Chapter: Troubleshooting

Topic: Leak Checking your GC

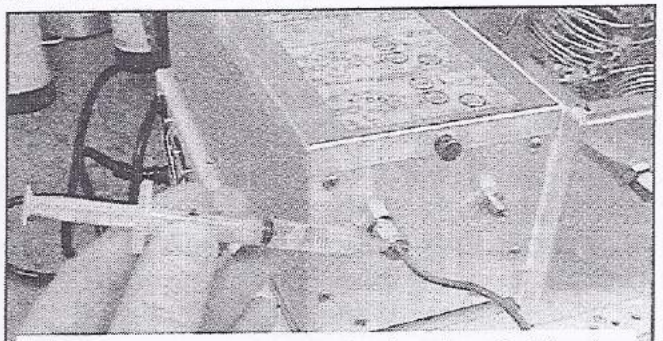
There are 3 ways to check for gas leaks in a GC.

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.

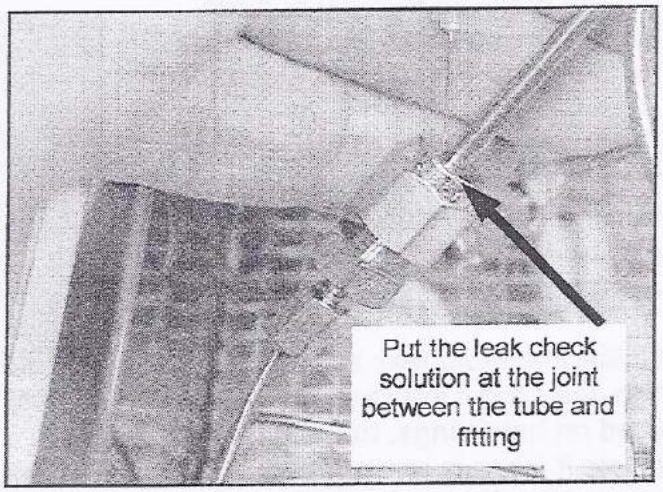
Apply gas pressure to the system then place a droplet or two of leak check solution on the tube connections. If tiny little bubbles are visible then the fitting is leaking.

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.

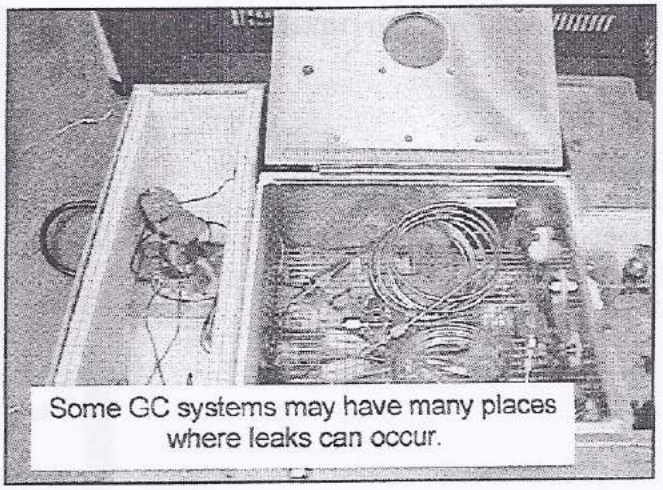
Liquid leak checking is the least effective way to check for gas leaks in a GC system.



A low cost disposable medical syringe is perfect for placing a drop of leak check solution at the joint where the tube and the fitting meet.
A 3ml leak check syringe is provided with every SRI GC



Put the leak check solution at the joint between the tube and fitting

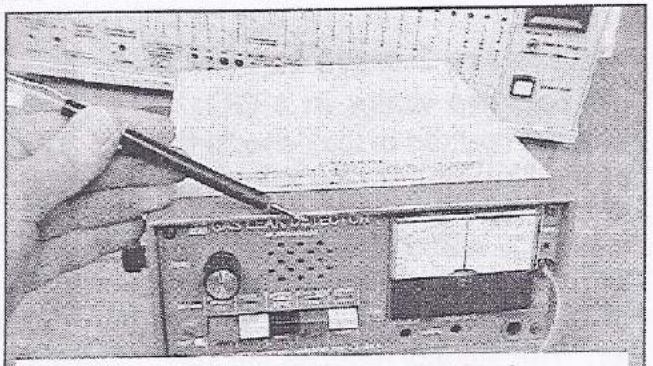


Some GC systems may have many places where leaks can occur.

Chapter: Troubleshooting

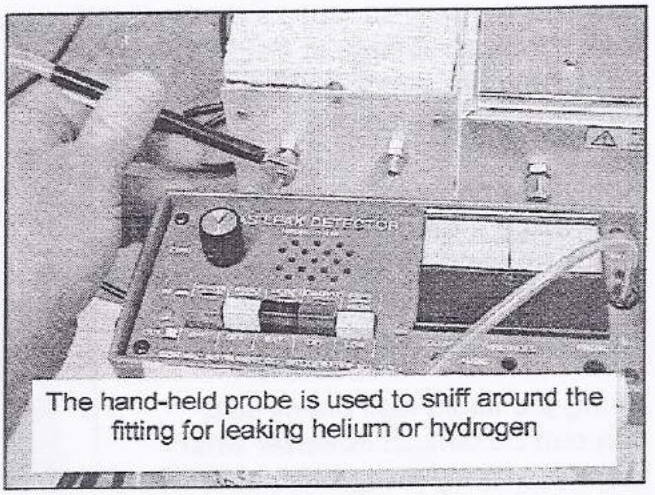
Topic: Leak Checking your GC

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.



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

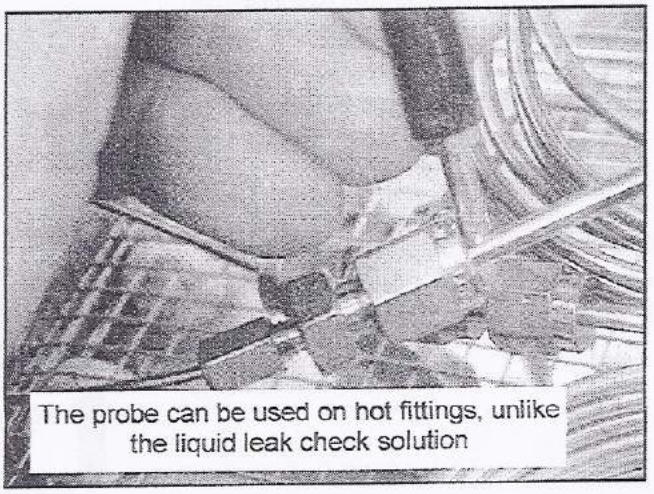
Apply gas pressure to the system then sniff around all the fittings with the Leak Detector. The display on the Leak Detector indicates a leak.



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

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



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

Chapter: Troubleshooting

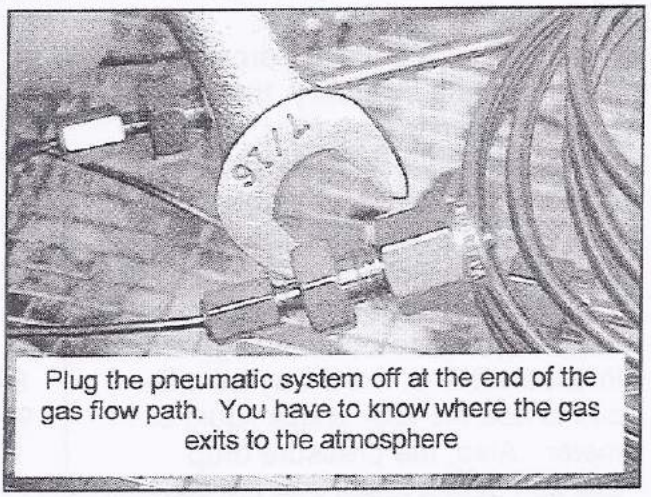
Topic: Leak Checking your GC

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

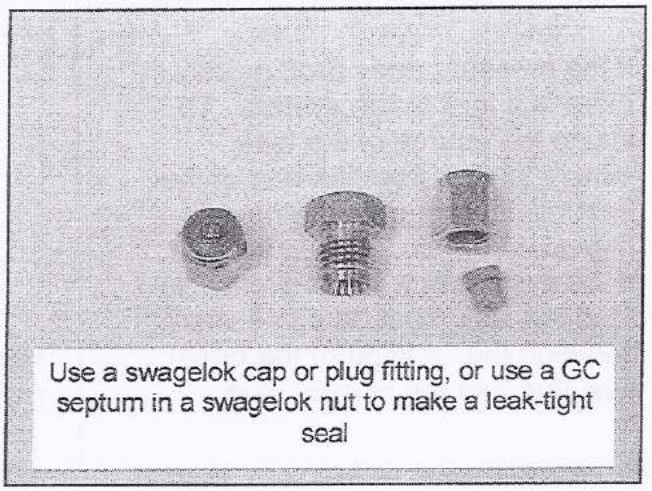
The pneumatic system is plugged at the end of the gas flow path. This may be the outlet of the detector or the end of the column.

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.

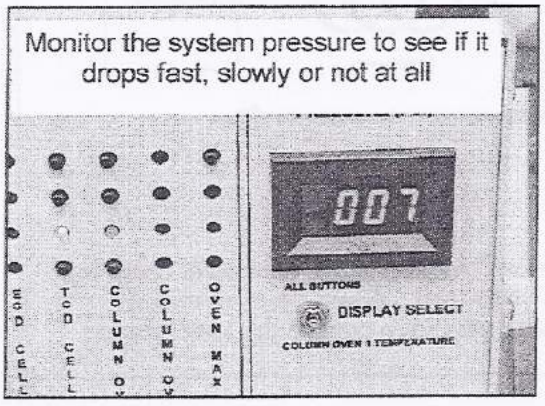
The system is then pressurized using the EPC (electronic pressure regulator) built-in to the SRI GC. The EPC is then turned down (or off). Because the end of the gas flow path is plugged, the gas is trapped (under pressure) in the pneumatic system. If there is a leak, the gas pressure will drop. If the 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



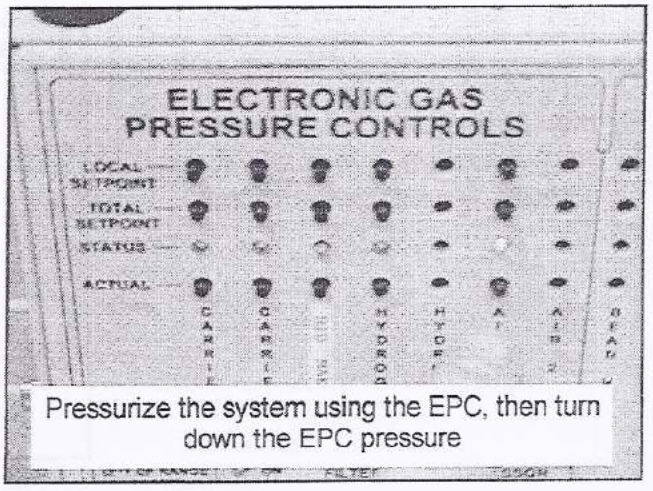
Plug the pneumatic system off at the end of the gas flow path. You have to know where the gas exits to the atmosphere



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

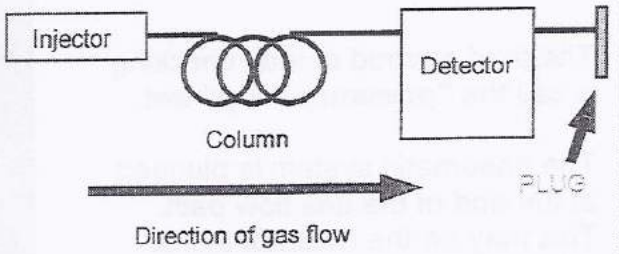
Chapter: Troubleshooting

Topic: Leak Checking your GC

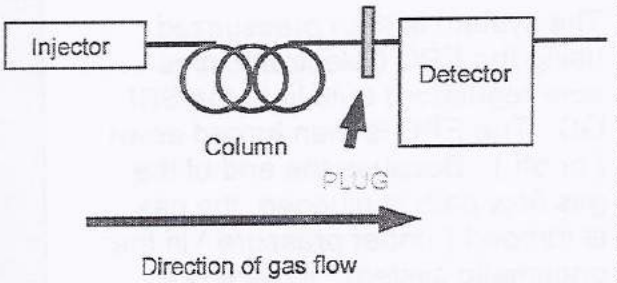
If the pressure does not drop at all, or drops very slowly, then the entire system is leak-tight. In some ways, this is the best way to check for leaks, because one test verifies that every connection in the system is holding pressure. With a complex gas system, or one where some of the fittings are 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.

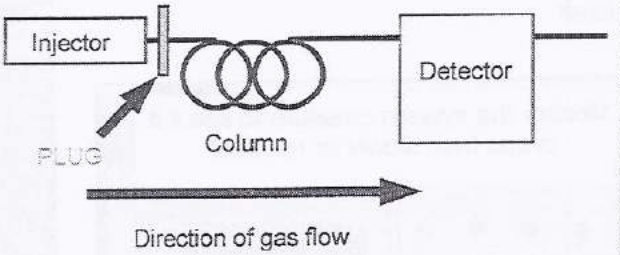
By moving the plug location step by step upstream, eventually it will be obvious where the leak must be.



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



Move the plug to the next fitting upstream in the pneumatic system and repeat the pressure drop test

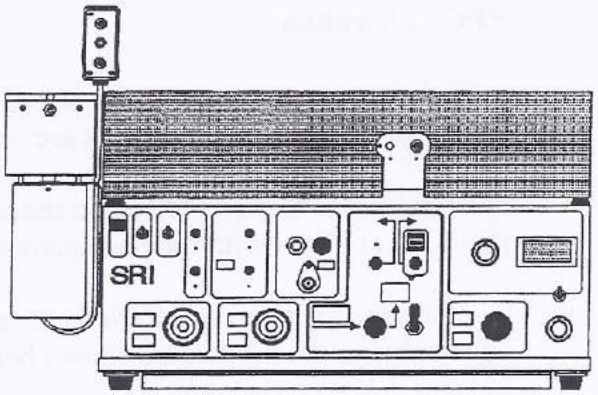


Again move the plug to the next point upstream and repeat the test. When the system does hold pressure, you have passed the leak location

Chapter: INJECTORS AND GAS VALVES

Topic: Electric Valve Actuator Maintenance

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.



SRI gas chromatogram equipped with electrically actuated gas sampling valve

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.

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.

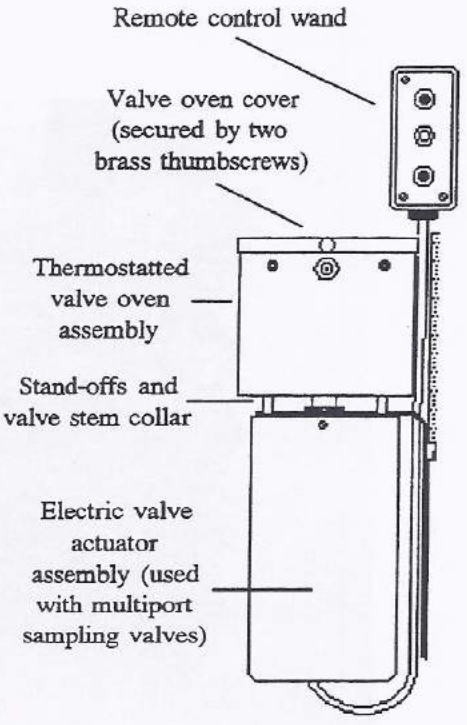
STEP 2: Remove the two brass thumbscrews securing the valve oven cover. Then remove the valve oven cover. Remove the top insulating blanket directly beneath the valve oven cover.

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.



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

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.

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)

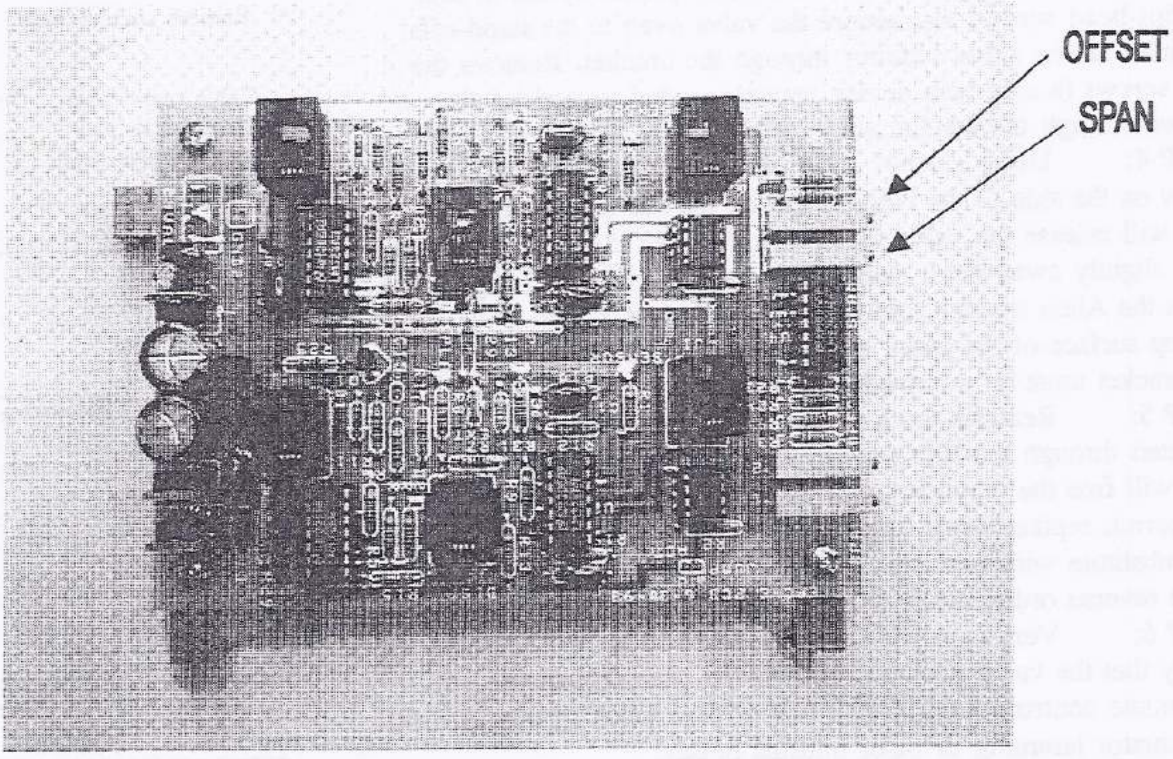
2. Adjust the EPC SET POINT on the top of the front panel to 20 psi. Verify the SET POINT is at 20 psi with the pushbuttons.

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

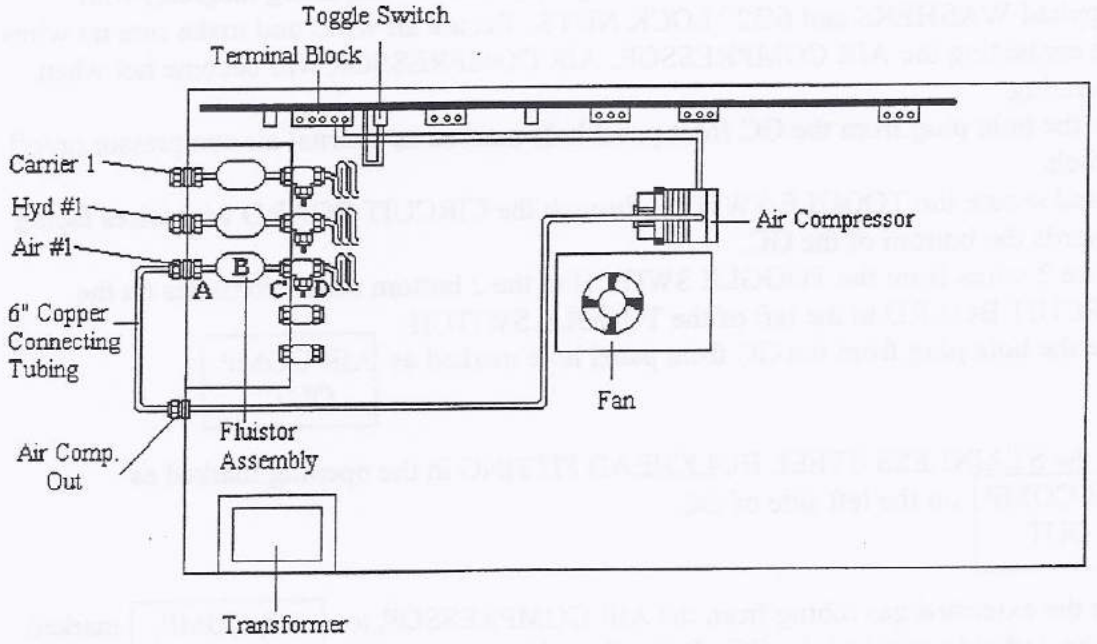
1. Turn off all gas supplies to the GC and removeAC power plug from outlet.
2. Remove the BOTTOM COVER of the GC by removing the 6 retaining screws.
3. Mount the AIR COMPRESSOR to the existing studs (see accompaning diagram) with supplied WASHERS and 6/32" LOCK NUTS. Secure all wires and make sure no 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 .
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.

The OP80 Amp Chip

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:

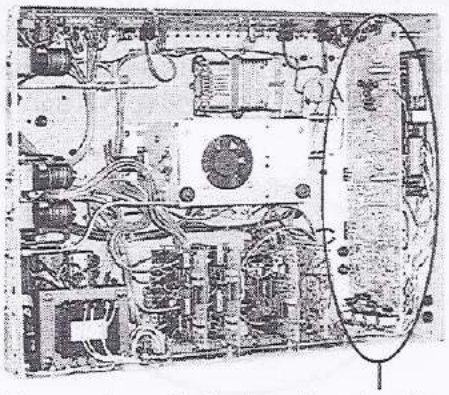
1. Make a "V" sign with the first 2 fingers of your hand.
2. Moisten those fingers (lick them).
3. Place one finger on the collector electrode, and simultaneously place the other on bare metal, like the column oven lid. Make your contact brief, and observe the milliVolt reading.
4. The data system signal 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 / TID	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)

Replacing the OP-Amp Chip

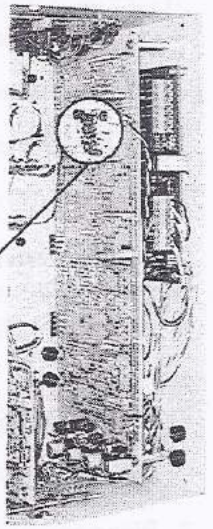
1. Turn OFF and unplug the GC.



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

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.

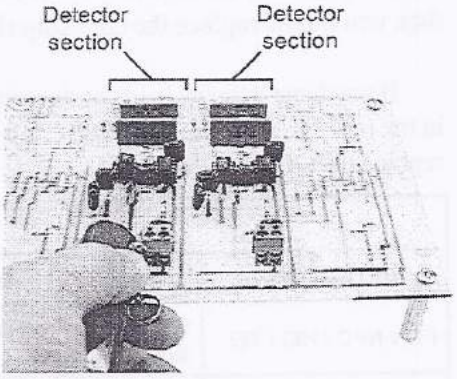
3. Locate the Amp board inside the GC chassis on the right hand side. Remove the protective steel plate by loosening the two thumbscrews that secure it to the aluminum stand-offs, and set it aside.



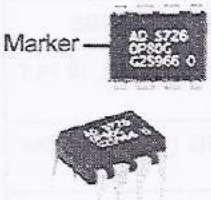
Pictured here is an amp board with two OP80 amp chips on it.

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.