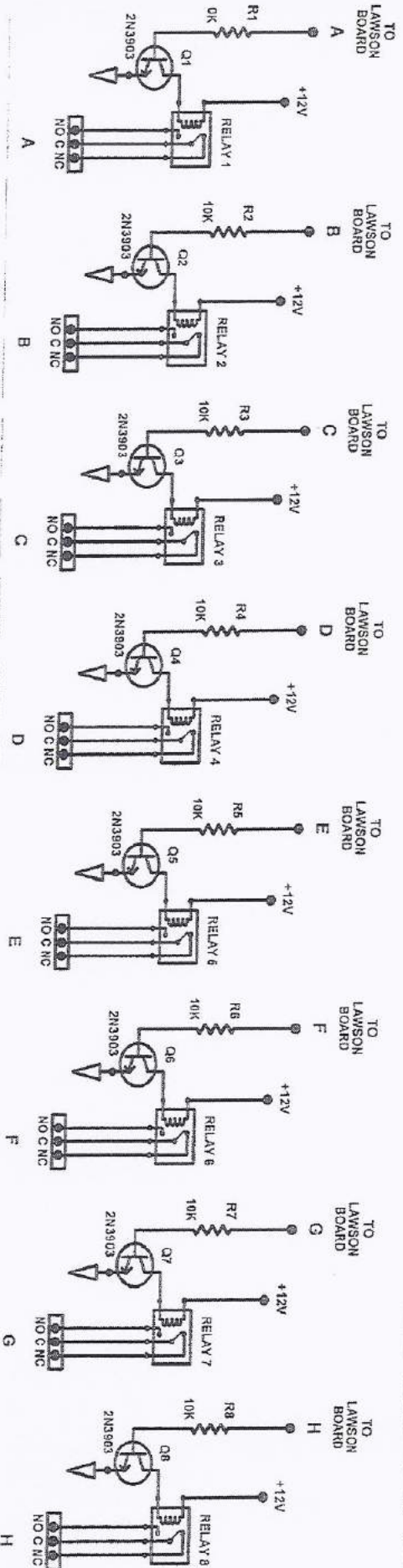
STEP 6: Installation of PeakSimple Software:

Refer to the "PeakSimple For Windows" section of this manual for details on proper installation and operation.

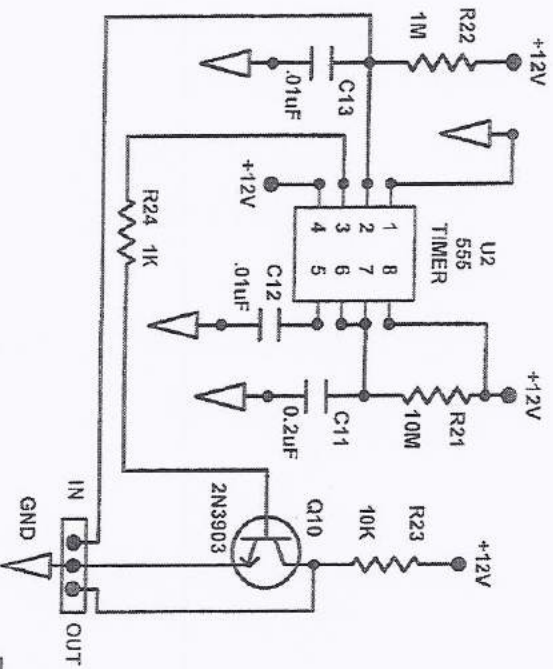
15 - 24 Vdc INPUT FROM WALL TRANSFORMER



ALSO SUPPLIES +12 V AND GROUND TO THE 203 A/D BOARD



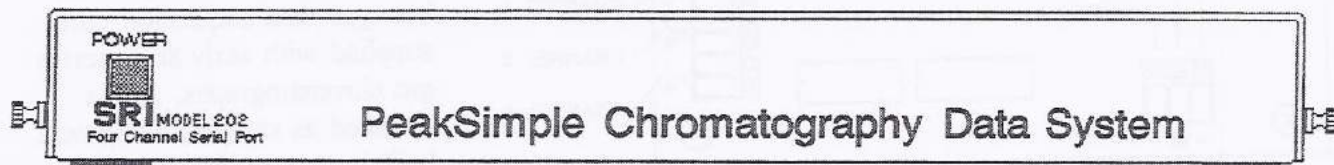
REMOTE START CIRCUIT
 (MOMENTARY GROUNDING OF THE INPUT PRODUCES A 2 SECOND NEGATIVE GOING PULSE ON THE OUTPUT WHICH TRIGGERS THE 203 A/D BOARD REMOTE START FUNCTION.)



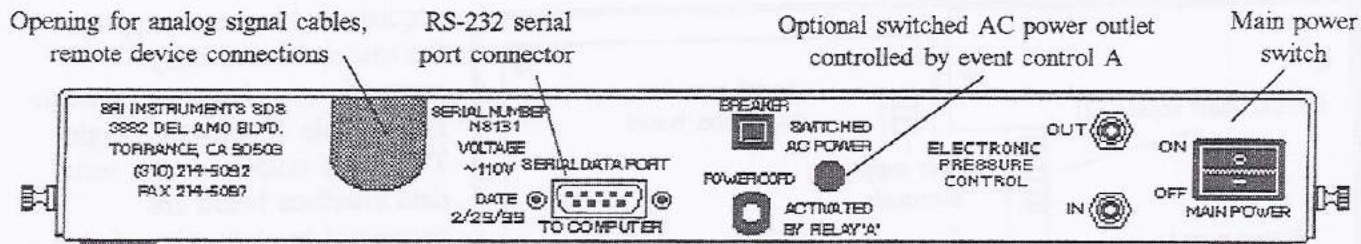
OPTIONAL RELAY CIRCUITS:
 USED WHEN A CONTACT CLOSURE IS NEEDED FOR ACTIVATION OF EXTERNAL DEVICES.

All SRI 8610B and 8610C gas chromatographs are equipped with a built-in four-channel serial data acquisition system. This system permits the acquisition of up to four analog signals in addition to providing control over the chromatograph's temperature, carrier gas pressure (if equipped with electronic pressure control, also referred to as EPC), and event functions. No additional interface board is needed, as is necessary when using the single-channel expansion bus data acquisition boards in use with pre-1995 SRI 8600 series gas chromatographs. All terminal connections previously found on the interface board are present on the serial interface board. Eight software-controlled relays provide external event control. The serial data acquisition system may be retrofit into early 8600 series gas chromatographs on request. Consult with SRI sales or technical support for details.

The SRI serial data acquisition system may be configured as an independent device, external to the chromatograph, permitting the use of a compact notebook or palmtop PC as the data system (via a serial port cable). In this configuration (shown below), the serial interface is contained within a power supply-equipped protective case and may be used with any brand or model of HPLC or gas chromatograph offering an analog detector output signal (0 - 5.0V). Both MS-DOS and Windows versions of PeakSimple software is provided with the serial interface unit and SRI GCs.



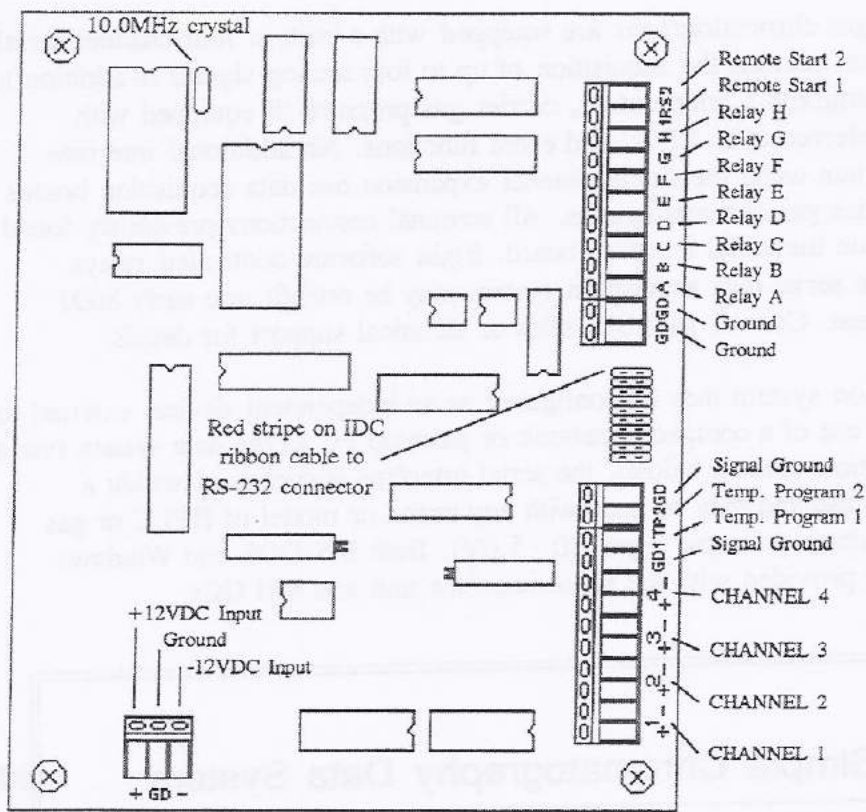
SRI Model 202 Serial data acquisition unit in stand-alone case with 110VAC power supply



Detail of rear panel of model 202 Serial data acquisition unit

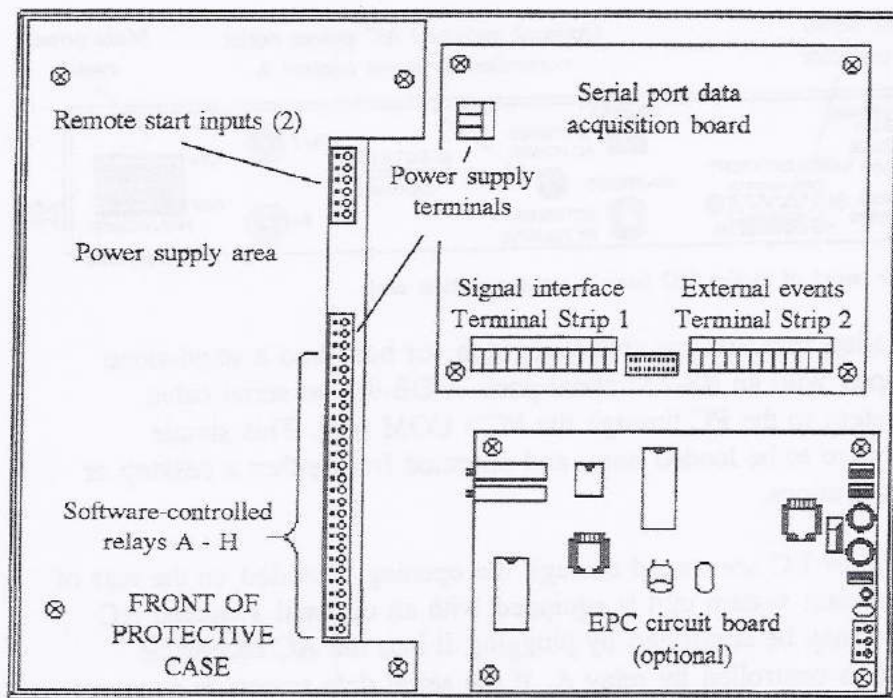
Every serial unit, whether installed in a SRI gas chromatograph, or built into a stand-alone external unit (shown above), is equipped with an RS-232 serial port. A DB-9 type serial cable (provided) connects the serial data system to the PC through the PC's COM port. This simple interface permits the data system software to be loaded onto, and operated from either a desktop or notebook PC for portability in field operations.

Connections to and from the GC or LC are routed through the opening provided on the rear of the serial data system unit. If the serial data system unit is equipped with an optional switched AC outlet, an external AC-powered device may be controlled by plugging it into the AC receptacle provided. The power to this receptacle is controlled by relay A. If the serial data system is equipped with the EPC option, two bulkhead connections will be found on the rear panel. Carrier gas is connected to EPC IN, and the pressure-controlled output is connected from EPC OUT to the GC injector carrier gas inlet. The programmable EPC option is controlled by the data system.



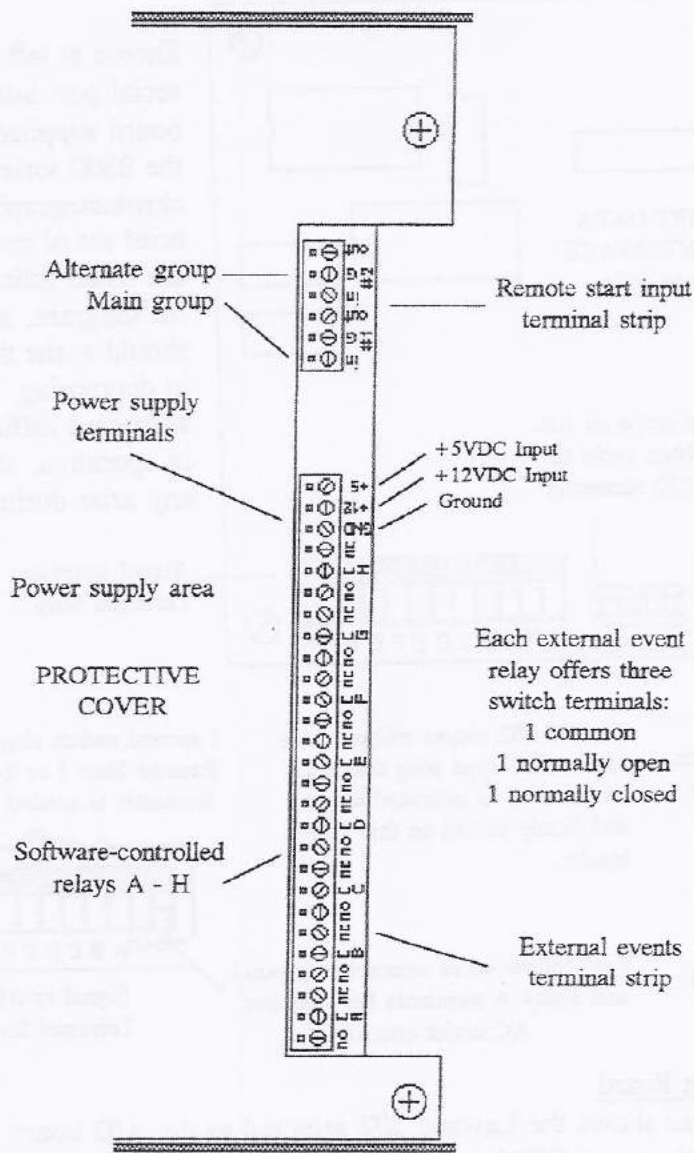
SRI Serial port data acquisition system board terminals

The SRI serial data acquisition system board, illustrated at left, may be installed directly into the chassis of most SRI gas chromatographs, either at time of manufacture, or as a retrofit. This board permits the gas chromatograph to communicate bi-directionally with the data system via a standard RS-232 serial port, in addition to acquiring analog signal data from up to four detectors simultaneously. The SRI model 202 serial data acquisition board replaces the earlier expansion bus-type data acquisition card supplied with early 8600 series gas chromatographs, and is included as standard equipment built into every full-featured SRI 8610B and 8610C GC.



Location of SRI serial port data acquisition board inside stand-alone power supply case

The serial data acquisition hardware supports the external event relay convention implemented in early PeakSimple II software. Eight TTL level outputs on the serial data interface board are connected to eight relays found on the edge of the power supply circuit board. These software-controlled relays permit automated or manual control of external events and devices. Also found on the power supply circuit board are two separate remote start inputs, for the data system main and alternate control groups. Four analog signal inputs are available on serial interface board's terminal strip 2. All unused inputs must be connected to signal ground - do not leave inputs "floating".

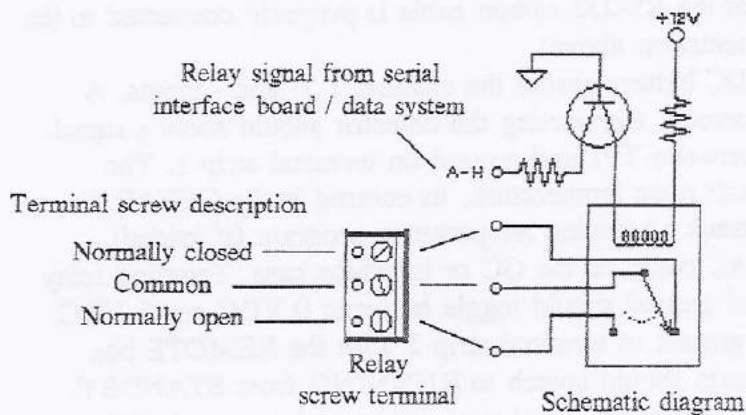


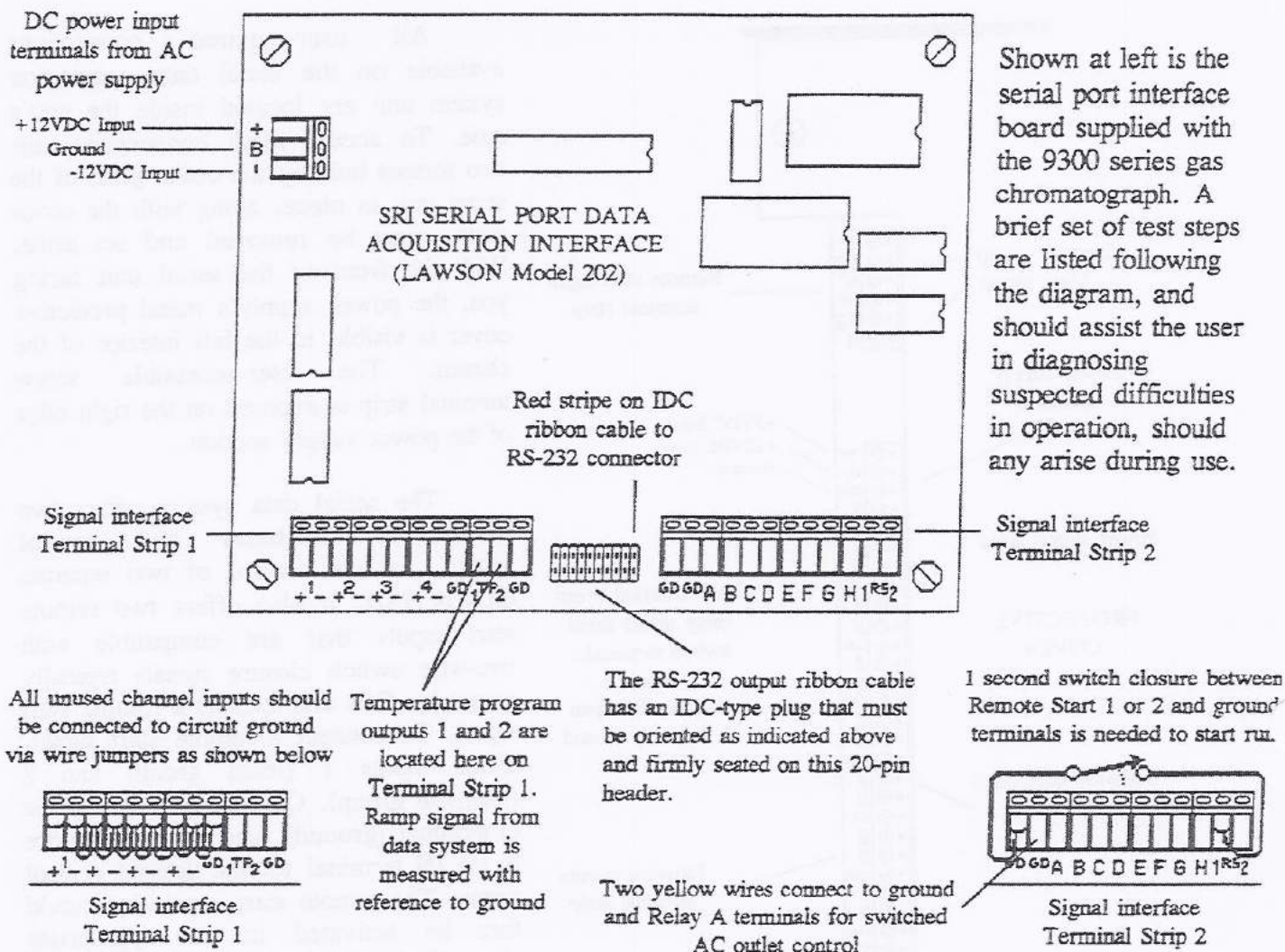
All user-required connections available on the serial data acquisition system unit are located inside the unit's case. To access these connections, the two screws holding the cover plate of the serial unit in place, along with the cover plate, must be removed and set aside. With the front of the serial unit facing you, the power supply's metal protective cover is visible to the left interior of the chassis. The user-accessible screw terminal strip is exposed on the right edge of the power supply section.

The serial data system offers two independent timebases and control groups, for the control of two separate GCs or LCs. It also offers two remote start inputs that are compatible with two-wire switch closure signals typically output by GCs and LCs as a remote start signal. To connect a remote start signal, locate inputs 1 (main group) and 2 (alternate group). Connect one wire to the G terminal (ground), and the second wire to the IN terminal for the desired control group. The remote start capability should then be activated in the appropriate channel's PeakSimple Details screen.

The SRI serial data system's user-accessible connection terminals are located inside the stand-alone power supply case to the right of the covered power supply

The serial data system is also equipped with eight electromechanical relays that are controlled by the PeakSimple data system. The relays may be turned on and off individually and automatically by means of a timed event table, and manually by direct keyboard control. When a relay event is activated, the serial data system interface board outputs a signal which is sent to the relay driver circuitry in the power supply section. Each relay offers three connections for control versatility - normally open, common, and normally closed. The diagram at left illustrates each relay's knife switch-type operation.





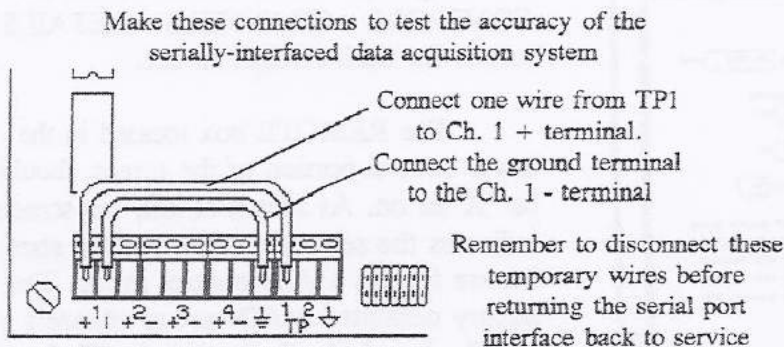
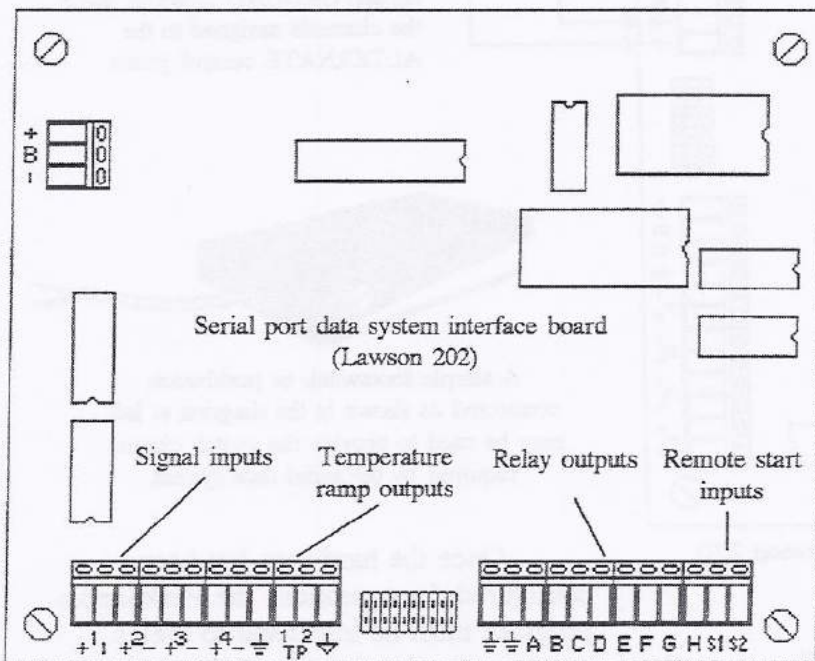
Test Procedure For The Serial Port Interface Board

1. Verify that the software's DETAILS screen shows the Lawson 202 selected as the A/D board type (lower right corner of screen). Verify that the proper COM port number is entered in the PORT ADDRESS box (center left of screen). Do this for each channel in use. Unused channel inputs should be jumpered to ground (as shown above left).
2. Check that the serial cable is plugged into both the computer's appropriate COM port and the serial port interface's serial connector. Make sure that the RS-232 ribbon cable is properly connected to the 20-pin header on the circuit board (see plug orientation above).
3. With the software running, connect a 1.5 VDC battery across the channel 1 + and - inputs. A signal of 1500 mV should be displayed on the screen. Connecting the detector should show a signal.
4. With a DC voltmeter, measure the voltage between TP1 and ground on terminal strip 1. The reading should reflect 10mV per degree of default oven temperature, as entered in the DETAILS screen (50°C = 500mV). This voltage should track a ramping temperature program (if loaded).
5. Plug a lamp or other load into the switched AC outlet on the GC or interface case. Toggling relay A should energize the load. The terminals A and ground should toggle between 0 VDC and 5 VDC.
6. By momentarily jumping terminals RS1 and ground of terminal strip 2 with the REMOTE box clicked on in the DETAILS screen, the data system should switch to RUNNING from STANDBY. The system should not restart after the END key is pressed. If all tests are passed, system is OK.

The SRI serial port data system is equipped with four channels of precision data acquisition. In fact, the signal inputs available on the serial port data acquisition interface offer the precision of a digital voltmeter. Any 0 to 5VDC detector signal may be connected to any one of the channel inputs, and the millivolt reading will be displayed on-screen. This reading should match the readings of any precision meter connected to the same input. No special calibration of detector signal inputs is required.

If it does become necessary to verify the precision of the serially-interfaced signal inputs, the following procedure will permit easy confirmation.

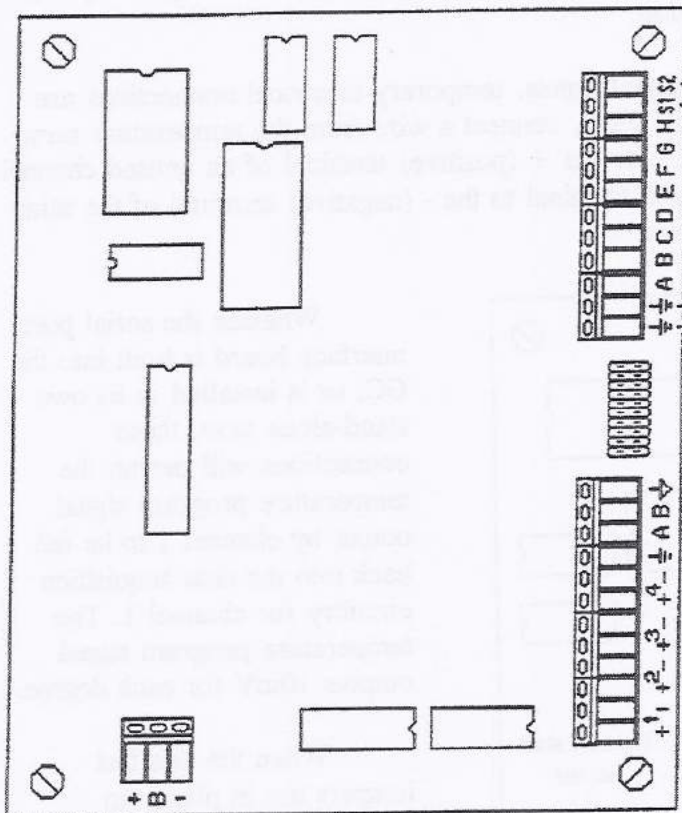
In order to confirm the precision of the signal inputs, temporary electrical connections are made at the serial port interface's terminal strips. First, connect a wire from the temperature ramp output on the serial port interface labelled "TP1", to the + (positive) terminal of an unused channel input. Then connect another wire from the ground terminal to the - (negative) terminal of the same channel input, as illustrated in the diagram below.



Whether the serial port interface board is built into the GC, or is installed in its own stand-alone case, these connections will permit the temperature program signal output by channel 1 to be fed back into the data acquisition circuitry for channel 1. The temperature program signal outputs 10mV for each degree.

When the two test jumpers are in place, an artificial signal is generated by loading the AREATEST.TEM file, included with the PeakSimple software, onto channel 1. When this temperature file has been loaded into the channel 1 temperature programming window, starting a run will send a ramped temperature program signal from TP1 into the channel 1 + input. This signal is plotted, and the user will see that the on-screen readings match those of a reliable digital voltmeter, down to the third decimal place.

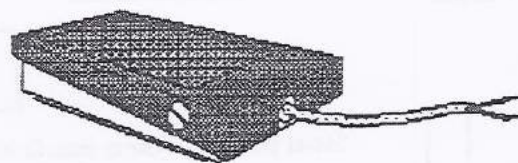
The SRI serial port data system offers a remote starting capability as a standard feature. This permits the user to start the data system (and SRI gas chromatograph, if attached) by means of a switch closure, such as a footswitch. In some applications, such as when a different brand of gas chromatograph is being used with the serial data system, the chromatograph offers a remote start signal output (or switch closure output) that permits starting an integrator or other device when the START button is pressed on the chromatograph's on-board control panel. Typically, this signal can be used to start the serial data system.



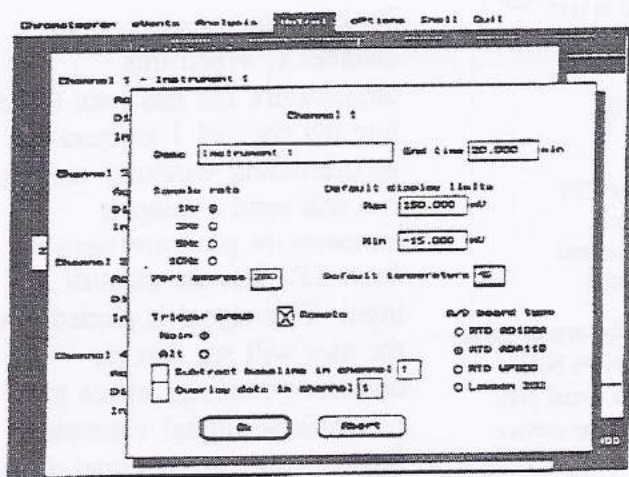
Serial port data system interface board (Lawson 202)

A switch closure between terminal S1 and GROUND remotely starts the channels assigned to the MAIN control group.

A switch closure between terminal S2 and GROUND remotely starts the channels assigned to the ALTERNATE control group.



A simple footswitch or pushbutton connected as shown in the diagram at left may be used to provide the switch closure required by the serial data system

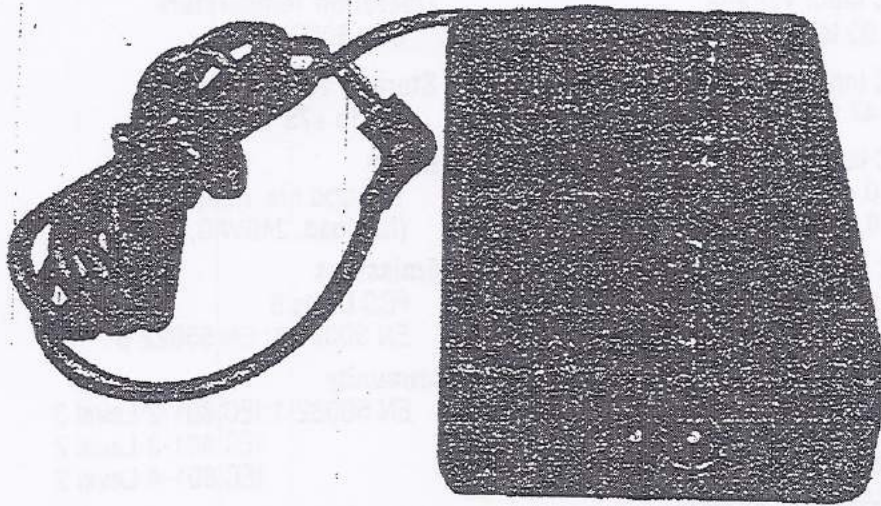


PeakSimple DETAILS screen

Once the hardware has been configured for operation, the PeakSimple program must be instructed to seek a remote start signal for the appropriate control group. This is selected from the CONTROLS - CHANNELS - DETAILS screen for each channel in use.

The REMOTE box located in the lower central portion of the screen should be "X"ed on. As shown at left, the screen indicates the selection of the remote start feature for the MAIN control group. The factory defaulted MAIN group channels are Ch. 1 and Ch. 2. By default, Ch.3 and Ch. 4 are set to the ALTERNATE control group.

15W World Wide - Two Wire Universal Input PSA-15W Low Profile Adaptor Series



Features

- Two Wire Operation
- Zero Minimum Loads
- Slim 1" Height
- <math><250\mu\text{A}</math> Leakage
- ISO 9001 Quality System
- Extended Design Life

Applications

- Networking
- Notebooks
- Peripherals and Terminals
- Portable Instruments

Safety Approvals

- UL1950 [E127643]
- CSA 22.2 234 [LR56927-162]
- TUV IEC 950, EN60950 [S9653583]
- Japan 91-55156

Dimensions: • Length: 110mm (4.33in) • Height: 25.4mm (1.0in)
• Width: 65mm (2.56in) • Weight: 200gm (8oz)

Output Specifications

Model	DC Output Voltage	Load		Ripple (1) P-P	Regulation	
		Min.	Max.		Line	Load
PSA-15W-050 (P)*	5V	0A	2.5A	50mV	±2%	±5%
PSA-15W-120 (P)*	12V	0A	1.25A	120mV	±1%	±5%

* Indicates center positive DC output

(1) Measured at full load by using a 12 inch twisted pair terminated with a 10mf capacitor and a 0.1mf ceramic in parallel

ISO 9001 • BABT Facility Approvals

15W World Wide - Two Wire Universal Input PSA-15W Low Profile Adaptor Series

Characteristics

AC Input Voltage 90 to 264 VAC	Operation Temperature 0 to 50°C
AC Input Frequency 47 to 63Hz	Storage Temperature -25 to +75°C
AC Input Current (Full Load) 0.4Arms (120VAC) 0.2Arms (240VAC)	MTBF 100,000 hrs. minimum (full load, 240VAC, 25°C)
AC Inrush Current (Cold, Full Load) 20A max. (120VAC) 40A max. (240VAC)	Emissions FCC Class B EN 50081-1: EN 55022 B
AC Surge Immunity IEC 1000-4-5; IEC 801-5, Level 3	Immunity EN 50082-1: IEC 801-2 Level 3 IEC 801-3 Level 2 IEC 801-4 Level 2
Leakage Current Less than 250µA	AC Mating Connector Cord, IEC EN 60320/C7 (2 wire)
Dielectric Withstand (Hipot) 3000VAC, 1 min., 10mA	DC Output Connector 2.1mm (ID); 5.5mm (OD) Coaxial Center Positive Standard
Hold-up Time (Full Load) 12msec, 120VAC 20msec, 240VAC	
Overcurrent Protection Short Circuit, Auto Restart	



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Internet: <http://www.phihongusa.com>

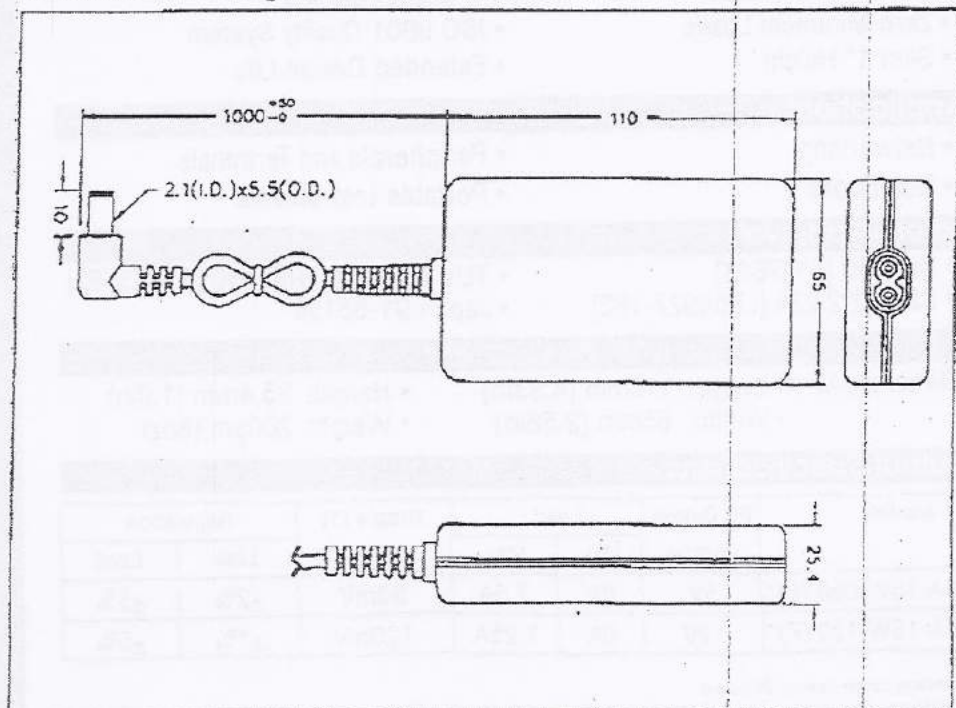
Eastern Office:

3005 Brodhead Road
Bethlehem, PA 18017

Phone: (610) 866-9911

Fax: (610) 866-9920

Dimension Diagram Unit: mm (inch)



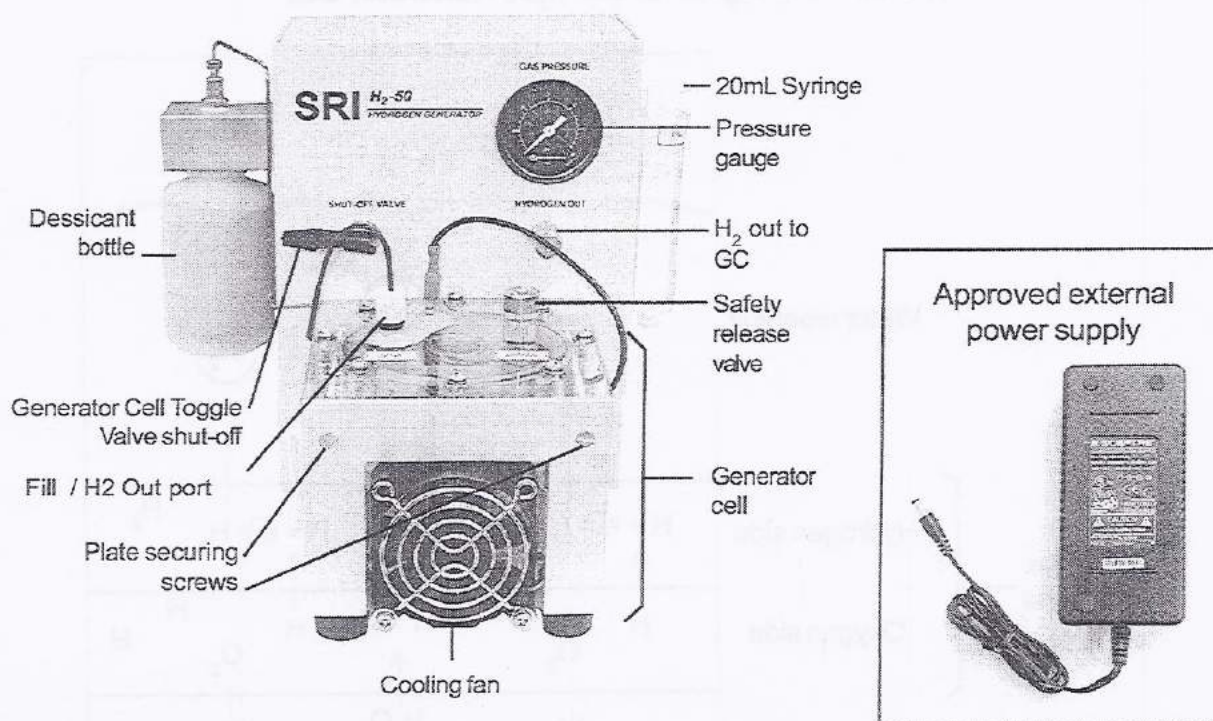
15-050/605

H₂-50 Stand-Alone Hydrogen Generator

Overview

Your SRI H₂-50 Stand-Alone Hydrogen Generator consists of a generator cell mounted on a metal chassis. The generator cell is attached to the chassis with two screws for easy disassembly—just unscrew them, unplug the power cord, and the entire cell comes off. On the metal chassis is a pressure gauge, an interior pressure switch, a dessicant bottle, and a toggle valve shut-off for isolating the generator cell. The dessicant bottle contains Indicating Molesieve dessicant beads which turn from blue to gray when they absorb water. Water vapor that is released from the generator cell with the hydrogen is removed by the dessicant before reaching the GC column, thus drying the hydrogen gas. The H₂-50 can supply enough gas for a detector or two as well as the GC carrier gas. During operation, there is about 40mL of hydrogen gas stored in the dessicant, which is enough to operate a split injector for short periods, in addition to the detector(s) and carrier. The toggle valve shut-off facilitates checking for leaks and allows the H₂-50 to reach operating pressure more quickly, while the interior pressure switch maintains the operating pressure. As a safety measure, a pressure release valve protects the generator cell from pressure overload. An external power supply/transformer that is provided enables the H₂-50 to operate on various voltages around the world. You may use any approved power supply rated 100-240VAC with 12VDC, 7amp output. Conveniently, the H₂-50 produces 50mL/min at 35psi (241316Pa, 2.4bar) using distilled water from the grocery store.

The SRI H₂-50



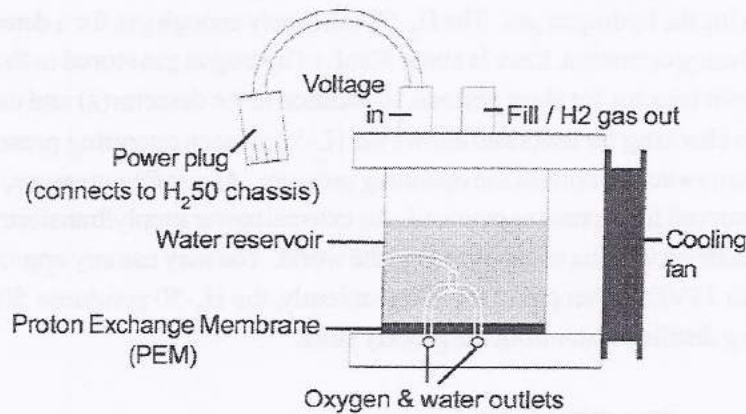
GC ACCESSORIES

H₂-50 Stand-Alone Hydrogen Generator

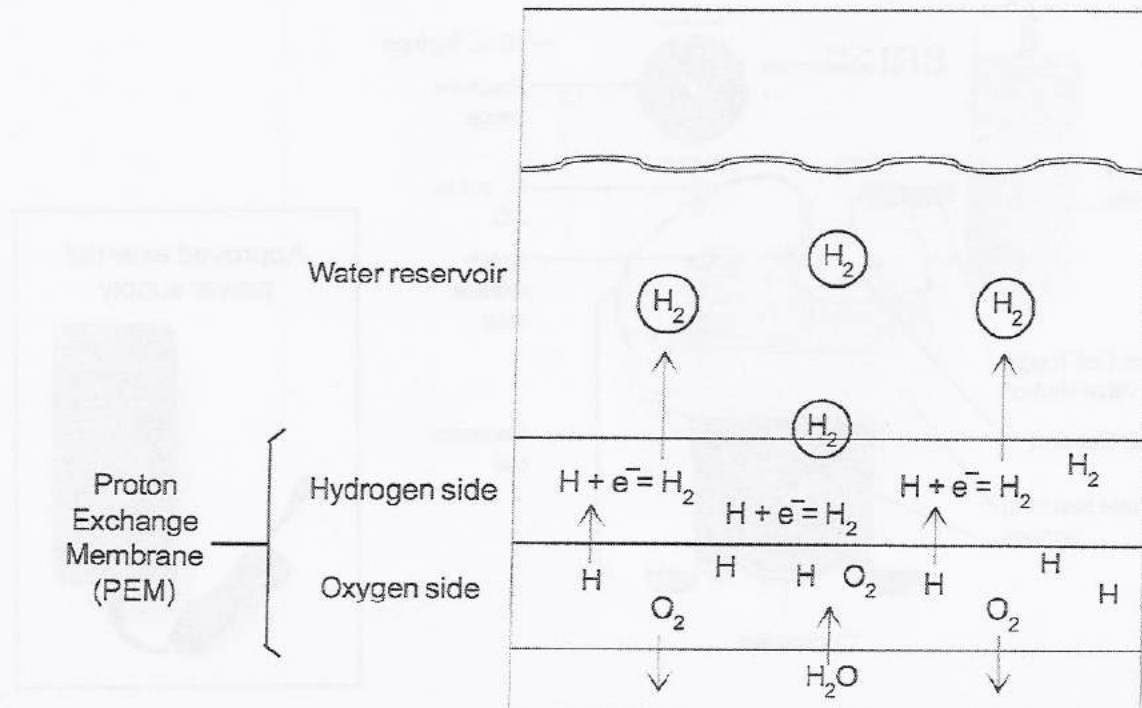
Theory of Operation

The SRI H₂-50 Hydrogen Generator separates water into hydrogen and oxygen using a Proton Exchange Membrane (PEM). The water on the oxygen side of the PEM is dissociated into O₂ and hydrogen protons. The hydrogen proton is transported through the PEM to the hydrogen side, where it recombines with an electron to make H₂, then bubbles up through the water reservoir.

The H₂ 50 Generator Cell



Operational Diagram of the H₂ 50 Generator Cell



GC ACCESSORIES

H₂-50 Stand-Alone Hydrogen Generator

General Operating Procedure

Use the H₂-50 on a flat, level surface, away from open flame and any other ignition sources, including spark sources.

1. Remove the nut with the septum from the Fill / H₂ Out port on the top of the generator cell.
2. Use the 20mL syringe mounted on the right-hand side of the H₂-50 chassis to inject clean distilled water into the water reservoir. Although clean tap water will work in a pinch, use distilled water whenever possible. Fill only to the top fill line; do not overfill. Replace the nut and septum on the fill port and hand tighten until the nut contacts the black o-ring on the fitting.
3. Make sure the dessicant bottle contains dry beads. Dry dessicant beads are blue in color; they turn grey when wet. See below for instructions on recharging and replacing the dessicant beads.
4. Connect the H₂-50's "H2 OUT" fitting to the GC's hydrogen gas inlet. Output from the H₂-50 "HYDROGEN OUT" fitting is connected to the GC with 1/8" or 1/16" O.D. tubing. Make sure the red and black power cord is plugged into the H₂-50 chassis, and connect the external power supply cord to the generator and a wall outlet. Make sure you have the correct input cord for the voltage you are using. Properly used, the transformer is not a spark source and poses no ignition threats.
5. Close the H₂ shut-off valve. Always build up pressure initially with the toggle valve shut; it will take 5-15 minutes.
6. The H₂ gas pressure is preset to 35psi (241316Pa, 2.4bar). Once this pressure is attained, the interior pressure switch will shut off the current to the generator. The water in the generator cell reservoir should stop bubbling.
7. Wait 10 minutes to make sure that 35psi (241316Pa, 2.4bar) pressure is maintained. If pressure is not being maintained, there is probably a leak. Check the dessicant bottle; it should be snug against the o-ring. Make sure the Fill / H₂ Out port nut and septum are intact and snug. Check the bottom of the water reservoir around the PEM for moisture to ensure generator cell integrity; if you find any seepage, tighten each of the eight screws that hold the cell layers together.
8. If you find no indication of a leak after 10 minutes of stabilization at 35psi (241316Pa, 2.4bar), open the toggle valve to let the H₂ gas flow into the GC.
9. When the water in the generator cell water reservoir reaches the bottom fill line, it is time to refill it.
10. Close the toggle valve.
11. Unscrew the Fill / H₂ Out port nut and septum and use the syringe to refill the cell to the top fill line.
12. Replace the nut and septum, and tighten until snug.
13. Since you have the cell pressure vented, it is a good idea to check the dessicant for any grey coloring to see if the beads need recharging. If they do, follow the instructions on the next page (**General Operating Procedure continued**).

GC ACCESSORIES

H₂-50 Stand-Alone Hydrogen Generator

General Operating Procedure continued

Recharging and Replacing the Dessicant Beads

Periodic recharging of the dessicant beads will be necessary as they absorb water during operation and turn grey. The blue color of the dry beads comes from cobalt chloride. Take care not to bake out the dessicant beads with any food item.

1. Before you loosen the dessicant bottle on the H₂-50 chassis, vent the hydrogen pressure in the generator cell by unscrewing the nut capping the fill port on the top of the cell. It will hiss audibly until it is released.
2. Dry the dessicant beads by pouring them onto a paper plate and cooking them in a microwave oven for 2-3 minutes. Or, pour them onto a glass or metal pan and bake them in the GC oven at 250°C. Do not microwave or bake the plastic dessicant bottle. The dessicant beads can be recharged over and over again; they last indefinitely. Should you need them, dry dessicant beads are available in kilogram quantities from Alltech (1-800-ALLTECH; part #05553).
3. Let the beads cool, especially after microwaving them. Refill the dessicant bottle with the dry, blue beads.
4. Replace the bottle on the H₂-50 chassis and hand tighten it. There is an o-ring that engages with the bottle top; tighten the bottle until it is snug against the o-ring.
5. The dry dessicant contains some air which will purge out during the first few minutes of operation. You may notice your retention times change temporarily since the carrier gas may initially be a mixture of hydrogen and air for a few minutes after dessicant replacement. The FID flame may also be hard to light until pure hydrogen comes through. You can speed up this equilibration process by building up pressure in the generator cell then venting with the toggle valve 2-3 times before reconnecting the H₂-50 to the GC. Keep in mind that the internal pressure switch will cut the current when the cell reaches 35psi (241316Pa, 2.4bar), so you don't need to build up too much pressure before venting it. Experiment to learn what works best for your particular GC system.

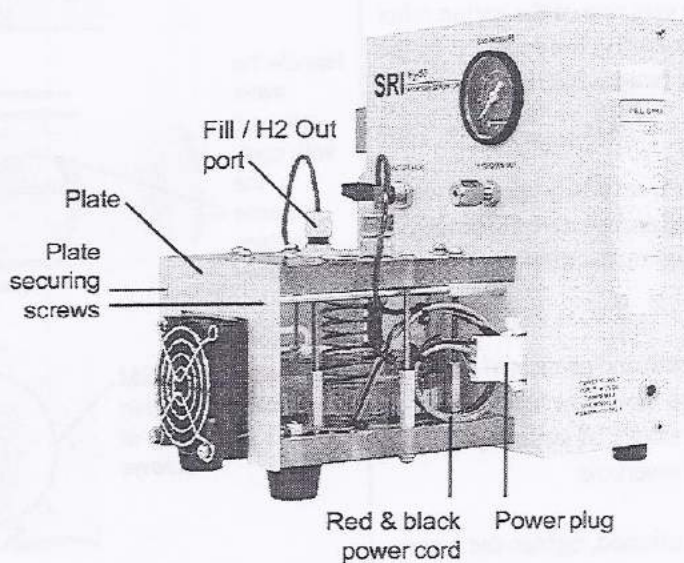
GC ACCESSORIES

H₂-50 Stand-Alone Hydrogen Generator

Maintenance and Troubleshooting

If the water in the H₂-50 water reservoir looks cloudy, it needs to be replaced:

1. Remove the nut with the septum from the Fill / H₂ Out port on the top of the generator cell.
3. Turn the generator over and pour the water out. When the water is almost all out, shake the generator to help it drain.
4. Use the syringe to refill the water reservoir with clean, distilled water through the Fill / H₂ Out port.
5. Replace the nut and septum on the Fill / H₂ Out port.



See the following page for PEM replacement

For service, call 310-214-5092.

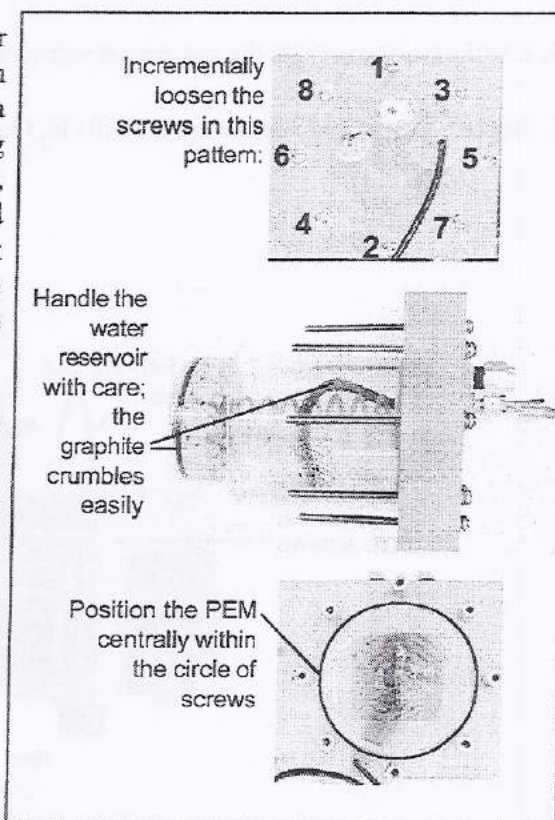
GC ACCESSORIES

H₂-50 Stand-Alone Hydrogen Generator

Maintenance and Troubleshooting continued

If the Proton Exchange Membrane (PEM) changes color, it most likely needs to be replaced. New H₂-50 PEMs are available from SRI under part # 8690-0151.

1. Put the replacement PEM in clean distilled water to soak while you take apart the generator cell.
2. Remove the generator cell from the H₂-50 chassis by unplugging the red and black power cord from the chassis, and unscrewing the two screws that hold the clamping plate against the cell.
3. Loosen the eight screws that hold the water reservoir with a philips head screwdriver. Loosen each screw in increments; first one, then the one opposite, and so on in a star-like pattern. As you progress, be mindful of the spring in the water reservoir; don't loosen the screws too suddenly, or it may pop open the reservoir, presenting safety and damage risks. You can feel the pressure of the spring relax as you loosen the screws sufficiently; hold the top of the generator cell firmly with one hand while loosening the screws with the other.
4. Once the screws are removed, carefully take the water reservoir off the bottom of the cell and remove the old PEM. Be very careful handling and moving the graphite coil, as it can easily come apart.
5. Take the new PEM out of its bath and position it centrally within the ring of screws. Place the water reservoir back on the bottom, over the PEM; the PEM should protrude slightly on all sides of the water reservoir.
6. Once the PEM is properly positioned, tighten the screws in increments until the water reservoir is snug against the bottom of the generator cell.
7. Put the generator cell back on the chassis and secure it with the plate and two screws. Plug the red and black power cord into the chassis.
8. Plug the H₂-50 into a wall outlet and pressurize the generator cell to 30psi. Check the bottom of the water reservoir around the PEM for moisture; if you see any seepage, tighten each of the eight screws a little more.



GC ACCESSORIES
H₂-50 Stand-Alone Hydrogen Generator

WARNING!



Warnings and Safety Precautions:

The H₂-50 generates hydrogen, which is an extremely flammable gas. Under normal operation, the safety features of the H₂-50 protect the operator. However, operators must use common sense and take basic precautions. Hydrogen burns with a flame that is invisible to the naked eye. Do not use the H₂-50 near any flames, sparks, or sources thereof, including lab ovens, heater elements, bunsen burners, torches, etc. When venting the hydrogen from the generator cell, NEVER open the H₂-50 toggle valve near an ignition source!

Hydrogen is non-toxic, but it can cause asphyxiation in confined spaces by displacing oxygen. Use the H₂-50 in a ventilated room with an ambient temperature of 5-40°C (40-100°F). If the GC power is interrupted or cut off during hydrogen generation, flip the toggle valve to isolate the generator cell, then disconnect the external power source from the H₂-50 and the wall outlet. This is a good general response in any situation of uncertain risk; if you're not sure what's happening, isolate the cell and pull the power plug. That way, you can take the time to diagnose any problems without H₂ accumulation. Familiarize yourself with the safe operation of the GC and other equipment to which you intend to connect the H₂-50.

The H₂-50 is designed to be safe under the following Environmental Conditions:

- indoor use;
- altitude up to 2000 meters;
- temperature 5°C-40°C;
- maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C;
- POLLUTION DEGREE = 2 in accordance with IEC 664.

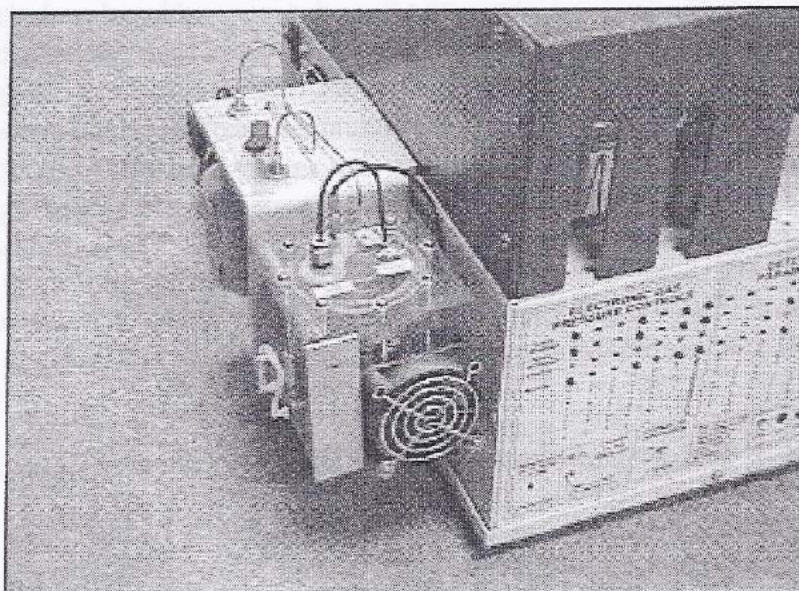
WARNING!

Changing the PEM membrane on the SRI hydrogen generator

The SRI Hydrogen generator is most commonly found as the stand-alone H2-50 version shown to the right.

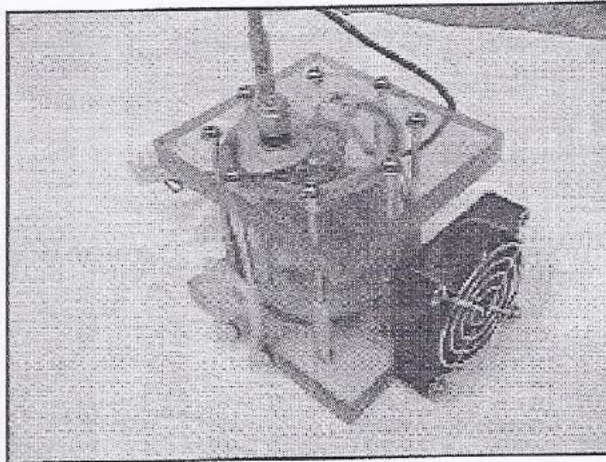


A smaller 25ml/min version may also be found built-in to some SRI 8610C GCs.

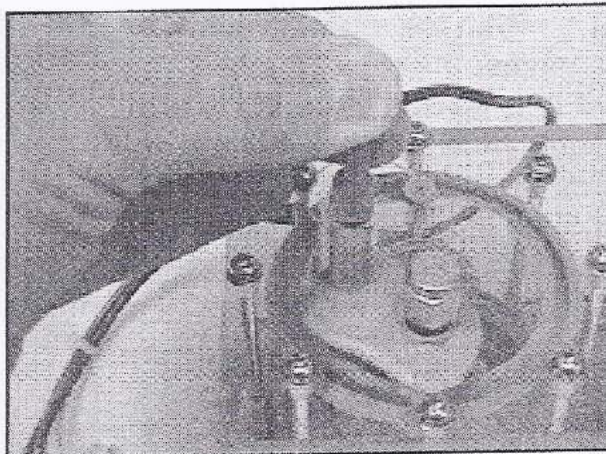


Changing the PEM membrane on the SRI hydrogen generator

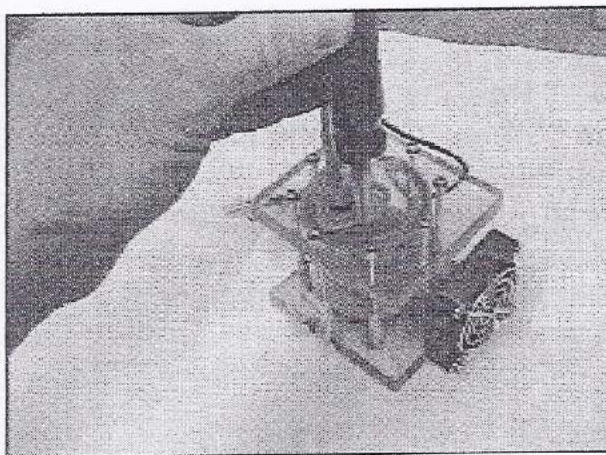
1) The Proton Exchange Membrane (PEM) used in the SRI hydrogen generator may need replacing periodically. If the generator does not make hydrogen at all, or only very little, if the membrane looks very dark or dirty, or if the generator gets hot and steamy, it may be time to replace the PEM.



2) Remove the H₂ generator cell from the GC or stand-alone chassis, then gently wiggle off the black wire connector on the top of the cell.

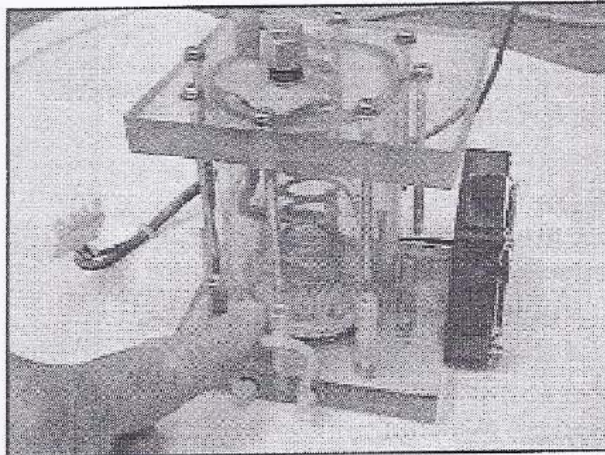


3) Loosen the eight screws which clamp the top of the cell to the bottom. Initially, just loosen each screw a little bit and loosen them evenly to avoid putting too much stress on any one screw. The water in the cell will leak out when you do this, so it may be a good idea to do this over a sink.

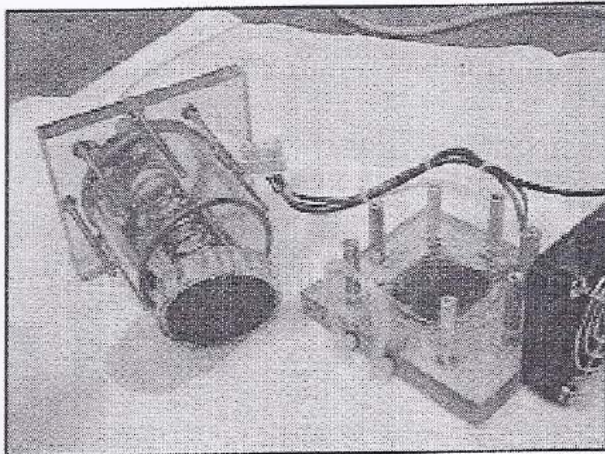


Changing the PEM membrane on the SRI hydrogen generator

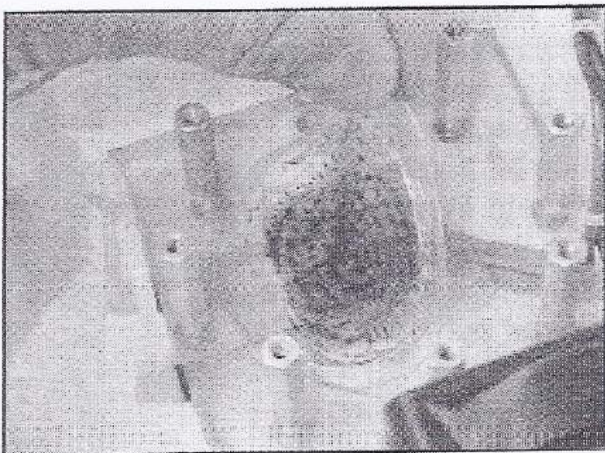
4) Be sure that the aluminum stand-offs on the bottom of the cell don't rotate as you remove the screws. Hold each stand-off with a small wrench if you have to.



5) With the eight screws removed, the top of the cell will pop up due to the spring inside which pushes the graphite rope electrode against the PEM. Carefully lay the top of the cell aside.



6) Peel the old PEM off the bottom. Check the platinum screen for bits of old PEM material. If the platinum screen seems rough or has sharp edges, use your fingers to smooth it down.



Changing the PEM membrane on the SRI hydrogen generator

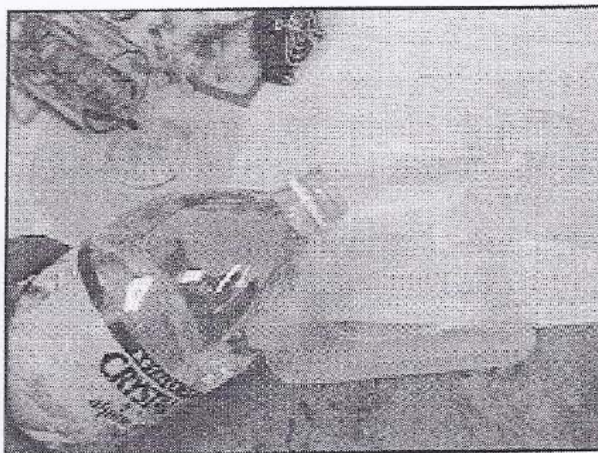
7) Examine the old PEM for clues as to why it may have failed.



8) The new PEM is available from SRI under part# 8690-0151 for the 50ml/min H₂ gen and 8690-0152 for the 25ml/min model. The new PEM is crystal clear and comes in a plastic bag. It is easy to think the bag is empty because the PEM is clear.

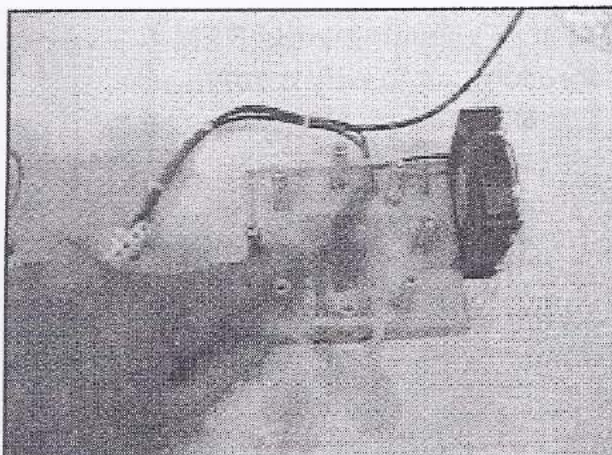


9) Soak the new PEM in clean water prior to installation. The PEM is extremely hydroscopic (absorbs water) and will expand slightly as it is soaked. Soak the PEM for a minute or two.

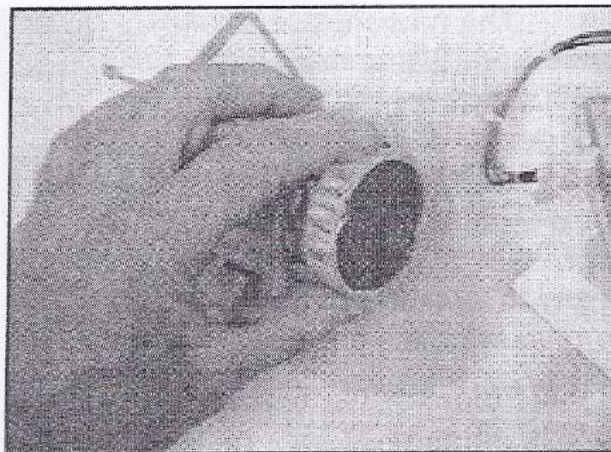


Changing the PEM membrane on the SRI hydrogen generator

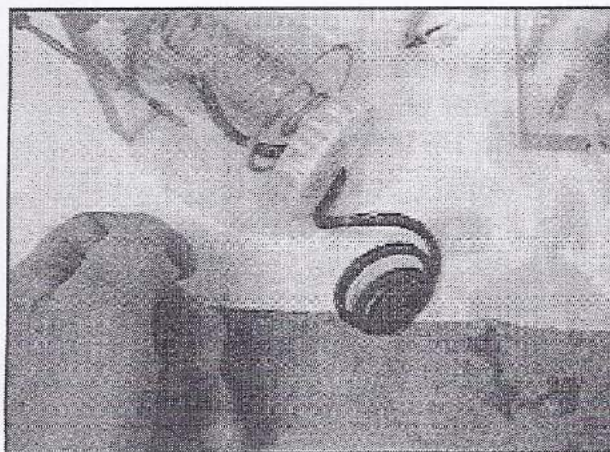
10) Place the new PEM in the center of the cell. It should fit snugly inside the circle of eight aluminum-stand-offs.



11) The graphite electrode is constructed of a coil of graphite rope. In most cases it will stay together, especially if you handle it gently.

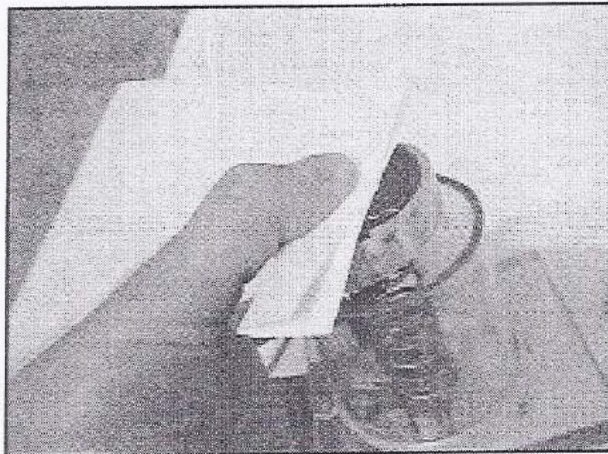


12) Sometimes the coil will come undone, so you may have to rewind it and coax it into position within the recess of the plastic disk. Do this in such a way that the coil of graphite lays flat.

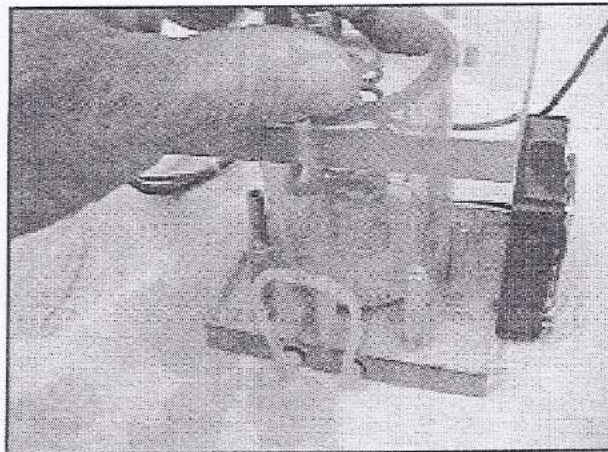


Changing the PEM membrane on the SRI hydrogen generator

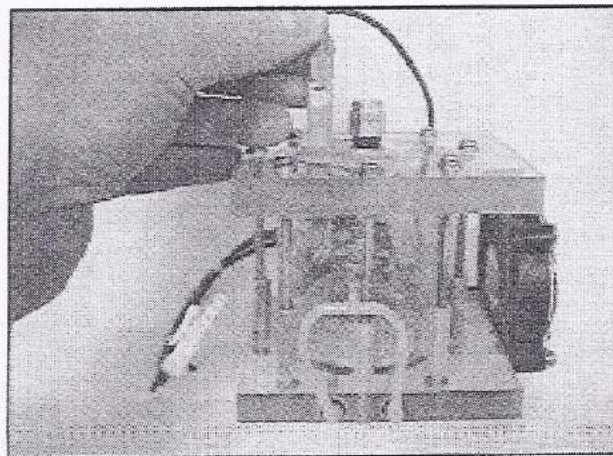
13) To keep the graphite coil from coming apart as you re-assemble the cell, place a thin ruler or strip of cardboard over the coil while positioning the cell top on the bottom. Once the top is in place, slide the strip out.



14) Replace 4 of the 8 screws, but just engage the screw threads one turn. Examine the cell from the sides and bottom to ensure the graphite coil is centered. If not, remove the screws and nudge the coil into the center of the cell.



15) Replace and tighten the eight screws. Tighten gradually and in an alternate pattern to avoid over-stressing the plastic. Finally, re-connect the black wire to the connector on the top, fill with clean water and re-attach to the GC or stand-alone chassis.



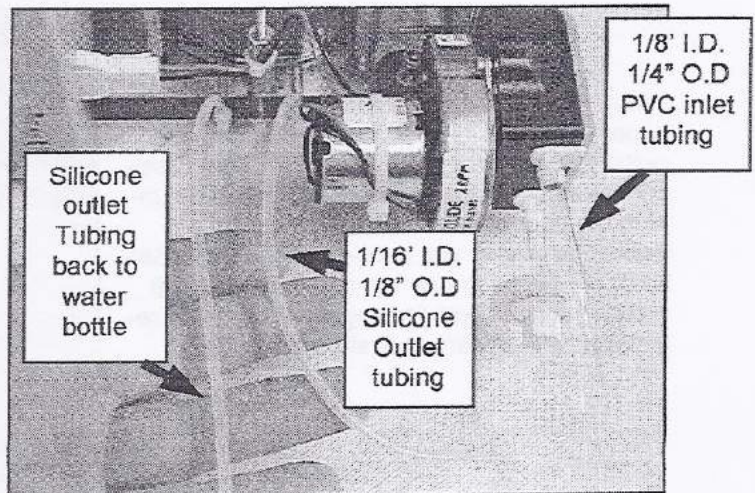
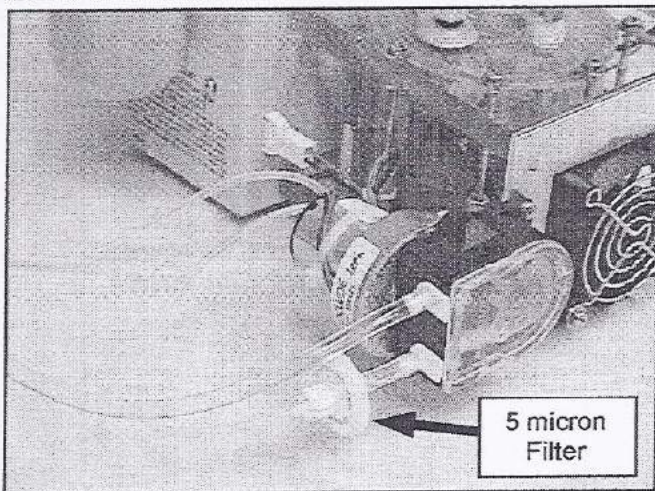
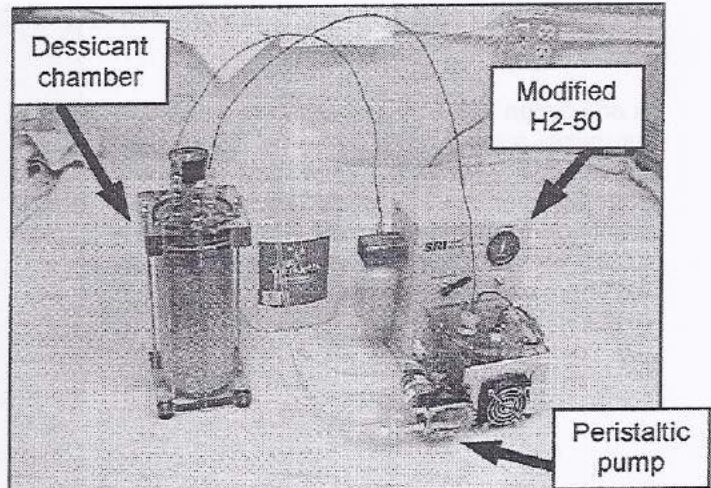
Chapter: Hydrogen Generator

Topic: Using the Extended Run H2 Generator kit

The SRI Extended Run kit for the H2-50 Hydrogen Generator consists of a modified Hydrogen generator cell and electronics, a peristaltic pump, and a large dessiccant chamber. The extended run cell comes equipped with a water level sensor which turns the peristaltic pump on and off automatically to maintain a constant water level inside the cell. A one gallon bottle of grocery store quality distilled water is sufficient for two months or more of operation. The large dessiccant chamber holds about two pounds of indicating mole sieve dessiccant. This quantity of dessiccant is also enough for two month continuous operation at 40ml/min or longer if the H2 flow requirement is lower. In the photo to the right, you can see the bottom third of the chamber has turned grey after one month of use.

The peristaltic pump re-circulates the distilled water from the bottle past the oxygen side of the PEM (proton exchange membrane). Electro-osmotic drag pulls the water through the membrane to the hydrogen side. When the water level rises to the tip of the water level sensor, the peristaltic pump shuts off. Excess water is returned to the distilled water bottle.

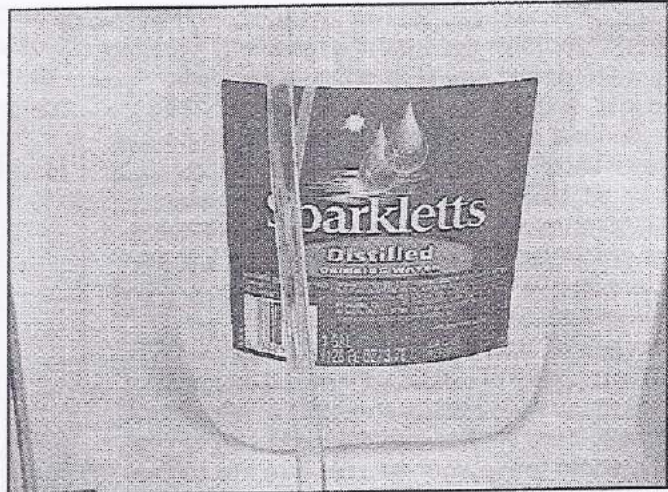
By pumping the water across the oxygen side of the PEM instead of directly into the water reservoir we can avoid pumping against the 30 psi of H2 pressure in the water reservoir, which is hard on any pump and prone to leaks. The oxygen side of the membrane is at ambient pressure, so a simple peristaltic pump can be expected to work reliably and for a long time. A disposable 5 micron 25mm syringe filter is used to prevent clogging of the passageways inside the H2 generator from dust and small fibers which seem to find their way into the water reservoir despite all precautions. This filter should be changed whenever the dessiccant is re-generated. Almost any brand of syringe filter is OK to use, but we supply a Millipore Millex-LS part# SLLS025NS.



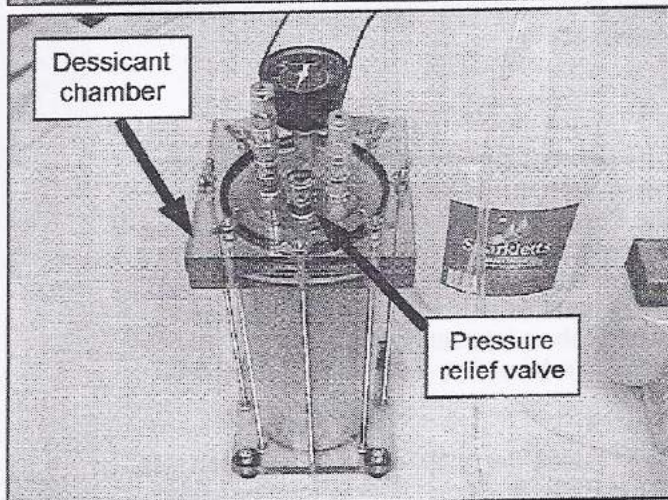
Chapter: Hydrogen Generator

Topic: Using the Extended Run H2 Generator kit

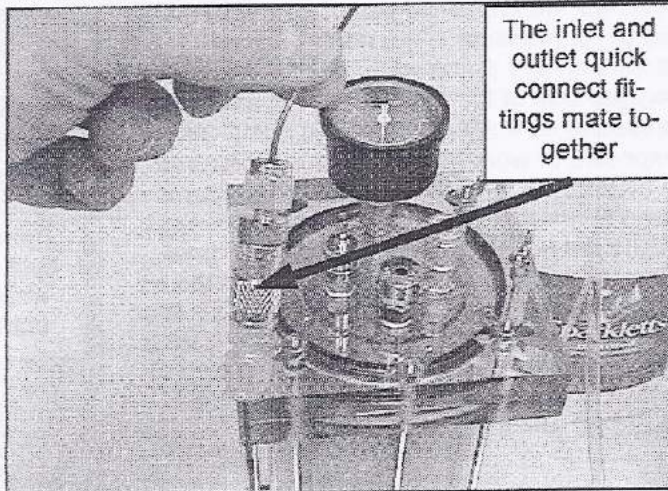
A one gallon bottle of grocery store distilled water makes a good water reservoir. Cut holes in the top and feed the 1/4" tygon and 1/8" silicone tubes all the way to the bottom. Put the cap back on to keep dust and fibers out of the water. Most pump problems result from clothing fibers clogging the internal water passages of the H2 cell.



The dessicant chamber has a pressure gauge, pressure relief valve (45psi) and two quick connect fittings. The brass quick connect is the inlet and the silver quick connect is the outlet.



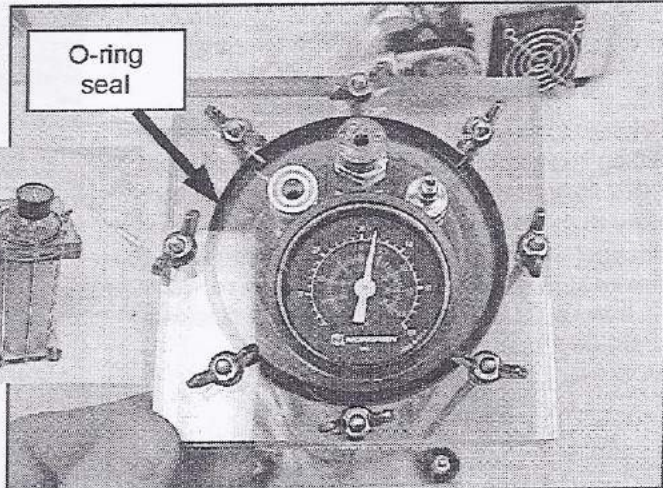
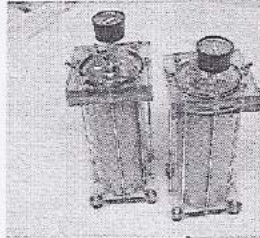
When changing the dessicant, or if you want to bypass the dessicant chamber, the inlet and outlet fittings simply plug together. The dessicant chamber stays pressurized when you unplug the connections. This is important because this allows you to re-generate the dessicant, pre-purge the air out and leave the unit pre-pressurized with hydrogen, ready to be re-installed with minimum system down-time.



Chapter: Hydrogen Generator

Topic: Using the Extended Run H2 Generator kit

Many customers opt to purchase a spare dessicant chamber so that when they arrive on-site to perform the monthly or periodic maintenance, they have a pre-charged dessicant chamber which they can swap right into the system. This avoids the down-time which would otherwise result from the time it takes to purge air out of the chamber after re-generating the dessicant beads. Since the H2-50 makes a maximum of 50 ml/minute, this can take hours. It makes more sense to swap dessicant chambers in the field and re-generate the old chamber back in the lab.

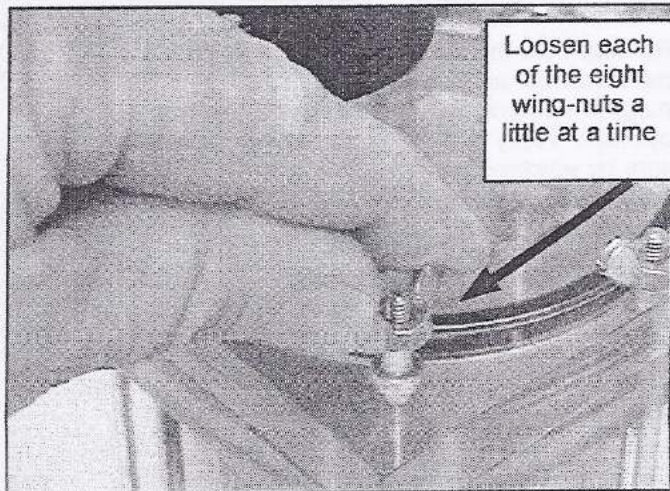


The dessicant chamber has eight wing-nuts which secure the top, compressing a rubber o-ring which seals in the pressure.

To change or re-generate the dessicant beads, release the pressure in the dessicant chamber by pushing the button on the top of the silver outlet quick connect fitting. Verify (using the pressure gauge) that the pressure has bled down to ambient before removing the nuts.



Loosen the wing-nuts evenly. Loosen each wing-nut a little bit at a time before removing any single wing-nut. This protects the plastic top from un-necessary stress.



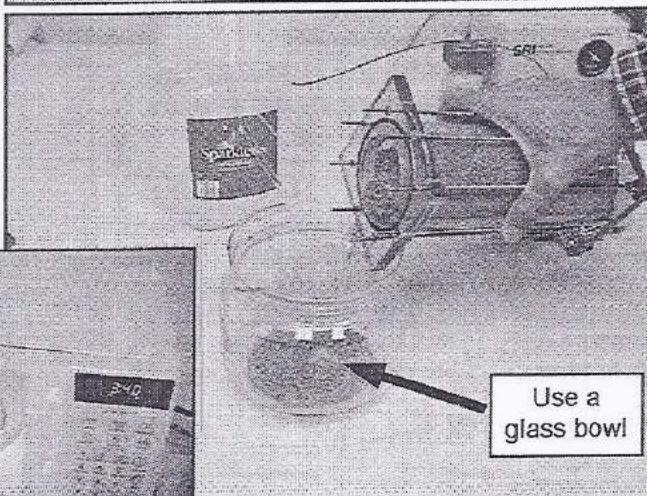
Chapter: Hydrogen Generator

Topic: Using the Extended Run H₂ Generator kit

Remove the top of the dessiccant chamber by lifting straight up. The brass inlet quick connect fitting has a tube which extends all the way to the bottom of the dessiccant chamber. Inspect the outlet at the bottom of the tube to make sure it is not plugged or blocked. (There is a metal frit in the tube to prevent blockage from dust).

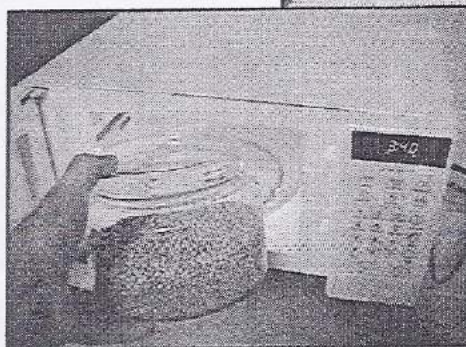


Pour the dessiccant beads into a glass bowl. Don't use a plastic or metal bowl. Microwave the beads for 5-10 minutes until the blue color returns. **DO NOT USE A MICROWAVE WHICH IS ALSO USED FOR FOOD.**

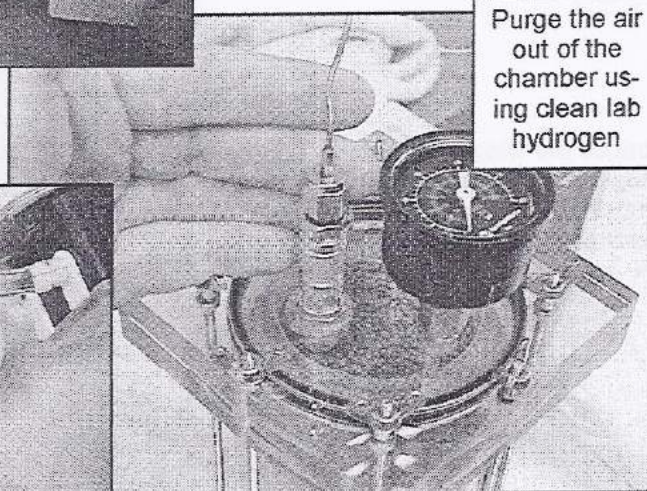


Use a glass bowl

The beads will be very hot when you remove them from the microwave oven, so allow them to cool, then pour them back into the dessiccant chamber. **DO NOT PUT THE DESSICANT CHAMBER INTO THE MICROWAVE OVEN.**

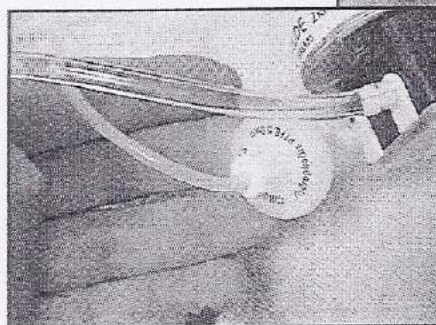


Re-assemble the dessiccant chamber and then purge the chamber with clean hydrogen from a cylinder. Verify that the chamber holds pressure by watching the pressure gauge after pressurizing the chamber to 30 psi.



Purge the air out of the chamber using clean lab hydrogen

Don't forget to change the filter.



Chapter: Troubleshooting

Topic: Leak Checking your GC

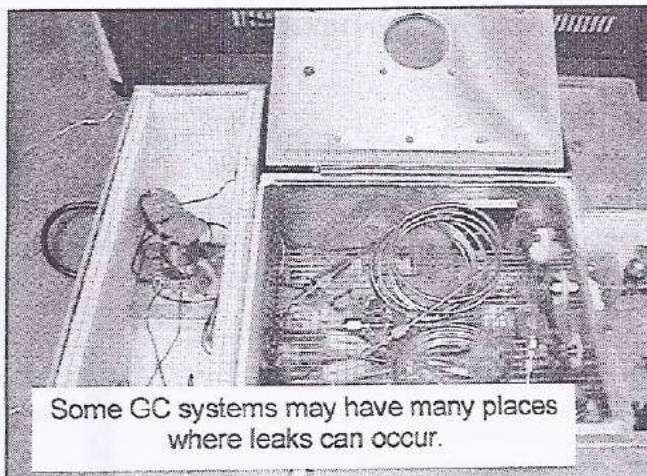
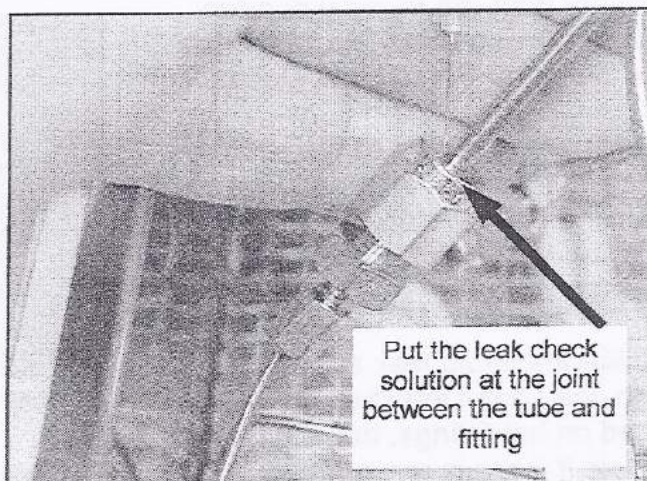
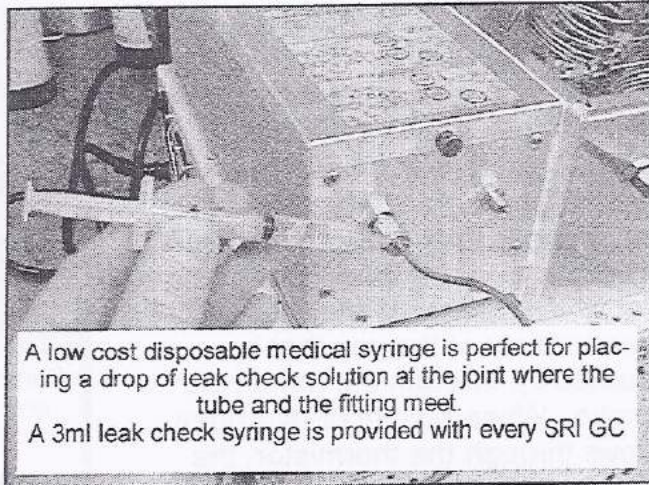
There are 3 ways to check for gas leaks in a GC.

The 1st method of leak checking is called "looking for bubbles" or "snooping the fittings". Snoop® is a specific brand of leak check solution, but SRI suggests a mixture of isopropyl alcohol (IPA) and water. The alcohol reduces the surface tension of the water so it flows into the cracks between the tubing and the fitting, otherwise water alone would be fine. Don't use soapy water because if the leak check solution gets inside the GC tubing or fittings, it will contaminate the system.

Apply gas pressure to the system then place a droplet or two of leak check solution on the tube connections. If tiny little bubbles are visible then the fitting is leaking.

Using the liquid leak check solution can be difficult however when there are many fittings to test or when some of the fittings are hot, (this will rapidly boil off the leak check solution) making it impossible to tell if there are bubbles from a leak or bubbles from the water boiling away.

Liquid leak checking is the least effective way to check for gas leaks in a GC system.



Chapter: Troubleshooting

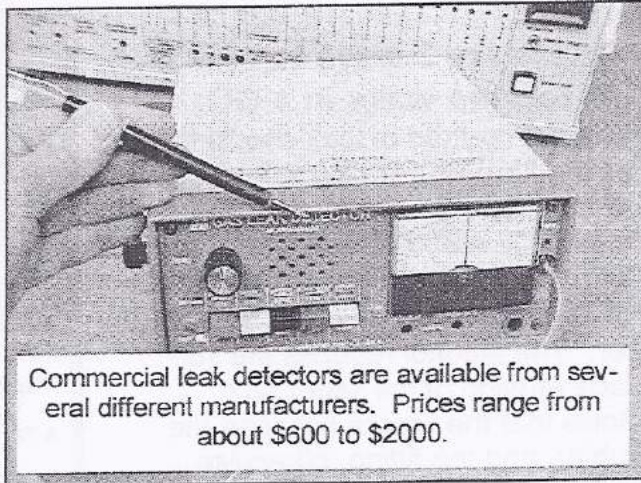
Topic: Leak Checking your GC

The second method of leak checking is to use a **leak detector**. Leak Detectors are made by several different manufacturers, but in most cases they consist of a vacuum pump and a thermistor detector which measures the thermal conductivity of the gas that is sucked up through the hand held probe. When helium or hydrogen flows through the thermistor, the thermal conductivity is a little greater than the thermal conductivity of air, so there is a response on the meter of the Leak Detector.

Apply gas pressure to the system then sniff around all the fittings with the Leak Detector. The display on the Leak Detector indicates a leak.

Unlike the liquid leak check solution, the Leak Detector can be used on hot fittings, but is difficult to use if there is any airflow around the fittings (such as in a GC oven with the fan running).

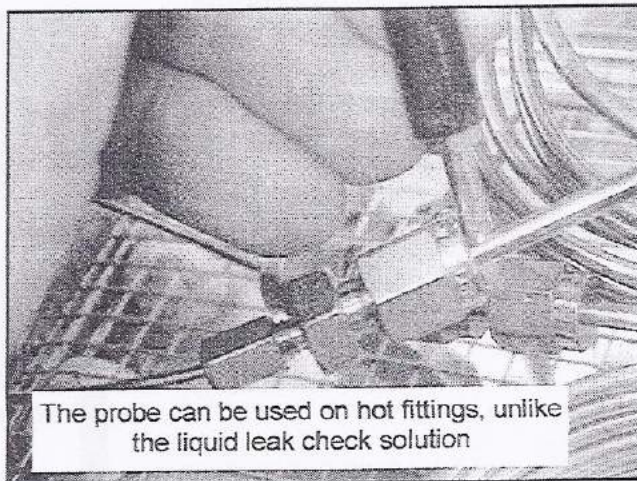
Some leaks may be too small to detect, and some fittings may be in-accessible. Be careful with the probe around live electrical circuits or heaters



Commercial leak detectors are available from several different manufacturers. Prices range from about \$600 to \$2000.



The hand-held probe is used to sniff around the fitting for leaking helium or hydrogen



The probe can be used on hot fittings, unlike the liquid leak check solution

Chapter: Troubleshooting

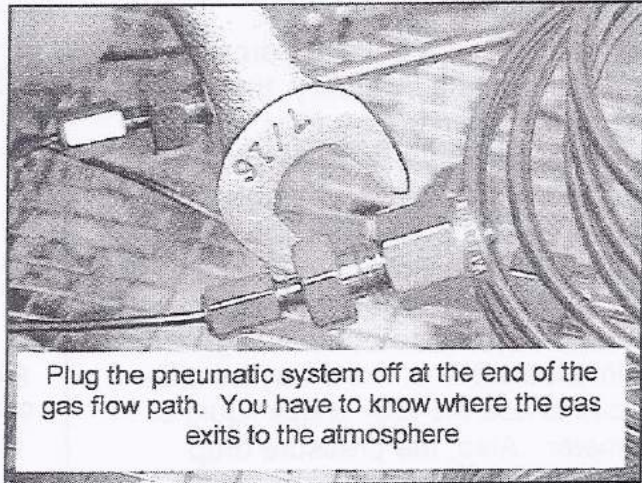
Topic: Leak Checking your GC

The third method of leak checking is called the "pressure drop" test.

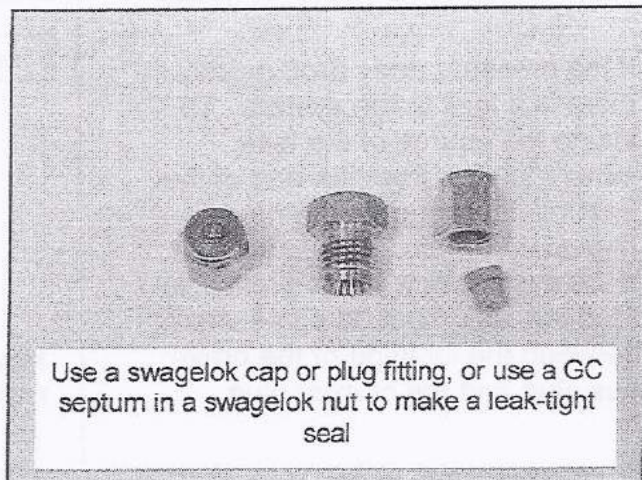
The pneumatic system is plugged at the end of the gas flow path. This may be the outlet of the detector or the end of the column.

Use a swagelok fitting or a swagelok nut with a GC septum to make a gas tight seal. If the plug leaks, the test will not work.

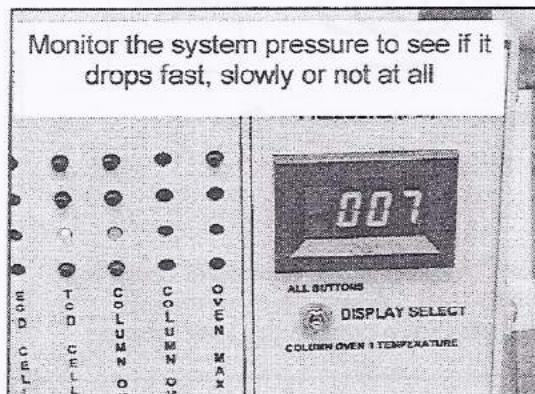
The system is then pressurized using the EPC (electronic pressure regulator) built-in to the SRI GC. The EPC is then turned down (or off). Because the end of the gas flow path is plugged, the gas is trapped (under pressure) in the pneumatic system. If there is a leak, the gas pressure will drop. If the entire system is leak free, the pressure will remain for many minutes before it slowly drops. The rate at which the pressure drops is indicative of the magnitude of the leak



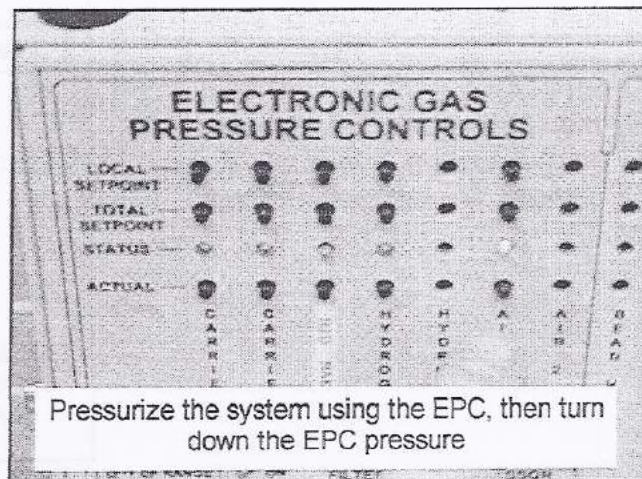
Plug the pneumatic system off at the end of the gas flow path. You have to know where the gas exits to the atmosphere



Use a swagelok cap or plug fitting, or use a GC septum in a swagelok nut to make a leak-tight seal



Monitor the system pressure to see if it drops fast, slowly or not at all



Pressurize the system using the EPC, then turn down the EPC pressure

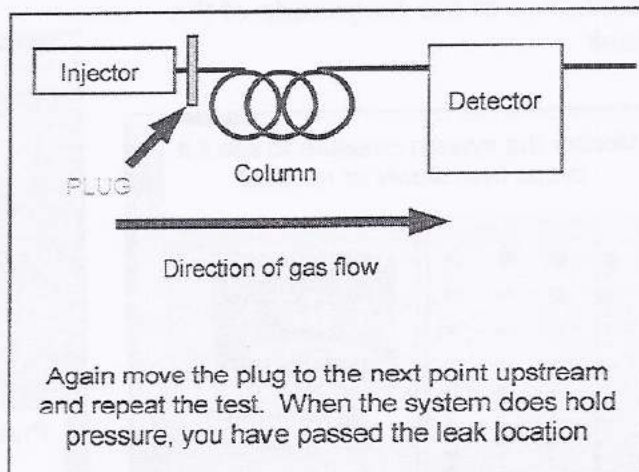
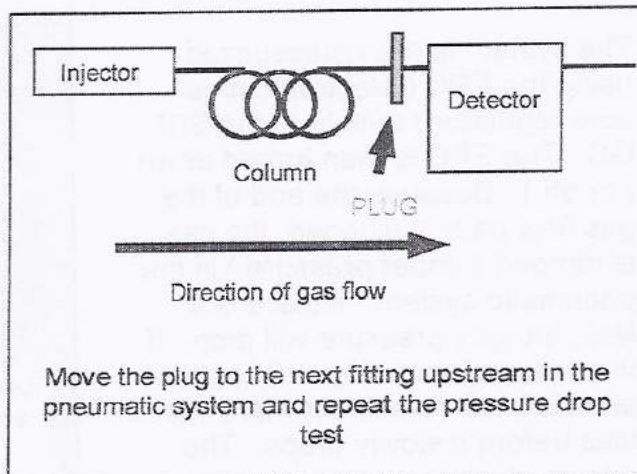
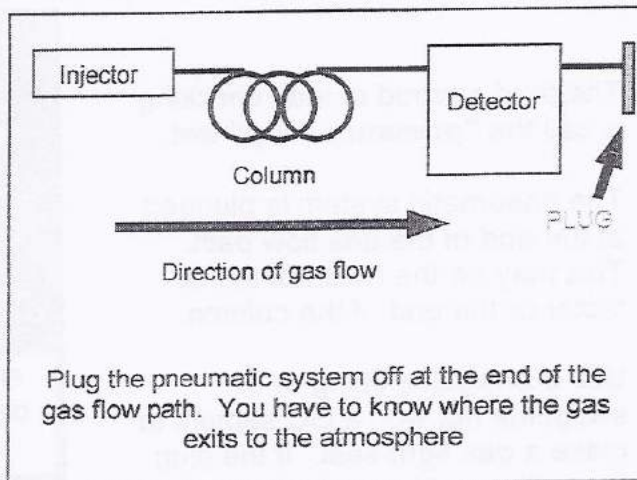
Chapter: Troubleshooting

Topic: Leak Checking your GC

If the pressure does not drop at all, or drops very slowly, then the entire system is leak-tight. In some ways, this is the best way to check for leaks, because one test verifies that every connection in the system is holding pressure. With a complex gas system, or one where some of the fittings are in-accessible or hot it may be difficult to use the leak check liquid or meter. Also, the pressure drop test can detect leaks that are too small for the other methods to see.

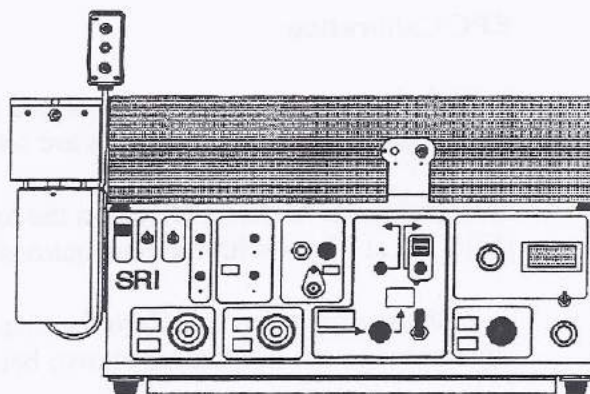
If the pressure does drop quickly, there is a leak in the system. To locate the source of the leak, move the plug from the end of the pneumatic system to the next fitting upstream and repeat the test. If the system now holds pressure, then the leak must be somewhere between the location of the previous plug and the current plug.

By moving the plug location step by step upstream, eventually it will be obvious where the leak must be.



If the gas chromatograph in use is equipped with an electrically actuated multiport gas sampling valve and, after discussing the trouble experienced with the technical support staff at SRI Instruments, a valve actuator replacement is deemed necessary, then a replacement valve actuator may be purchased (or ordered under warranty) and the replacement may be performed in the field by the user.

By following the steps outlined below, the user may effect the replacement of the actuator in a relatively short period of time without much difficulty.



SRI gas chromatogram equipped with electrically actuated gas sampling valve

STEP 1: Remove power from the unit and allow it to cool to ambient temperature. Disconnect the power cord from the AC supply (wall outlet). Unplug the 5-wire modular plug on the cable that exits the base of the actuator housing.

STEP 2: Remove the two brass thumbscrews securing the valve oven cover. Then remove the valve oven cover. Remove the top insulating blanket directly beneath the valve oven cover.

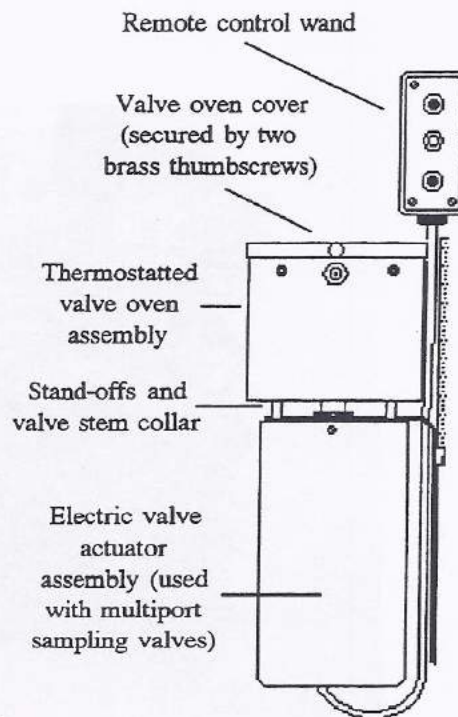
STEP 3: Note that there are four holes in the insulating blanket at the base of the valve stem. These holes permit access to four Phillips-head screws that secure the valve oven to the stand-offs mounted on the valve actuator through the bracket. Remove the four screws (a magnetic device may be needed to retrieve the screws through the insulation).

STEP 4: Using a 9/64" Allen wrench, loosen the set screw on the side of the collar securing the valve stem shaft. This will release the valve assembly. Then lift the valve oven slightly away from the actuator assembly in order to insert the Allen wrench into the two set screws present in the top surface of the collar ring. These screws go through the bracket must be removed.

STEP 5: Remove the four hexagonal stand-off posts mounted through the bracket into the valve actuator assembly. This will free the valve actuator assembly from the bracket and permit replacement. Remove defective actuator assembly and substitute with replacement valve actuator. Reassemble in the reverse order, from step 5 to step 1.

STEP 6: Verify proper valve operation after reinstallation. Verify that the valve position matches the position indicated on the remote control wand. Listen to the valve when rotating to hear for actuator jamming or other unusual noises.

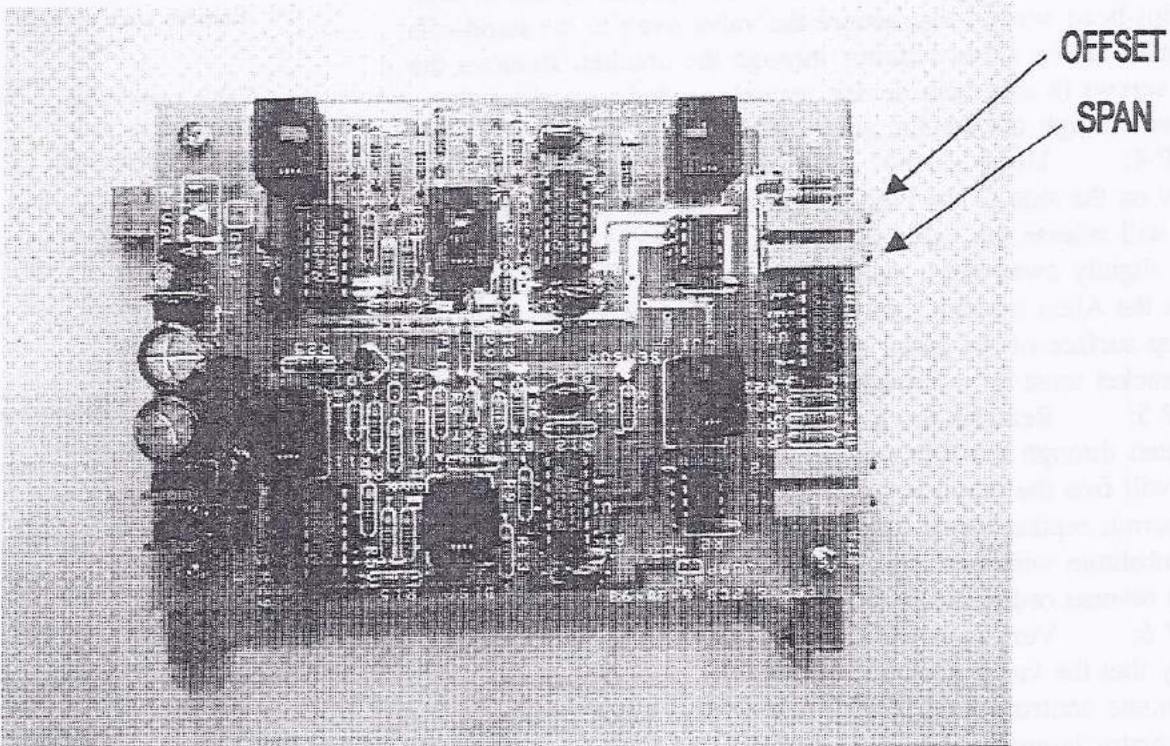
If any difficulties are encountered during or after the valve actuator replacement process, contact SRI Instruments technical support for assistance at (310) 214-5092. If an actuator is suspected to be defective, consult with SRI before attempting removal. The problem may be located elsewhere in the system and diagnosis may be possible over the telephone.



VIEW OF VALVE OVEN AND ACTUATOR ASSEMBLIES AS SEEN FROM FRONT OF UNIT

EPC Calibration:

1. With the gas off connect a 0 – 30 psi gauge to the union on the output of the EPC. (Inside the instrument, the EPC's are on the left)
2. Adjust the EPC SET POINT on the top of the front panel to 20 psi. Verify the SET POINT is at 20 psi with the pushbuttons.
3. With the supply gas off, Zero the display to a setting of -0.0 using the OFFSET POT adjustment on the EPC board shown below.
4. With a supply pressure of 30 psi turn on the supply gas.
5. Adjust the SPAN POT on the EPC board to make the gauge pressure equal to the SET POINT pressure.
6. Repeat steps 3-5, until the ZERO is -0.0 and the gauge and display both read 20 psi.



CHAPTER: MAINTENANCE

Topic: Installation of the optional Air Compressor in SRI 8610C GC

Parts List:	Quantity
TOGGLE SWITCH	1
FLAT WASHER	4
LOCK NUT	4
6" COPPER CONNECTING TUBING	1
1/16" to 1/8" SS BULKHEAD FITTING	1
AIR COMPRESSOR with extended leads and extended output tubing	1

1. Turn off all gas supplies to the GC and remove AC power plug from outlet.
2. Remove the BOTTOM COVER of the GC by removing the 6 retaining screws.
3. Mount the AIR COMPRESSOR to the existing studs (see accompanying diagram) with supplied WASHERS and 6/32" LOCK NUTS. Secure all wires and make sure no wires are contacting the AIR COMPRESSOR. AIR COMPRESSOR will become hot when operating.
4. Remove the hole plug from the GC front panel hole marked as internal air compressor on/off switch.
5. Install and secure the TOGGLE SWITCH through the CIRCUIT BOARD with wires facing towards the bottom of the GC.
6. Solder the 2 wires from the TOGGLE SWITCH to the 2 bottom connector holes on the CIRCUIT BOARD to the left of the TOGGLE SWITCH.
7. Remove the hole plug from the GC front panel hole marked as

AIR COMP. OUT

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8. Mount the STAINLESS STEEL BULKHEAD FITTING in the opening marked as

AIR COMP. OUT

 on the left side of GC.
9. Connect the extended gas tubing from the AIR COMPRESSOR to

AIR COMP. OUT

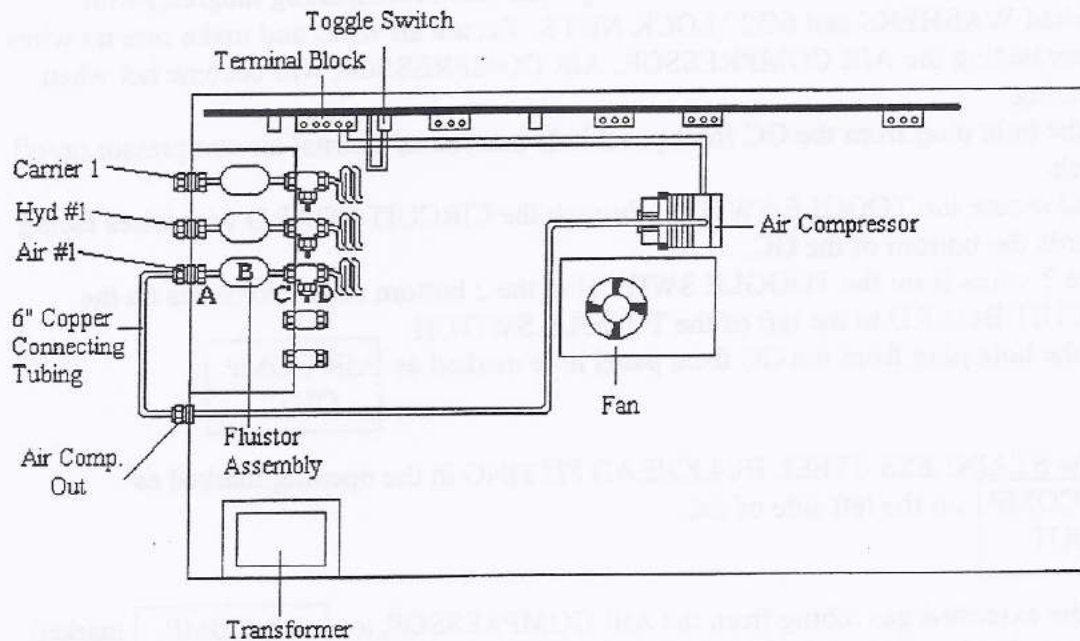
 marked on the left side panel of the GC. Route the tubing away from electrical components.
10. Connect the 2 wires from the AIR COMPRESSOR to first 2 positions of the blue terminal block, which is next to connector holes for the TOGGLE SWITCH wires on the CIRCUIT BOARD.
11. Disconnect the FLUISTOR ASSEMBLY (B in diagram) by loosening nut C in diagram with a 7/16" wrench and a 7/16" wrench on point D to prevent the T-fitting from roating.

CHAPTER: MAINTENANCE

Topic: Installation of the optional Air Compressor in SRI 8610C GC

Warning! Excess torque or stress on FLUISTOR ASSEMBLY can damage the delicate device.

12. Disconnect FLUISTOR ASSEMBLY by loosening nut A with a 7/16" wrench.
13. Remove the STAINLESS STEEL BULKHEAD FITTING from the GC.
14. Remove the frit, if present, inside the STAINLESS STEEL BULKHEAD FITTING by inserting a 1/16" diameter rod into the BULKHEAD FITTING and carefully tap the end of the rod on a desk. Without removing the frit, air supply pressure can be reduced from approximately 12 psi to 7 psi, which may result in low FID sensitivity.
15. Re-install the STAINLESS STEEL BULKHEAD FITTING and FLUISTOR ASSEMBLY.
16. Connect **AIR COMP. OUT** and **AIR #1** BULKHEADS, which are marked on the left side panel of the GC, with supplied 6" COPPER CONNECTING TUBING.
17. Re-secure the BOTTOM COVER of the GC.



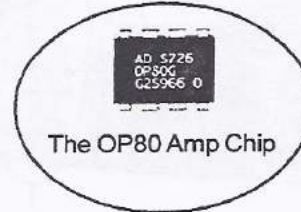
Replacing the OP-Amp Chip in Your SRI GC

Testing the OP80 or LF356 Amplifier Chip(s)

The parts kit in the plastic tackle box under the red lid of your SRI GC contains a spare OP80 or LF356 amplifier chip. Additional OP-Amp chips are available under SRI part number 8690-7000. FID, NPD, HID, TID, PID, FPD, and DELCD detectors use the OP-Amp chip. The OP-Amp chip amplifies the analog detector signal. You should replace a detector's OP-Amp chip when you're not getting the signal response that is otherwise consistently observed from your detector, when the detector signal is pegged up (5000mV) or down (0), or when the detector has failed the Wet Finger test.

If your detector signal is pegged up or down, try the following:

1. Turn OFF the GC power (for at least 10 seconds).
2. Shut down the PeakSimple software program.
3. Re-launch PeakSimple.
4. Turn the GC power ON.



5. Without zeroing the data system signal, observe the milliVolt reading. If it is still pegged at 5000mV, replace the OP-Amp chip. Sometimes the signal will be pegged at or near 0, but 5000mV is much more common with a faulty OP-Amp chip.

Wet Finger Test:

1. Make a "V" sign with the first 2 fingers of your hand.
2. Moisten those fingers (lick them).



3. Place one finger on the collector electrode, and simultaneously place the other on bare metal, like the column oven lid. Make your contact brief, and observe the milliVolt reading.
4. The data system signal should jump from 0 to 5000mV (max voltage), and come back down when you remove your fingers. If your contact does not produce a similarly significant change in the milliVolt reading, then you should replace the OP-Amp chip.

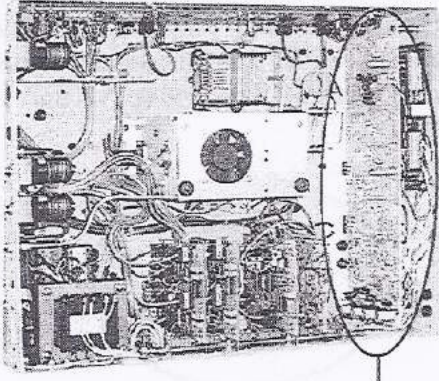
If you have dummy loads or the means to create them at your disposal, you may use the method outlined in the table below to test the OP-Amp chip(s). If the readings are not within the target range, you should replace the OP-Amp chip(s).

DETECTOR GAIN TEST		
DETECTOR(S)	DUMMY LOAD	TARGET GAIN(S) READINGS
FID / NPD / HID / TD	16000MOhm resistor connected to center of BNC jack and ground	HIGH (+2000mV), MED (100mV), HI FILT (+2000mV)
PID	16000MOhm resistor connected to center of BNC jack and ground	HIGH (+1000mV), MED (100mV), LOW (10mV)
FPD	16000MOhm resistor connected to center of BNC jack and ground	HIGH (+1000mV), MED (100mV), HI FILT (+1000mV)
DELCD	100MOhm resistor connected to red & white wire screw terminals	HIGH (+1400mV), MED (140mV), LOW (14mV)

ELECTRONICS

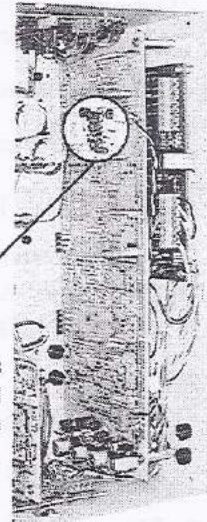
Replacing the OP-Amp Chip in Your SRI GC

Replacing the OP-Amp Chip



The amp board is the long board on the right hand side of the GC chassis interior

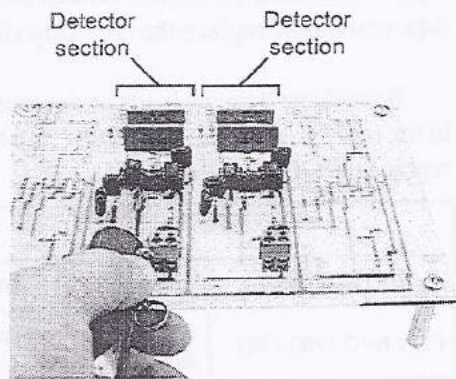
1. Turn OFF and unplug the GC.
2. Remove the 6 screws holding the bottom panel on the GC chassis. Support the panel while you gently rock the GC onto its back, then lower the panel to your working surface to access the chassis interior.
3. Locate the Amp board inside the GC chassis on the right hand side. Remove the protective steel plate by loosening the two thumbscrews that secure it to the aluminum stand-offs, and set it aside.



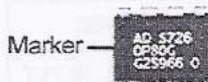
Pictured here is an amp board with two OP80 amp chips on it.

4. There are four possible places on the Amp board for the OP-Amp chip, depending on the detector to which it is assigned. From the top (or front, with the GC in normal operating position), the Amp board sections read FPD, FID, PID, and DELCD. If present, the NPD will be at the FID position, as would a TID if present. However, because the circuits are identical, this is just a general guide. The Amp board will be populated according to the detectors installed on the GC. Note that each circuit has a pair of chips, almost identical in appearance, installed side by side; the OP-Amp chip is the one on the left.

5. Use a small flat blade screwdriver or similar tool to pry the OP-Amp chip out of its socket and off the Amp board. (A pocket knife nail file was used in the picture).



OP80 Amp Chip



6. Note the semi-circular depression on one end of the OP-Amp chip; this is a marker for proper orientation of the chip, and it corresponds with a similar mark on the socket. The end of the chip bearing the marker faces the top of the amp board, so you will install it with that end facing away from you. Carefully position the chip over the socket so that each of the eight pins occupies a hole and press it into place.

7. Test the new OP-Amp chip with the methods described on the previous page.