# OPERATING MANUAL

**Series 5900**
**Discharge Ionization Detector**
**Gas Chromatograph**

**Series 5900: 105-125 VAC, 60 Hz**
**Series 5902: 200-240 VAC, 50 Hz**

**November 2023**
**Rev. 11**

## READ INSTRUCTIONS BEFORE OPERATING


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# Contents


This instrument was designed for DRY sample applications only!

Care must be taken to make sure only moisture-free samples are introduced into the system.

GOW-MAC® Instrument Company is not responsible for damage to equipment caused by exposure to hydrolyzed samples.

# Section 1
# Safety

1-1 This section is designed to bring special attention to specific areas or practices that may pose particular hazards to personnel and/or equipment safety only. For complete installation instructions, see **Section 3.**

It is in the operator's best interest to read this section to ensure the safe operation of the instrument.

1-2 BURN HAZARDS

The detector, column, and column oven lid may reach very high temperatures and remain **HOT** for several hours after the instrument has been shut down. Wear protective gloves to prevent painful burns resulting from contact with the hot surfaces.

1-3 ELECTRICAL HAZARDS

A. This instrument employs voltages that are **dangerous. EXTREME** caution must be exercised when working with this equipment. Disconnect the instrument from all power sources before removing front, side or back panels and exposing potentially dangerous voltages.

B. **DO NOT** handle exposed voltage terminations until the load and/or supply has be discharged (grounded). An unloaded supply may take up to 15 seconds to fully discharge.

C. Make sure that the actual line voltage is the proper value for which the instrument was designed. (For properly grounded outlet only).

D. **DO NOT** overload the AC outlet with other electrical equipment.

E. Adhere to the color coding descriptions when hooking up electrical connections.

F. Repair or replace faulty or frayed wiring **IMMEDIATELY.**

1-4 COMPRESSED GAS CYLINDERS

Compressed gas cylinders are potential sources for serious accidents, injuries and even death if proper precautions and safety practices are not followed. Therefore, during handling and use of these gases, be certain to use applicable safety precations described by your local compressed gas supplier, the Compressed Gas Association, and/or O.S.H.A. regulations.

A. Read the label on all cylinders BEFORE using to identify the cylinder contents. If the label is illegible, return the cylinder to the supplier. **DO NOT ASSUME THE CONTENTS.**

B. All gas cylinders in use and in storage MUST be secured to an immovable structure to prevent accidental falling or movement. Read the relevant safety codes.

C. **DO NOT** move or transport cylinders with regulators attached or without safety cap screwed on over the valve system.

D. Store or move cylinders **ONLY** in the vertical position.

E. Store cylinders in a well ventilated area away from heat or ignition sources.

F. When installing tubing, provide ONLY approved, adequate pressure reducing regulators and pressure relief devices to prevent over pressurizing the tubing and equipment.

**WARNING**

**READ CGA AND/OR O.S.H.A. PROCEDURES FOR PROPER HANDING OF COMPRESSED GAS CYLINDERS**

1-5 GENERAL

A. Perform periodic leak checks at all fitting areas. The GOW-MAC Model 21-080 Mini Gas Leak Detector is recommended to find small leaks.

B. Keep combustibles away from gas cylinders and eliminate ignition sources.

C. DO NOT place papers, charts, samples, etc. on top of the GC.

D. Maintain adequate ventilation. Vent all gases to the outside. DO NOT allow flammable and/or toxic wastes to accumulate.

E. De-pressurize supply gas piping before working on it.

# Section 2
# Specifications

2-1 The GOW-MAC Series 5900 DID is a rugged, compact gas chromatograph designed for the analysis of low concentrations of impurities in base gases.

2-2 The right-hand section of the Series 5900 contains the electronics necessary for the proper operation of the gas chromatograph. A 7" LCD digital touchscreen will control the DID high voltage, polarization voltage, column and detector temperatures, valves and signal output. Contained within the internal housing are the signal processing and support electronics for column oven and DID.

2-3 The center section of the chromatograph houses the column oven, a purged housing which contains the pneumatically actuated valves, the DID detector, and bellows metering valves to control gas flow to columns, detector and purge gas. All inlet fittings and column fittings are VCR® type. There are also exit ports for measuring column flow, purge flow and sample flow which are 1/8" compression fittings.

There are a maximum of four pneumatically actuated valves mounted inside a purged housing. Refer to the valve section on the system flow diagram to determine which valves are included in your Series 5900.

2-4 Specifications for the Series 5900 DID GC

**General**

| | |
|---|---|
| Dimension | 19.5" W x 25" D x 12 1/2" H (48.26 cm x 63.5 cm x 31.75 cm) |
| Weight Net | 50 lbs. (22.68 kg) |
| Power Requirements | Series 5900: 105-125 VAC, 60 Hz, 1100W<br>Series 5902: 200-240 VAC, 50 Hz, 1100W |
| Fuse | Series 5900: 10 amp<br>Series 5902: 5 amp |

**Column Oven**

| | |
|---|---|
| Dimension | 10" W x 4 1/2" D x 7 1/2" H (25.64 cm x 11.54 cm x 19.23 cm) |
| Temperature | Ambient to 300 °C |
| Display Readout | 7" LCD Digital Touchscreen |
| Temperature Control | Digital programmable PID controller, solid state output, RTD input, direct reading, ambient to 300 °C on display screen |

**Detector**

| | |
|---|---|
| Type | Discharge Ionization |
| Sensitivity | 5 ppb $CH_4$ |
| Carrier Gas | Grade 6 purity helium (He) |
| Discharge Gas | Grade 6 purity helium (He) |
| Temperature Range | Ambient to 120 °C |

**O2 Traps (optional)**

| | |
|---|---|
| Dimension | 5" W x 6" D x 6" H (12.76cm x 15.24 cm x 15.24 cm) |
| Temperature | Operating: 80 °C<br>Regnerate: 130 °C (Factory Set) |
| Display Readout | 7" LCD Digital Touchscreen |

Brand names used in this manual:

- VCR is a registered trademark of Swagelok Company
- Tygon is a registered trademark of Saint-Gobain
- Sulfinert is a registered trademark of Restek Corp.

**Gas Flow**

Bypass/needle valve for flow control of purged housing flow rate. A front panel flowmeter is provided to measure the sample flow rate.

Up to six (6) bellows metering valves for separate flow control of columns, carrier gases and the discharge gas depending on the instrument flow configuration.

Table 2.1: GC Support Gas Specifications

| Detector | Service | Gas | Grade, Purity | Supply Pressure (psig) | |
|---|---|---|---|---|---|
| | | | | Recommended | Maximum |
| DID | Carrier and detector discharge | Helium | UHP 99.9999% (note) | 100 | 120 |
| | Purge | Helium | Instrument 99.99% | 50 | 120 |
| | Calibration | Analysis-dependent | | 15 | 20 |
| | Sample | Various | | 15 | 20 |
| O2 Trap (only with Oxygen Trap option) | Regeneration | H2 | UHP 99.999% | 20 | 40 |
| | Valve Actuator | N2/Air | Instrument 99.99% | 50 | 80 |

NOTE: For DID carrier service, UHP helium, 99.9995% purity, must be further purified by a GOW-MAC Model 75-810 or 75-800 noble gas purifier or equal.

Actuators require 40 to 50 psig to operate. Be sure this pressure is supplied at the ACTUATOR AIR IN gas connection on the back of the instrument.

High Voltage Discharge Ionization Power Supply
Output Voltage : up to 1000 V Max.
Output Current : 10 mA

High Voltage Polarization Power Supply
Output Voltage : up to 500 V
Max. Output Current : 1 mA

Electrometer Amplifier
Circuit : Solid state FET operational amplifier

# Section 3
# Installation

3-1 It is **EXTREMELY IMPORTANT** that the operator become familiar with this section BEFORE proceeding with the installation of this instrument.

3-2 Additional Equipment Required

A. Research or Ultra High Purity Helium (He) Carrier Gas: cylinder should be equipped with a NEW Ultra High Purity Regulator terminating in a 1/4" VCR® fitting.

B. High Capacity Carrier Gas Purifier (recommended for Grade 5 helium or lower)

C. 1/8" Stainless Steel Tubing, PRE-CLEANED

D. Data Acquisition Software

E. AC Power Source: Series 5900 : 1100 W at 115 V, 60 Hz
Series 5902 : 1100 W at 230 V, 50 Hz

**WARNING**

**OPERATING INSTRUCTIONS FOR BOTH MODELS ARE THE SAME, EXCEPT FOR LINE VOLTAGE REQUIREMENTS. TO PREVENT DAMAGE TO THE INSTRUMENT, MAKE SURE THAT THE AC ELECTRICAL OUTLET IS THE CORRECT VOLTAGE BEFORE PLUGGING IT INTO THE OUTLET. DO NOT PLUG THE UNIT IN AT THIS TIME.**

F. GOW-MAC P/N 59-595 Accessory Package

Package Includes:
a.) Ultra-high purity regulator with CGA 580 fittings
b.) Ultra-high purity regulators with CGA 350 fittings
c.) Regulator with CGA 580 fitting
d.) Noble Gas Purifier: Model 75-810 (115 VAC) or 75-812 (230 VAC)
e.) Metering Valve, 1/8"
f.) Four (4) helium rotameters
g.) Gaskets for VCR® connections, 1/8" & 1/4"
h.) Tygon® Tubing

3-3 Unpacking - Inspection

A. When unpacking the instrument, check it carefully for evidence of shipping damage or rough handling. Check to ensure that all components ordered have either been supplied or back-ordered. Notify GOW-MAC of any discrepancies immediately. The packing box should be retained for use if the instrument needs to be returned to the factory for repair or modification. GOW-MAC does not supply field service. ALL repairs are made at Bethlehem, PA, USA or by an authorized GOW-MAC representative.

B. Remove all plastic and/or paper shipping caps and restraints before operating.

3-4 Location

A. The Series 5900 DID GC should be placed in a location that is secure, vibration free, protected from abrupt temperature changes (operating ambient temperature range is 15 °C - 40 °C), and drafts. Such changes may upset the temperature stability in the course of an analysis or preparation.

B. Enough adjacent tabletop space should be allowed for the installation of computers, etc, allow sufficent space on all sides of the GC for easy access.

C. Make sure that there is adequate space for the installation of the gas cylinders. Cylinders should be securely fastened to an immoveable structure per CGA and/or O.S.H.A. regulations.

D. An electrical outlet (AC) should be near the location where the GC will be installed. If the outlet is not a 3-pin type, make sure that a good ground connection is available since a good ground is necessary for proper operation. The AC outlet should be connected to a circuit that is not heavily loaded with other electrical equipment. Input voltage to the GC should be steady for optimum operating stability.

If the AC line voltage varies, consideration should be given to the installation of a stabilizing transformer at the AC outlet. An uninterruptable power supply (UPS) with surge protection is also recommended to prevent disruption from power loss or electrical spikes.

**NOTE**

**BOTH THE GC AND DATA INTERFACE SHOULD BE CONNECTED TO THE SAME DUPLEX SERVICE OUTLET TO PREVENT GROUND LOOPS.**

3-5 Power Requirements

A. The Series 5900 DID GC requires a 120 volt/50-60 Hz power source with a minimum of 15 amps.

B. The Series 5902 DID GC requires a 240 volt/50-60 Hz power source with a minimum of 10 amps.

C. The AC power cord is terminated with a straight-blade 3-prong plug rated for 15 amp service that requires a matching receptacle.

3-6 Recorder Connection and Data Acquisition

The Series 5900 GC may be used with chromatography software. Consult the software operating manual for installation and operation instructions. After the software is properly installed and connected to the instrument, the software may be turned ON.

A. Analog Output

The low pass filtered analog output available on the rear binding posts can be used to connect to an external data acquisition system.

The maximum value of the output signal on the front display is + / - 6.25 V D/C, which is also the maximum level of the signal offset range.

The maximum level of the signal on the rear binding post is + / - 12 V D/C. Please use caution and be sure your signal interface device can accept up to 12V D/C without causing damage.

The three binding posts on the rear panel of the control section are as follows:

Black = Signal (-), negative signal to interface device.
Red = Signal (+), positive signal to interface device.
Green = Chassis ground.

B. Retransmitted Analog Output

Representation of the valve in the on-screen signal box
Scaled from 0-5 V DC output
DB25 Connector with signal (+) referenced to ground (-)

0 = - 6250 display reading
2.5 V = 0 display reading
5.0 V = 6250 display reading

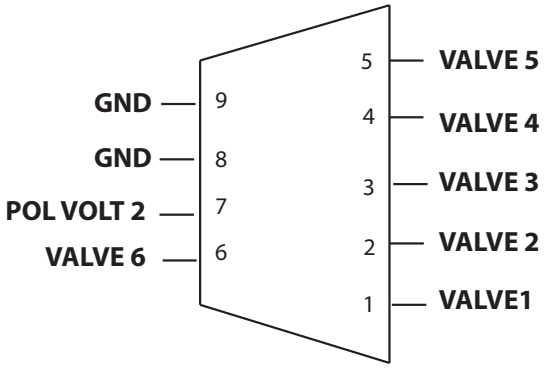
## 3-7 Remote Valve

The valves in the Series 5900 DID Gas Chromatograph can be operated either manually by the touchscreen or through the DB9 (male) connector on the rear of the GC. The external valve selection box on the LCD touchscreen must be selected to “ON” in order to accept the signal from a remote source or software.

The schematic below shows the pin configuration on the DB9 connector provided with the instrument for valve wiring connections. A “closed contact” input between ground and the appropriate valve terminal is required to remotely activate the desired valve.

Note: Consult the software operating manual for installation and operating instructions.

**DB9 Rear Connector Board**
**(Labeled: VALVE CONTROL)**

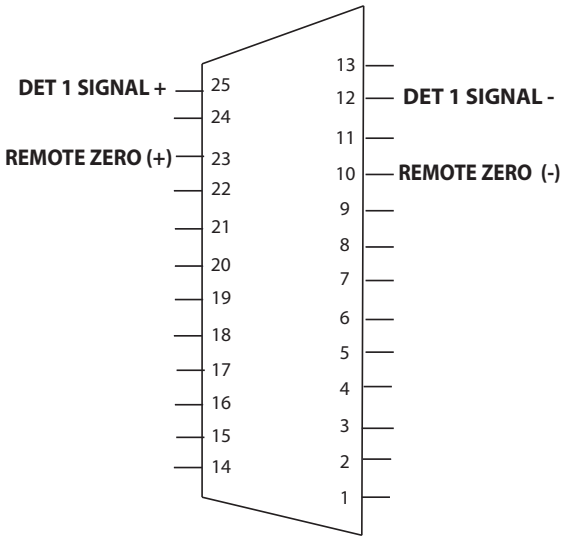



## 3-8 Remote Zero

The remote zero can be controlled through the DB25 (female) connector on the rear panel of the Series 5900, please see the DB25 diagram below. A mating connector board is provided with the Series 5900 for wiring connections.

It requires an active “low” TTL signal (falling edge) to trigger the same zero function as pressing the front keypad zero. There is no box to select between keypad and remote like the valves have, either will trigger a zero at any time. The remote zero control signal can remain at “high” TTL level and then be pulsed “low” to activate the zero. If the zero signal is allowed to remain “low”, the signal must be brought “high” for at least 3 seconds before switching back to “low”.

**DB25 Rear Connector Board**
**(Labeled: I/O)**




3-9 Hydrogen Separator Connections (optional)

If you ordered a Hydrogen Separator from GOW-MAC, follow these directions for connecting it to the Series 5900 DID GC (Figure 3.1 and the instrument flow diagram):

1. Disconnect left-hand fitting on left-hand column.

2. Disconnect jumper from the two fittings located on the left-hand side of the oven.

3. Connect a jumper from the “Connection FROM Separator” fitting located on the inside oven, to the left-hand column.

4. Connect a jumper from the “Connection TO Separator” fitting located on the inside oven to the left-most column fitting.

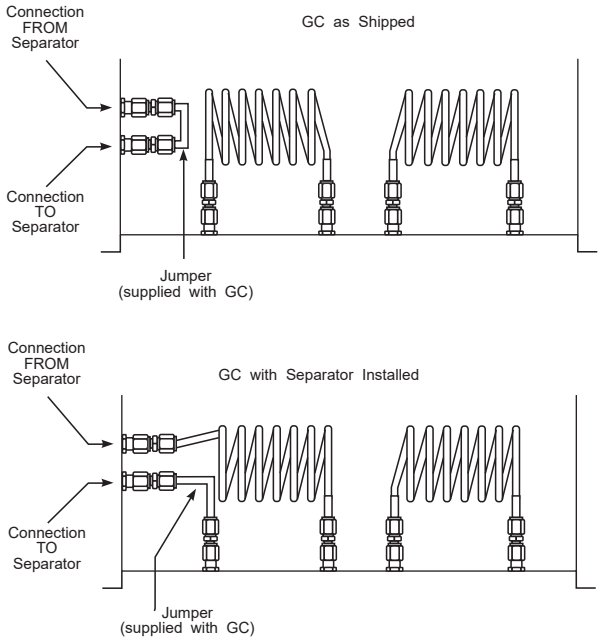



FIGURE 3.1

## 3-10 Gas Connections

Refer to Table 2.1 for support gas specifications.

A. The Series 5900 DID GC requires the following gases:

Research or Ultra High Purity Helium (He) or Purified Helium for the carrier gas and the discharge gas.

Instrument Grade Helium (He) for purging the DID housing.

Instrument Grade Nitrogen (N2) or Air for actuating the valve.

B. The Ultra High Purity Helium Gas cylinder should be equipped with an Ultra High Purity Helium Regulator.

The Instrument Grade Helium Gas Cylinder should be equipped with a two stage helium regulator.

The Instrument Grade Nitrogen Gas Cylinder should be equipped with an ordinary two-stage nitrogen regulator.

The Instrument Grade Air Cylinder should be equipped with an ordinary two-stage air regulator.

C. The carrier gas connections and sample gas connections are 1/4” VCR fittings. All other tubing connections are 1/8” compression fittings.

D. GOW-MAC strongly encourages the use of NEW unused 1/8” stainless steel or inconel tubing. Contact GOW-MAC Sales to inquire about purchasing new tubing, if necessary.

1. To prevent contamination of the GC and the extremely sensitive detector from grease, oil, or chemical residue, ALL stainless steel or inconel tubing MUST be free of all possible contaminants PRIOR to connection to the Series 5900 DID GC:

   a. Cut desired tubing length with a hand-held tubing cutter. DO NOT use any cutting oils or motorized saws. Oils contaminate and saws create rough edges and burrs.

2. All tubing should be free from moisture before installation.

3. Make proper leak test on all fittings.

**NOTE**

**IT IS HIGHLY RECOMMENDED THAT A GOW-MAC GAS LEAK DETECTOR BE USED TO LEAK TEST THE SYSTEM. USE OF SOAP SOLUTIONS IS NOT RECOMMENDED BECAUSE THEY MAY CONTAMINATE THE SYSTEM.**

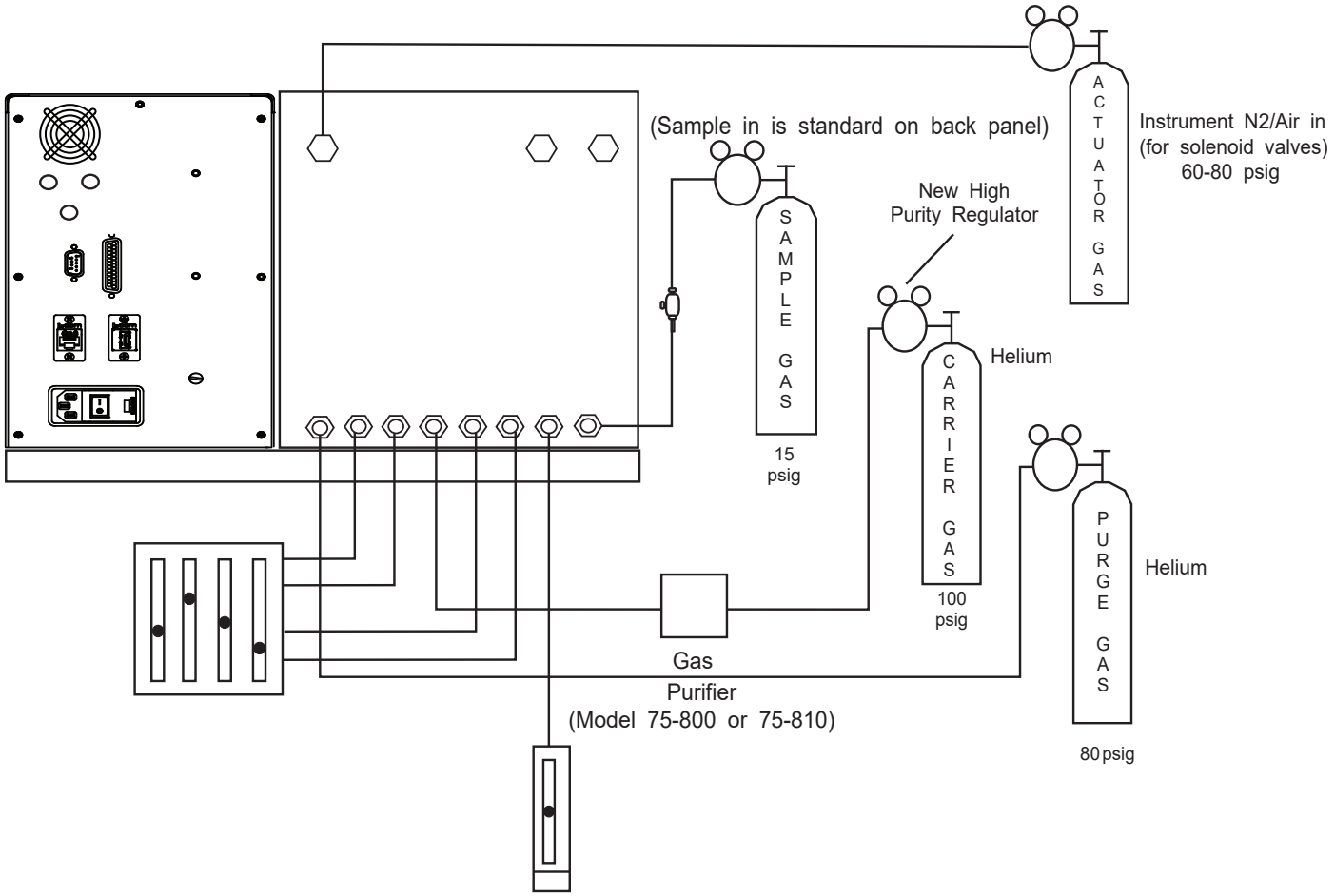



FIGURE 3.2

3-11 Carrier Gas Purity

The Series 5900 DID GC is an instrument which can determine impurities in helium at the part-per billion level. However, in order to reach this level of sensitivity, EXTREME care must be taken to ensure that there are no leaks in the system and that the carrier gas is as pure as can possibly be.

If for some reason the carrier gas is not as pure as the sample gas, negative peaks can occur for gases which are in lower concentration in the sample gas. By using a carrier gas purifier (GOW-MAC Model 75-810) in the helium line, instrument grade helium can be purified to a level cleaner than chromatographic grade helium.

**NOTE**

**IT IS HIGHLY RECOMMENDED THAT IF A PURIFIER WAS PURCHASED, THE OPERATOR READ THE GAS PURIFIER OPERATING INSTRUCTIONS.**

To prevent low level impurities from appearing in the baseline, the purifier must be heated. Refer to the manufacturer's instructions.

3-12 Purge/Actuator Gas Adjustment

**ACTUATORS REQUIRE 60 TO 80 PSIG TO OPERATE, MAKE SURE THIS PRESSURE IS SUPPLIED AT THE ACTUATOR AIR IN GAS CONNECTION ON THE BACK OF THE INSTRUMENT.**

A. The PURGE HELIUM control valve found in front of the instrument oven section is a combination shut off and flow metering valve, known as a combo valve. The outer knurled knob is for gas on-off control and the screwdriver-adjustable inner knob controls fine flow metering.

B. Turn on the instrument grade helium gas flow at the regulator. This flow is factory adjusted and should be set to 30 mL/min. for continuous operation after the air has been purged from the system. If adjustment is needed:

1. Open the outside combo valve knob (counterclockwise) to get fast purge flow. The inside knob can be in any position and will not affect fast purge flow.

2. Fast purge for about one (1) minute, then turn the outer knob clockwise all the way to shut off the fast flow.

3. Adjust the low (operating) purge flow to 30 mL/min using the inner knob. Typical low flow purge time required before analysis is 12 to 24 hours.

3-13 Carrier Gas Flow Adjustment

A. This instrument is equipped with a maximum of six (6) bellows metering valves found on the GC front panel. They are used to set carrier flows through the columns and system. For making initial flow adjustments, all internal actuated valves should be in the counter clockwise (CCW) starting position (BLUE color on LCD display).

B. Turn the Helium carrier on at the regulator. Allow CARRIER gas to flow for about one (1) hour to purge air out of the system. The operator must reference the flow system drawing specific for the Series 5900 model.

C. CARRIER 1 flow should be set to read 30 mL/min on the sample rotameter (located on the front of the GC) when the 4 port Sample Isolation valve is in the CARRIER (CW or CCW) position. Adjust flow with the CARRIER 1 metering valve.

D. Turn SAMPLE ISOLATION valve to SAMPLE and set flow rate by adjusting the metering valve in the SAMPLE supply line. The metering valve is supplied in the GOW-MAC Accessory Package Part No. 59-595.

The SAMPLE ISOLATION valve should be kept in the CARRIER position except when making an injection. This keeps the sample gas from penetrating the injection valve rotor and causing sample cross contamination.

E. Turn down the detector helium gas flow by using the DETECTOR HELIUM metering valve.

F. Measure gas flows at the various vent/outlet fittings on the back of the 5900. Set the carrier flowrates to 30 mL/min using the bellows metering valves. Each carrier flow must be set separately.

G. Both the column effluent and the detector gas are measured from the same fitting, therefore they MUST be measured sequentially. Adjust the flowrate to 30 mL/min (for 1/8” columns). Next, add 10 mL/min detector helium with the DETECTOR HELIUM metering valve for a total of 40 mL/min exiting the DETECTOR OUT vent.

H. Switch the final valve going to the DID and reset flows as per procedure above.

## 3-14 Leak Check

A. After all connections have been made and the gases are flowing, it is VERY IMPORTANT that they be tight and free from leaks. A leak in a carrier supply tube or fitting will contaminate the gas causing baseline drift and noise.

**CAUTION**

**A LEAK CHECK SHOULD BE MADE OF THE ENTIRE GC SYSTEM PRIOR TO INSTRUMENT OPERATION.**

B. Areas To Check

1. Column connections. Check at the small holes in the VCR® nuts.
2. Carrier gas & discharge gas connections at the rear of the GC.
3. Sample gas connection at the front of the GC.
4. All connections made at the gas cylinders.

**NOTE**

**LEAK CHECKS SHOULD BE RUN PERIODICALLY AND ARE A MUST WHEN NEW COLUMNS ARE INSTALLED OR GAS CONNECTIONS ARE MADE.**

## 4-1 Controls

With the exception of the MAIN POWER SWITCH, all of the operating controls are located on the LCD Digital Touchscreen. The operator should become very familiar with these controls and their functions BEFORE operating the instrument. Refer to Figure 4.1.

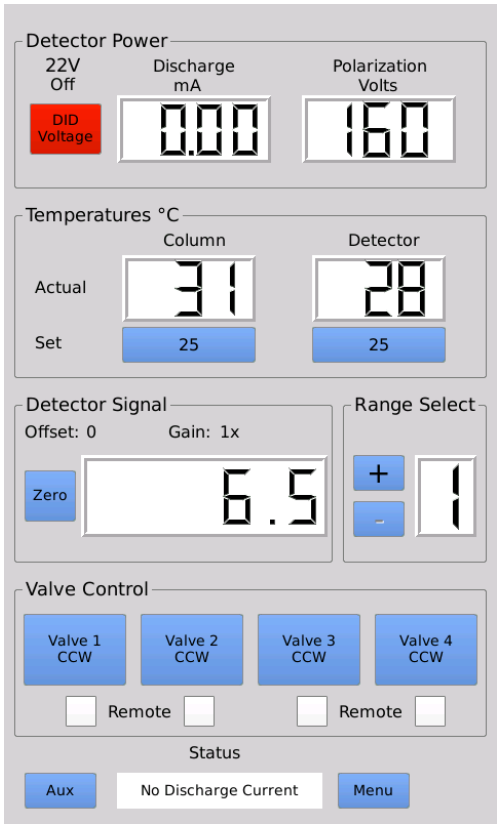



FIGURE 4.1

### A. DETECTOR POWER

1. ***DID VOLTAGE Button*** - Controls the output of the DID high voltage supply.

2. ***DISCHARGE mA*** - Displays actual discharge current for the DID.

3. ***POLARIZATION VOLTS*** - Displays polarization voltage of the detector.

### B. TEMPERATURES

1. ***Actual*** - Displays the actual temperature of the column oven or detector.

2. ***Set*** - Sets the desired column or detector. The button is BLUE and turns GREEN once the set temperature displayed on the button is reached within ( ± 2 °C).

### C. DETECTOR SIGNAL

Displays the output signal to recorder ouput. The ZERO button adjusts the signal

level close to ~0.00 mV (or to a user settable offset.) See Menu #11.

D. **RANGE SELECT**

Adjusts the input range of the electrometer by a factor of 10. Range 1, the recommended starting point is the least sensitive ($10^9$) increasing to Range 4 being the most sensitive ($10^{12}$). The + and - button will respectively increase and decrease the range or sensitivity.

E. **VALVE CONTROL**

A BLUE valve control button indicates counter-clockwise (CCW) position and a GREEN button indicates clock wise (CW) position. "Remote" box allows operator to control the selected valves remotely using external software. When the box is checked, each respective valve button is GRAYED out, and valve control by touchscreen is disabled.

F. **MENU**

When the "Menu" button is pressed, the following screen, Figure 4.2 appears. The code number must be entered to activate the desired function.

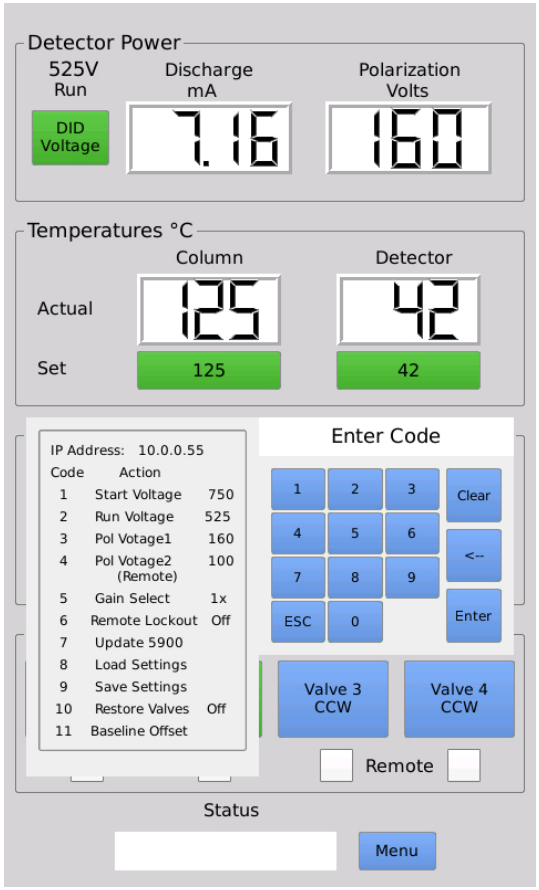



FIGURE 4.2

| Code | Action | Description |
|---|---|---|
| 1 | Start Voltage | Sets the DID voltage to ignite the detector. 750 V is the default setting. |
| 2 | Run Voltage | Sets the DID voltage for normal operation. 525V is the default setting. |
| 3 | Pol Voltage 1 | Sets the polarization voltage of the detector. 160 V is for normal operation and is factory set. |
| 4 | Pol Voltage 2 (Remote) | Sets a higher polarization voltage (~240 V) for Neon impurity analysis. This can also be controlled (like a valve) remotely. |
| 5 | Gain Select | Adjusts desired gain of 1x (Low) or amplified 10 x (High) on any range. When the gain is changed, “PLEASE ZERO INSTRUMENT” will appear in the status bar at the bottom. |
| 6 | Remote Lockout | Locks the manual valve control function on main screen to remotely control the valves. All the valve buttons are GRAYED out when this option is selected. |
| 7 | Update 5900 | Updates the latest firmware. See Section 5-2.L |
| 8 | Load Settings | Loads the saved or default settings for operation. |
| 9 | Save Settings | Stores the operator’s preferred settings. |
| 10 | Restore Valves | Gives option on power-up to set valve positions to the state at previous power down or to set all valves to the default CCW (setting). |
| 11 | Baseline Offset | Allows the signal to be raised or lowered to accommodate an external data system. (Example: to allow measurement of negative peak) |

**NOTE**

**AFTER ENTERING ANY NUMERIC VALUE USING POP-UP KEYPAD, ALWAYS PRESS THE ENTER TO ACCEPT THE SET POINT. PRESS ESC WHEN FINISHED TO EXIT AND CLOSE THE KEYPAD**

## 4-2 Connections

The 5900 signal out is connected to the (+) Red and (-) Black RECORDER jacks. These connect to input (+, -) on your computing software package. Refer to Section 3-6 and the software manual for installation and operating instructions.

4-3 Power & Recorder Connections

A. Power Switch with Fuse: This protects the entire instrument from AC voltage malfunctions. Should power fail to remain ON, remove power cord from AC outlet and check for a blown fuse in the power switch assembly.

B. Service Cord: This power cord should be plugged into a grounded receptacle. If grounded receptacle is not available, use a three/two adapter but make sure that the ground lead is attached to your facility's earth ground.

4-4 Columns

The Series 5900 DID GC comes equipped with analytical columns for a specified application.

**NOTE**

**COLUMNS SUPPLIED ARE CONDITIONED. PROPER COLUMN CONDITIONING PROCEDURES SHOULD BE OBSERVED BEFORE ANALYSIS IS PERFORMED. CARE SHOULD BE TAKEN DURING CONDITIONING SO CONTAMINATION OF THE DETECTOR DOES NOT OCCUR. REFER TO SECTION 6-1.D FOR PROPER COLUMN CONDITIONING PROCEDURE.**

4-5 Front Panel

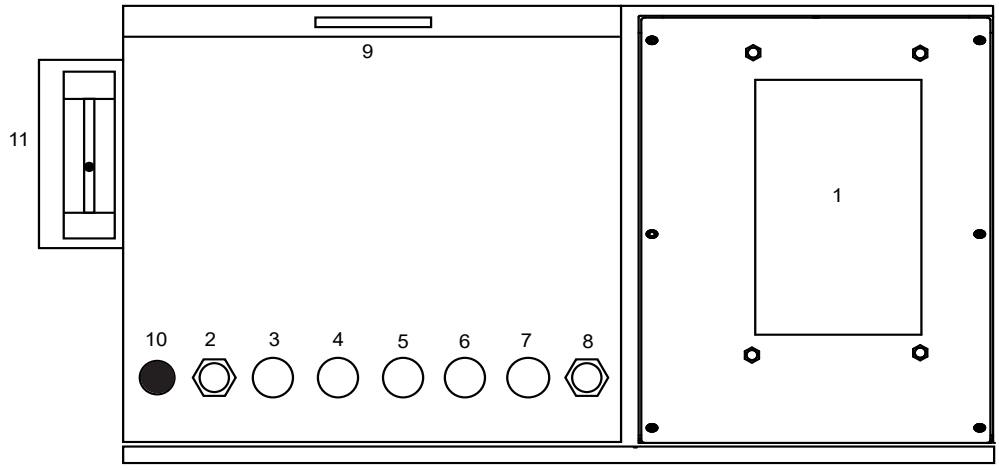



FIGURE 4.3

1. LCD digital touchscreen display
2. DETECTOR HELIUM metering valve
3. CARRIER 1 metering valve *
4. CARRIER 2 metering valve
5. CARRIER 3 metering valve
6. CARRIER 4 metering valve
7. CARRIER 5 metering valve
8. PURGE HELIUM valve
9. Oven lid
10. SAMPLE IN 1/4" VCR ® (optional on front panel, standard on back panel)
11. Sample out rotameter

***NOTE**

**CARRIER VALVES MAY DIFFER DEPENDING ON THE SERIES 5900 MODEL.**

4-6 Back Panel (ALL fittings are 1/8” compression fittings except as noted)

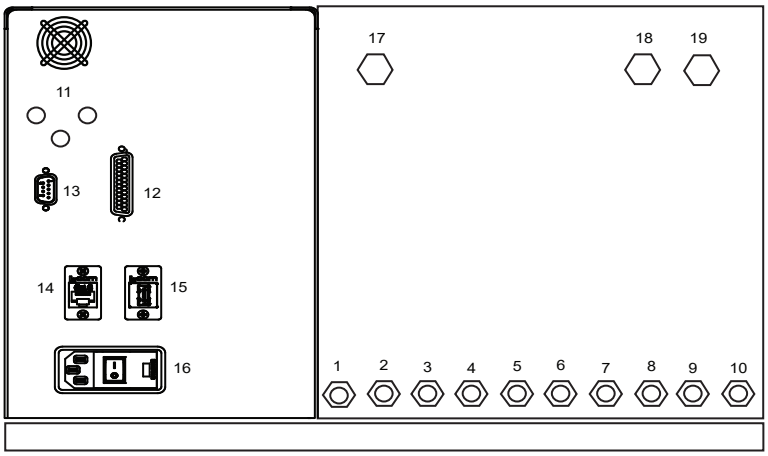



FIGURE 4.4

1. PURGE IN
2. VENT 4
3. VENT 3
4. VENT 2
5. DETECTOR OUT
6. CARRIER IN (1/4” VCR®)
7. PURGE OUT
8. VENT 1
9. SAMPLE OUT
10. SAMPLE IN (1/4” VCR®) (Standard on back panel, optional on front panel)
11. RECORDER output (+Red) (-Black) ground (chassis) (Green)
12. I/O connection (25-pin connector)
13. VALVE CONTROL (9-pin connector)
14. ETHERNET connection
15. USB connection
16. Power switch ON/OFF
17. ACTUATOR AIR IN
18. From Accessory (optional)
19. To Accessory (optional)

# Section 5
# Operation of the Series 5900 DID GC

## 5-1 General

The chromatographer should be familiar with the techniques of chromatography, the functions of all instrument controls, the operation of the recorder, and the characteristics of the column used PRIOR to running samples.

## 5-2 Initial Operation

A. Turn power switch “On” at rear of instrument. The LCD touchscreen will boot up and display the operation screen.

B. Carrier Gas Flow Adjustment

1. Make sure that ALL gas valves are in the “Ccw” position (BLUE color on the valve buttons).

2. Set gas flows.

**NOTE**

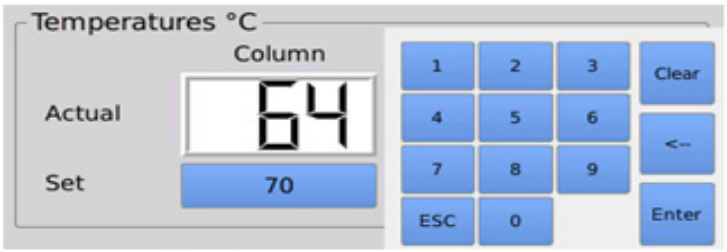
**MEASURE THE FLOW RATES ON THE BACK OF THE INSTRUMENT BEFORE ADJUSTING MANUAL BELLOW VALVES. THE VALVES WERE FACTORY-SET TO PRODUCE THE TEST RESULTS INCLUDED WITH THE INSTRUMENT, SO DRASTIC ADJUSTMENTS MAY NOT BE NECESSARY. SEE PARAMETERS AND SETTINGS LISTED ON THE SUPPLIED TEST CHROMATOGRAM.**

3. Check for leaks.

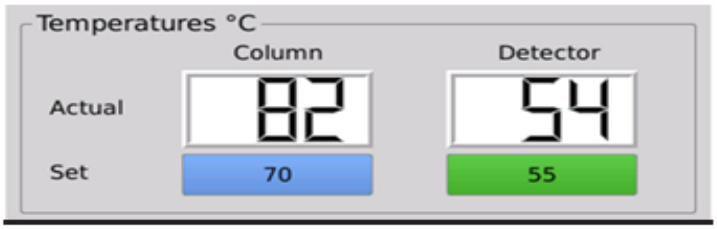
4. Turn on purge gas flow. Check for proper flow rate (30 mL/min) on back of instrument. This has been factory-set but you may need to adjust if necessary.

C. Temperature Warm-up

1. Set desired “Column Temperature”. This can be done by pressing the “Set” button with numerical value. A keypad will pop up and the desired temperature (in Celsius) can be entered. The value must be keyed in and “Enter” must be pressed, followed by “Esc” to exit the keypad. The set temperature will be displayed in the “Set” button while the actual temperature will be displayed in the Actual box. The “Set” button is BLUE and turns GREEN once the set temperature is reached.




2. Set detector temperature to desired setting. 40 °C is the recommended operating temperature. If the column temperature is too high, you may need to slightly increase the detector temperature to compensate the heat distribution in the oven ( ~ 50 °C).




**NOTE**

**DO NOT EXCEED MAXIMUM OPERATING COLUMN TEMPERATURE (AS LISTED ON THE COLUMN TAG) AND MAXIMUM DETECTOR TEMPERATURE OF 120 °C TO AVOID DAMAGING THE COLUMN AND THE DETECTOR**

3. Provide adequate time for the column oven and DID to reach set temperature and allow a minimum of 2 hours for temperatures to stabilize.

D. Ignite the DID

1. The DID arc must be established before chromatography can be accomplished. Press the “DID Voltage” button to ignite the DID. Initially, the “DID Voltage” button is RED and the text above reads “off” indicating that the DID is not lit. Pressing this button turns it BLUE and changes the text above to “Start”. This elevates the voltage for the DID to light easier upon startup of the instrument. Verify discharge current is established and press the button again, it now turns GREEN and the text above changes to “Run”. The presence of discharge current indicates that the DID is lit and the actual value of the DID voltage is displayed at the top. The “Off” voltage reads 0V, the “Start” voltage reads 750V, and the “Run” voltage reads 525V. These three values have been factory set.

2. To change the settings for DID high voltage, press “Menu”, and enter the code number to activate the function. Enter “1” to change the “Start Voltage”, or enter “2” to change the “Run Voltage”. Press “Enter” to set the new values, or “Esc” to exit to main screen.

3. Monitor the discharge current for the DID. The “Discharge mA” box should read between 4-10 mA.

**NOTE**

**WHEN A CODE NUMBER IS KEYED IN ON THE MENU SCREEN, PRESS “Enter” TO ACTIVATE THE FUNCTION, “Clear” TO KEY IN A DIFFERENT CODE NUMBER, OR “Esc” TO EXIT TO MAIN SCREEN. PRESS “< -” TO DELETE INPUT OR “Clear” TO START OVER.**

E. Polarization Volts

1. The polarization voltage ***(Pol Voltage 1)*** is factory-set to 160 V for standard operation. The actual value is displayed on the ***Polarization Volts*** box. A higher polarization voltage ***(Pol Voltage 2)*** of 240 V - 260 V can be set if neon impurity must be included in the analysis. ***Pol Voltage 2*** is controlled remotely like a valve using contact closure control. See Section 3 for remote operation.

2. To change or set the polarization voltage, press “Menu” and enter code number “3” for ***Pol Voltage 1*** or code number “4” for ***Pol Voltage 2***. Press “Enter” to set the new values, or “Esc” to exit to main screen.

**NOTE**

**OPERATION FOR LONGER THAN 5 CONTINUOUS MINUTES AT POLARIZATION VOLTAGE HIGHER THAN 160 V MAY DAMAGE THE DID.**

F. Range Select

1. Set the input range by pressing the **+** or **-** to increase or decrease the sensitivity by a factor of 10. Range 1, the ideal starting point is the **LEAST** sensitive ($10^9$) increasing to Range 4 being the **MOST** sensitive ($10^{12}$). "PLEASE ZERO INSTRUMENT" will appear in the status bar at the bottom when a new range is selected. Proceed to zero the instrument (See Section 5-2.H).

2. The set number and sensitivity correlation is shown in the table below.

| Set Number | Sensitivity |
|---|---|
| 1 | Least |
| 2 | Low |
| 3 | Medium |
| 4 | Most |

**NOTE**

**START THE OPERATION WITH THE LOWEST RANGE FIRST AND PROGRESS TO THE MOST SENSITIVE RANGE. SOMETIMES IT MAY TAKE LONGER TO REACH HIGHER RANGE (EG: RANGE 4) DUE TO IMPURITIES IN THE CARRIER GAS LINE. IF THE RANGE IS NOT READY, "-" WILL APPEAR. WAIT FOR 10 SECONDS BEFORE ATTEMPTING TO CHANGE TO LOWER RANGE AGAIN. THE DID WILL GET CLEANER IN TIME, SUITABLE FOR HIGHER RANGE OPERATION.**

G. Gain Adjust

The gain is the DID signal amplification and is factory set at **1X LOW** on any range. To change to the higher **10X HIGH** gain, press "Menu" and enter code number "5" for "Gain Select". Select **10X HIGH** and press "Enter" to accept the setting, or **ESC** to exit to the main screen. "PLEASE ZERO INSTRUMENT" will appear in the status bar at the bottom when a new gain is selected. Proceed to zero the instrument (See Section 5-2.H). The selected gain button turns from BLUE to GREEN.


H. Zero Instrument

1. The indicated detector signal is the actual output signal to data collection (mV). Press "zero" button to zero the baseline signal. The instrument may require multiple attempts to bring the baseline to ~0.00mV. The baseline signal can also be zeroed remotely. This can be done by toggling (0-5V) TTL signal from high to low using DB25 rear connector board.

I. Valve Control

1. Set the desired valve position for operation by pressing the valve buttons in “Valve Control”. BLUE button indicates counter-clockwise (CCW) position and GREEN button indicates (CW) position. See the supplied flow diagram for operating valve configurations. The labels displayed on each valve may differ depending on the supplied flow diagram.

2. “Remote” box allows operator to control the selected valves **REMOTELY** using the software with contact closure controls controls. When the box is checked, each respective valve (BLUE or GREEN) button is GRAYED out.


3. “Remote Lockout” locks the manual valve control function on the main screen to remotely control the valves. **ALL** the valve buttons are GRAYED out when this option is selected. To activate the “Remote Lockout” press “Menu” and enter code number “6”. Press “Enter” to accept the setting, or “Esc” to exit to the main screen.

J. Save Settings

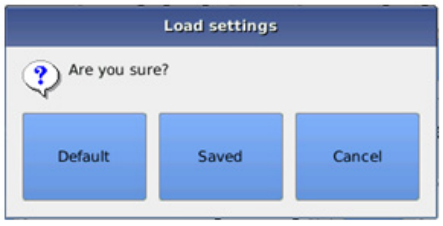
1. Customized settings and operating parameters can be stored for future operations. Press “Menu” and enter code number “9” to save settings. Press “Enter” to accept or “Esc” to exit to main screen.

K. Load Settings

1. To load the stored settings for the operation, Press “Menu” and enter code number “8”. The operator can select “Default” to return all settings to factory or “Saved” to load the customized settings. Select “Cancel” to return to the main screen. The set values on the main screen will change based on the selected settings.

2. The **DEFAULT** factory settings are as follows:

| | |
|---|---|
| Column Temperature | : 70 °C |
| DID Temperture | : 40 °C |
| Start Voltage | : 750 V |
| Run Voltage | : 525 V |
| Polarization Voltage | : 160 V |
| Range | : 1 |
| Gain | : 1x Low |



L. Firmware Updates

Steps to update the latest software:

1. Restart instrument by powering off/on before continuing to next step. Insert flash drive with latest firmware version into the Series 5900 GC USB Port on the rear panel.

2. Press “Menu” and enter code number “7”. Press “Enter” to accept or “Esc” to exit to main screen.

3. After the update is completed, the Series 5900 GC will automatically self-restart. Verify the updated version on the startup screen.

4. Verify the application parameters (temperature, gain, range, etc.) before operating.

5-3 Prep for Analysis

A. After allowing for sufficient time for the Series 5900 DID GC to equilibrate and the operating parameters are rechecked, it is recommended to start the **RANGE** at **1** and **GAIN** at **1X LOW** to begin calibration and adjustment of the DID. As the carrier gas and DID clean up and become free of air contaminants, the sensitivity will increase and Range and Gain can be set as required for the analysis.

B. It is necessary to purge the sample loop for a sufficient time to remove all traces of room air and old sample. This may take 5 to 10 minutes at a flow rate of 50 to 100 mL/min, especially if you have changed sample sources.

**NOTE**

**THERE MAY BE RESIDUAL AIR TRAPPED IN THE SAMPLE REGULATOR BOURDON TUBES WHICH MUST ALSO BE PURGED TO GIVE CONSISTENT RESULTS AT LOW LEVEL ANALYSIS.**

C. Initial Analysis: The operation of the instrument cannot be evaluated without the injection of a known sample. Initial injections should be made with a relatively simple material that will elute in a short period of time. The sample should be as pure as possible to give 2 or 3 sharp peaks.

D. Steps to making an injection

1. Make sure all flow rates are set properly (refer to Section 3)
2. Set Valves to the desired purge positions as detailed on the flow diagram.
3. Switch SAMPLE ISOLATION VALVE to SAMPLE. (read flow rate at flowmeter on front of GC).
4. When making an injection, turn GAS SAMPLE VALVE to INJECT position.
5. Repeat steps for more injections.

5-4 Calibration

When consecutive injections yield repetitive chromatograms, the 5900 GC is at steady state and ready to be calibrated. To calibrate, analyze a certified gas standard in coordination with your chromatography software.

## 5-5 Standby and Overnight Conditions

A. CARRIER GAS & DISCHARGE GAS flows should remain as set.

B. Turn PURGE gas flow rate down to 10 mL/min.

## 5-6 Shutdown Procedure

The following should be performed in the following sequence to ensure proper cooldown of the GC and longer life of the detector.

1. Stop automatic injections on the software method.

2. Turn down the column and detector temperature to ~ 40 °C. DO NOT turn carrier gas off when the temperature is high as it will deteriorate the column and damage the detector.

3. Turn “OFF” MAIN POWER SWITCH on rear of instrument.

**WARNING**

**FOR CERTAIN SAMPLE COMPOSITIONS THAT INTERACT WITH ATMOSPHERICS (OXYGEN, MOISTURE, ETC), IT IS NECESSARY TO THOROUGHLY PURGE THE ENTIRE INSTRUMENT OF SAMPLE GAS BEFORE SHUTDOWN. FOR PURGE, FLOW AN INERT GAS INTO THE SAMPLE INLET. THIS IS REQUIRED FOR SAMPLES WITH HIGH CONCENTRATIONS OF COMPOUNDS THAT FORM ACIDS (HF, HCl, HBr,ETC) OR REACT VIOLENTLY AND/OR CORROSIVELY WITH ATMOSPHERIC ELEMENTS.**

## 5-7 Daily Check List

It is good practice to check the following items at the beginning of each day or shift, and when starting up the instrument after a weekend shutdown.

1. Electrical
   _____ Additional instrumentation is connected properly.

2. Pneumatic
   _____ Gas cylinder pressures are sufficient.
   _____ Gas flow rates are adjusted properly.
   _____ Carrier Gas Flow = 30 mL/min.
   _____ Detector Gas Flow = 10 mL/min.
   _____ Appropriate column is installed.
   _____ Leak check of entire system made.
   _____ Recorder/Integrator zeroed.

3. Front Panel
   _____ All temperature settings are set to desired settings.

**NOTE**

**IF PEAK SIZE CHANGES AFTER SITTING OVERNIGHT, CHECK THE CARRIER GAS AND DISCHARGE GAS FLOW RATES.**

# Section 6
# Maintenance & Service

## 6-1 Columns

**NOTE**

**WHEN ORDERING A NEW COLUMN, PLEASE SPECIFY;
INSTRUMENT MODEL NUMBER & SERIAL NUMBER; LENGTH, DIAMETER, MATERIAL,
% LIQUID PHASE, % LOADING, SOLID SUPPORT, AND MESH SIZE.**

A. The Series 5900 requires analytical columns based on the desired application of the gas chromatograph. Different applications may require specific columns based on separation properties and retention times.

Columns for the Series 5900 GC can be purchased from GOW-MAC. Call Sales at (610) 954-9000 for assistance.

B. Care should be exercised to ensure that these columns are not used below 25 °C or above the maximum remperature listed on the column tag.

C. Changing Columns

Care should be exercised when changing or removing columns. Protect exposed fittings, especially VCR® sealing surfaces.

Both a 7/16” and a 3/8” open-end wrench are necessary for either removing or tightening the column nuts. A new 1/8” VCR® gasket is required each time a change is made. Assemble gasket between the nuts and screw together the nuts finger tight. Apply the two wrenches and tighten the nuts 1/8 turn.

D. Column Conditioning

**CAUTION**

**CHECK COLUMN OPERATING PARAMETERS ABOVE 200 °C. THERMAL BREAKDOWN OF COLUMN MATERIAL MAY OCCUR.**

**WARNING---CAUTION---WARNING---CAUTION---WARNING**

**The instrument incorporates a valve actuator that has a maximum temperature of 150 °C. Therefore, to condition a column in the GC, the following must be performed.**

1. **Remove the FRONT PANEL from the instrument.**
2. **Turn “OFF” the HOUSING PURGE GAS.**
3. **Remove VALVE/DID HOUSING FRONT COVER.**
4. **Set DETECTOR TEMPERATURE to 120 °C.**
5. **Set COLUMN TEMPERATURE to 110 °C for 8 hours**

## 6-2 Servicing

Allow 10 minutes for high voltage discharge after power is turned “OFF” before attempting to service the GC.

Servicing of the complex integrated circuits in the electronic housing of the unit should be performed by QUALIFIED personnel ONLY. All calibrations and adjustments are made at the factory before shipping. Once these calibrations are performed, they should never need adjustment again during the life of the instrument.

If questions arise that this manual does not answer or service of our GC goes beyond these instructions, please call our REPAIR DEPARTMENT at (610) 954-9000.

For a complete overhaul, new detector, or other repairs, please contact us for a RETURN AUTHORIZATION NUMBER and further instructions for the return of your GC. Our receiving address for repairs is:

GOW-MAC Instrument Co.
277 Broadhead Road
Bethlehem, PA 18017-8600
Tel: (610) 954-9000
Email: repairs@gow-mac.com

Upon inspection of the instrument, repair costs can be furnished, IF REQUESTED, prior to repair.

# Section 7
# Valves

7-1 General

The Series 5900 DID GC is equipped with a maximum of four (4) gas valves. They must be treated with care.

**WARNING**

**VALVES HAVE UPPER TEMPERATURE LIMITS WHICH, IF EXCEEDED, CAN PERMANENTLY DAMAGE INTERNAL COMPONENTS.**

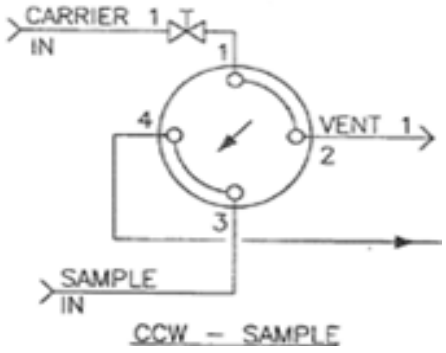
**UPPER TEMPERATURE LIMIT FOR VALCO VALVES IN THIS GC: 175 °C**
**UPPER TEMPERATURE LIMIT FOR ACTUATORS IS 150 °C**

7-2 All helium actuators are high temperature type (T). When ordering a replacement valve, make sure to order a low temperature valve with high temperature actuators.

7-3 Gas Sampling Valves

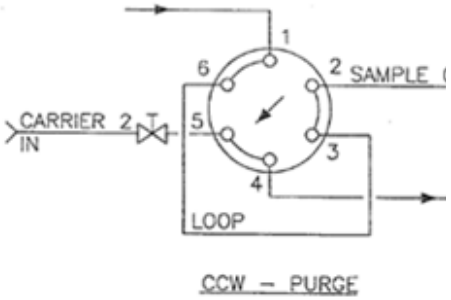
The gas sample valves are used to introduce gas samples into the chromatograph on a reproducible basis. The sample may be take from a static system or from a flowing stream. Valves are also used for column back-flushing, heart-cutting, column selection, sample selection and detector switching.

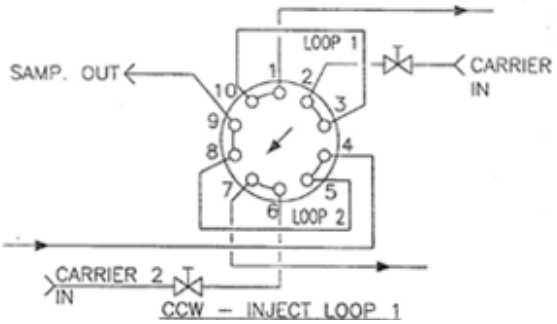
A. **Sample Isolation Valve:** The 4 port sample isolation valve is included in every Series 5900 GC. The sample isolation valve allows the operator to purge the sample from the source to vent in the CW position while purging the GC with carrier helium. This is a great troubleshooting tool as the GC can inject the helium carrier gas and check for “leak peaks”. If the GC flow system is leak tight, the injected baseline should result in a flat line void of any atmospheric peaks. The CCW position will allow the sample to go to the sample injection valve for analysis injection.




B. **Sample Injection Valve:** The most common use of the valve is for sample injection. The gas sample valve may be a 6 port single sample loop valve or a 10 port dual sample loop valve. A sample loop, a length of tubing of know volume, makes a connection between two ports on the valve. The following procedure is for gas injection on a valve outfitted with a sample loop.

The valve starts in the counterclockwise position to purge the sample through the loop as the carrier gas passes through the valve to the column. When the valve is rotated clockwise, the carrier gas pushes the sample from the loop and carries it through the column. The valve is then returned to the counterclockwise position to refill the sample loop and prepare for another injection.

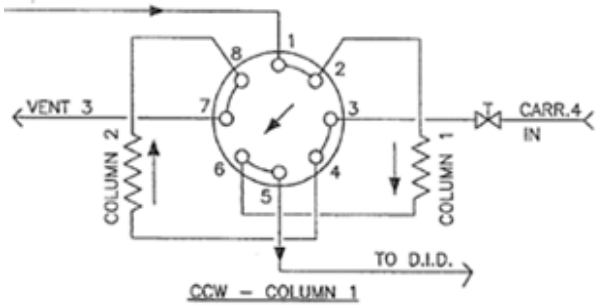


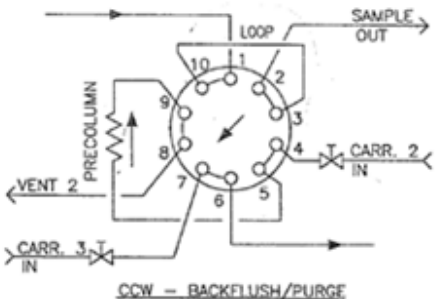

Care must be taken to allow sufficient time for the sample loop to be completely filled with sample before injection. This time is easily calculated from the carrier gas flow and sample loop volume Similarly, allow sufficient time for carrier gas to sweep the loop before switching the valve from INJECT to PURGE.

Compressibility of the sample can be a problem when using a gas sample valve. If the sample and the standard are at different pressures, there can be more or less volume of gas in the loop. To yield reproducible results, always inject the sample at atmospheric pressure to compensate for line pressure variations.

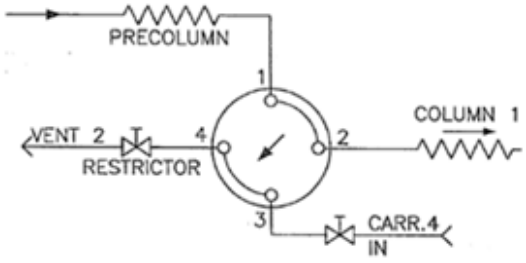
C. **Column Selection Valve:** The 8 port column selection valve is used to place on column in-line with the gas injected from the sample loop into the DID, while the second column is purging with carrier gas. This allows two different applications/impurity analysis on the sample gas by two separate injections.



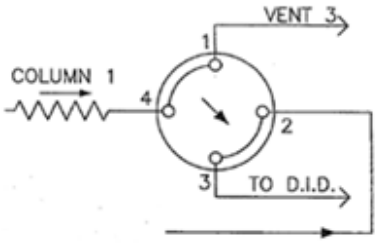

D. **Backflush Valve:** The 10 port backflush valve is used to allow impurities to pass through the column ahead of the “heavy” sample gas with longer retention time. The sample loop will inject the sample gas onto the “precolumn” which will separate the smaller/lighter impurities and allow them to pass to a primary column or directly to DID. As soon as the impurities of interest are through this precolumn, the valve will rotate to the CCW position where the heavy retained gas will reverse carrier flow and purge out to vent preventing it from reaching the DID. This will prevent saturation of the DID and minimize recovery time. A general rule of thumb is to backflush the heavy gas at a 3:1 ratio, meaning there should be 3 minutes of backflush time for every minute into the precolumn.



E. **Foreflush (or Heartcut) Valve:** The 4 port foreflush valve is opposite of a backflush valve and is used to purge a lighter gas that elutes before the impurities of interest. The sample loop will inject the sample gas onto the “precolumn” which will separate the smaller/lighter gas and purge it to vent. As soon as the bulk gas elutes and vents, the impurities of interest will continue to pass through the precolumn and the flow path is returned by moving the valve back inline to a primary column.




F. **Detector/Vent Valve:** The 4 port Detector/Vent valve allows residual sample or large impurities that were not foreflushed to be purged to vent before it reaches the DID. This is considered a last line of defense to prevent DID saturation or baseline disruption.



# Section 8
# Replacement Parts

When ordering replacement parts for your Series 5900 DID GC, please specify the serial number of the instrument.

| | | |
|---|---|---|
| Heaters (115 V) | Column Oven Heater, 500 W | 124-183 |
| | Detector Heater, 50 W | 124-187 |
| Heaters (230 V) | Column Oven Heater, 500 W | 124-184 |
| | Detector Heater, 50 W | 124-191 |
| Electronic Modules | Temp. Controller PCB, complete | 123-309 |
| | DID Detector Board | 123-335-6 |
| | 4 Channel Solid State Relay PCB | 123-327 |
| | Polarization Voltage Select Power Supply | 123-321 |
| | 7” LCD Digital Touchscreen | 123-341-1-P |
| | Power Supply, 24 VDC @ 0-1.7 A | 123-111 |
| | PCD, CPU Interface | 123-328 |
| Detector | Discharge Ionization Detector | 15-590 |
| Electronic Parts & Controls | | |
| | Blower Motor | 127-358 |
| | Blower Wheel | 127-381 |
| | Blower Wheel Ring | 127-370 |
| | Fan Blade | 127-360 |
| | Purge/Adjust Valve | 180-671 |
| | Probe, platinum | 124-175 |
| | Back Panel Fan, 24 V | 124-267 |
| | Back Panel Finger Guard | 127-246 |
| | Power Cord, 3 conductor shielded (115 V) | 127-378 |
| | Power Cord, 3 conductor shielded (230 V) | 127-407 |
| | Receptacle, power switch w/line filter | 129-152-10A |
| | Fuse, 10 A (115 V) | 121-162 |
| | Fuse, 5 A (230 V) | 121-177 |
| | Rubber Feet | 141-947 |
| | Sample Loop, 2.0 mL, Sulfinert® | 180-454SI |
| | Solenoid, 24VDC | 180-859 |
| | Bellows Metering Valve | 180-485 |
| | Flowmeter, AIR@ 130 ccpm | 180-216 |
| | *Flowmeter, AIR@ 130 ccpm | 180-534 |
| | **Flowmeter, AIR@ 130 ccpm - SAMPLE | 180-216-CLN |

| | | |
|---|---|---|
| Valves | 4-port Valco Sample Isolation Valve | 181-501 |
| | *4-port Valco Sample Isolation Valve, Hastelloy | 181-405HC |
| | 6-port Valco Gas Sample Valve | 181-502 |
| | *6-port Valco Gas Sample Valve, Hastelloy | 181-402HC |
| | 8-port Valco Column Selection Valve | 181-503 |
| | *8-port Valco Column Switching Valve, Hastelloy | 181-403HC |
| | 10-port Valco Column Selection Valve | 181-504 |
| | *10-port Valco Column Switching Valve, Hastelloy | 181-404HC |

* Indicates special parts for corrosion resistant DID systems

** Indicates cleaned for Oxygen Service

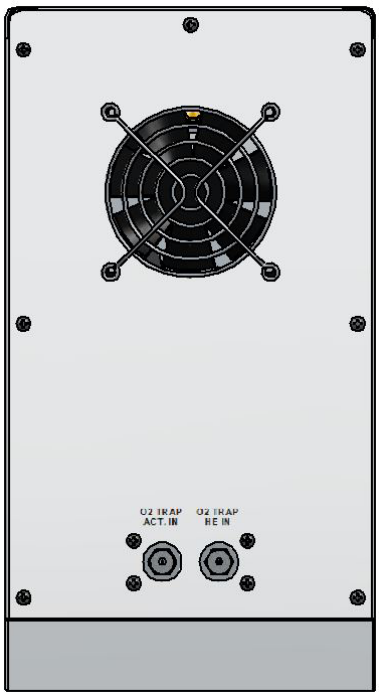
# Section 9
# Addendum
# Dual Oxygen Trap Operation

## 9-1 General

The $O_2$ trap is designed to analyze oxygen purity with a gas chromatograph. It is used specifically for measuring very low concentrations of impurities (for example nitrogen, argon, methane) in oxygen. Oxygen sample is exposed to a heated catalyst after injection with a gas sample valve. The copper-based catalyst retains the oxygen while leaving the remaining impurities in the sample helium carrier stream.

## 9-2 Gas Connections and Accessory Housing

Connect two gases to the accessory housing back panel for the oxygen traps: actuation gas in and helium in. Specifications for these are found in Section 3 of this manual. The connections are 1/8 inch compression. Leak testing is recommended before operation.



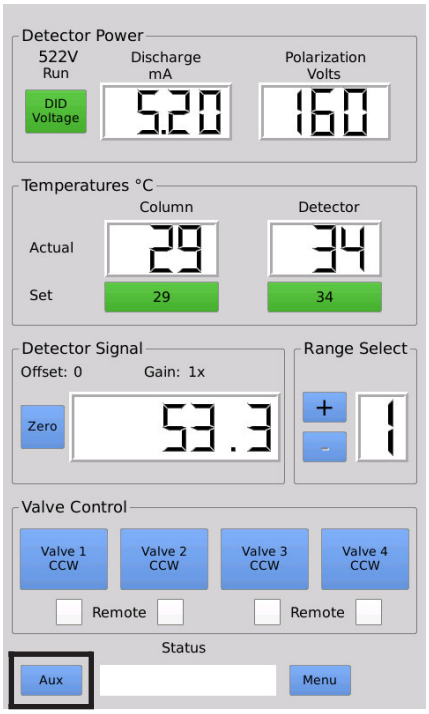

***5900 ACCESSORY HOUSING BACK PANEL FOR OXYGEN TRAP OPTION***

On the accessory housing front panel find a rotameter and metering valve. The rotameter indicates sample flow through the gas sample valve. This is not related to the adjacent metering valve. The metering valve labeled CARRIER 4 controls flows of both the oxygen trap helium and of the oxygen trap activation gas, depending on the position of the trap control valve. Set the supply pressures of the trap gases to yield about the same flow with one metering valve setting as measured at VENT 2. The flow of each trap gas should be about 30 ml/min +/- 10 ml/min.

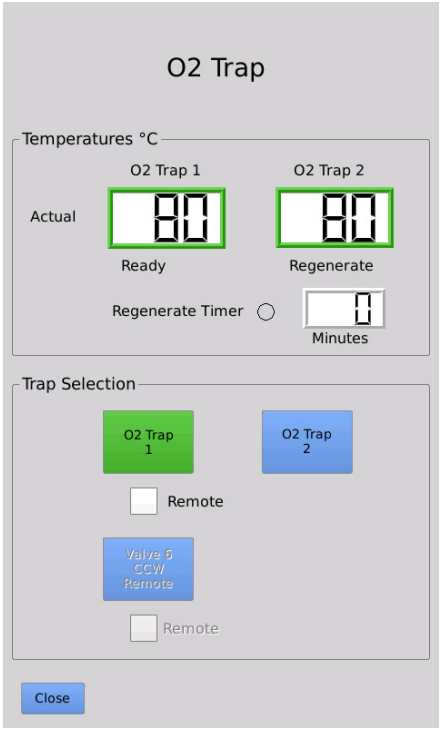

***5900 ACCESSORY HOUSING FRONT PANEL FOR OXYGEN TRAP OPTION***

## 9-3 Operation

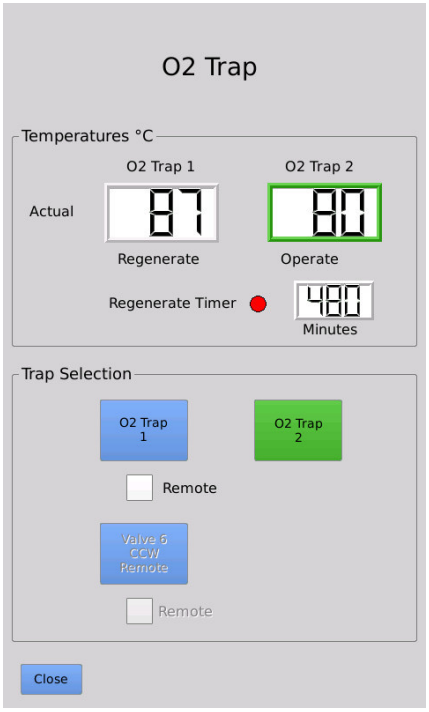
A. Oxygen trap control features are available through the “Aux” button on lower left of main screen. This button will only be available on instruments with integrated oxygen traps. Press the Aux button to open the $O_2$ trap control screen.



B. The $O_2$ trap in operation is shown with a green box highlighting the Trap Selection Box. This indicates a single $O_2$ trap is at operating temperature (80 °C) and also has “Ready” under the temperature display.

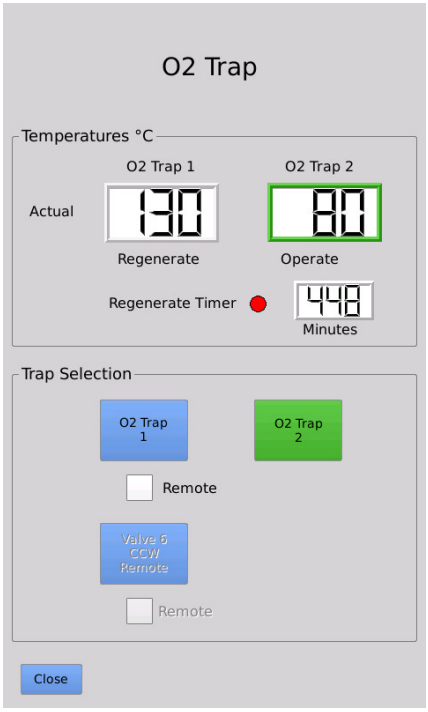



C. Selecting the second oxygen trap switches that trap into the flow path and automatically starts the regeneration process of the other oxygen trap by raising the temperature of the “offline” trap. A regeneration timer is started and the “offline” trap will remain at the preset regeneration temperature (130 °C) for 8 hours. There will be a red indicator light next to the regenerate timer and this countdown timer will decrease in minutes. This light will turn off when the regeneration process is complete.



D. This screen shot shows Trap 1 at regeneration temperature and Trap 2 at operating temperature (80°C).

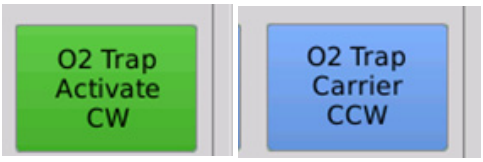
Example:



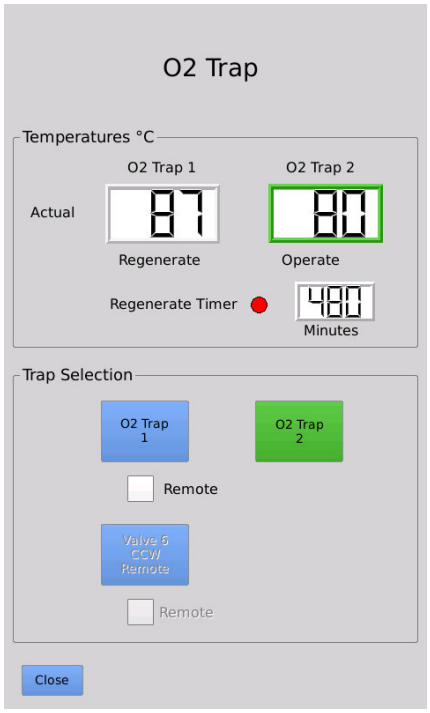

During regeneration and purge, the $O_2$ traps are inaccessible and the trap control valve disabled. Valve 4, which is shown as either "$O_2$ trap carrier" or "$O_2$ trap activate" automatically switches during this period but otherwise is disabled. The valve is configured to flow carrier gas when neither oxygen trap is regenerating and flow activation gas during regeneration.

The default regeneration timers are:

- Trap regeneration: 8 hours
- Cooldown and carrier purge: 1/2 hour



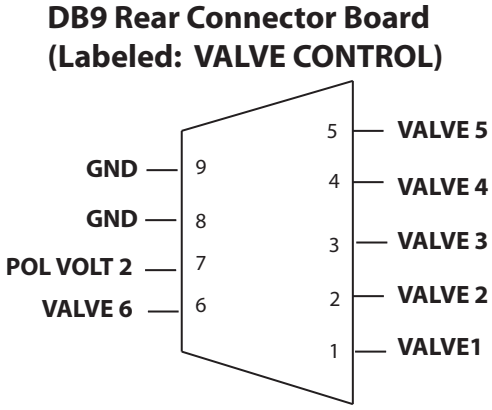

E. After the regeneration period is complete, the temperature of the "offline" trap will automatically start returning to normal operating temperature (80 °C) and start the "Purge" process. The countdown for this will appear in the regeneration timer box. Once complete, the frame will be highlighted green indicating the temperature is stable and the trap ready for use. After the regeneration and purge, the trap will display "ready" under the temperature box. This newly regenerated trap can now be switched into service at any time. The regeneration process will begin automatically for the "offline" trap.




F. Remote operation of the $O_2$ trap is available by selecting the remote box and connecting an available contact closure valve cable. The $O_2$ trap is selected by remote operation of the valves.

The default positions of the $O_2$ traps are:

- $O_2$ trap 1: CCW
- $O_2$ trap 2: CW



# Warranty

ALL INSTRUMENTS SOLD BY GOW-MAC® INSTRUMENT CO. ARE WARRANTED FOR A PERIOD OF ONE YEAR AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP. THE TERMS OF THIS WARRANTY ARE AS FOLLOWS:

1. The warranty period begins with the shipping date of the equipment to the original purchaser.
2. Certain parts such as batteries, fuses, glass accessories, septa, columns, etc., are expendable in normal use, and their service life is unpredictable. Such items are not covered by this warranty.
3. Filaments of thermal conductivity detectors are not covered by this warranty.
4. Hydrogen Palladium Tubes are not covered by this warranty.
5. All requests for service or repair under this warranty must be received within the warranty period by GOW-MAC® or its authorized representative. All repairs are made at GOW-MAC plants or at the office of authorized representatives.
6. All repairs, adjustments, and other services under this warranty shall be performed free of charge to the purchaser. However, warranty service and repairs shall be limited to equipment malfunctions which, in the opinion of GOW-MAC®, are due or traceable to defects in original materials or workmanship. Instrument malfunctions caused by abuse or neglect of the equipment are expressly not covered by this warranty.
7. Instrument parts which have been repaired or replaced during the warranty period are themselves warranted only for the remaining unexpired portion of the original one-year warranty.
8. Repairs, adjustments, and service performed after expiration of the one-year warranty period shall be charged to the purchaser at the then current prices for parts, labor, and transportation.
9. This warranty attaches to the equipment itself and is not limited to the original purchaser. Unexpired portions of the warranty are thus transferable to subsequent owners.
10. GOW-MAC® expressly disclaims any liability to users of its products for consequential damages of any kind arising out of or connected with the use of its products.
11. Except as stated in Sections 1 through 8 above, GOW-MAC® makes no warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated in Sections 1 through 8 above, GOW-MAC® shall have no liability under any warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise.
12. Statements made by any person, including representatives of GOW-MAC® which are inconsistent or in conflict with the terms of this warranty shall not be binding upon GOW-MAC® unless reduced to writing and approved by an officer of the Company.
13. This warranty shall be governed by the laws of the Commonwealth of Pennsylvania.

7/5/23
kj

# Health and Safety Declaration for the Return of GOW-MAC Instrument Co. Equipment

In order to protect our employees from exposure to various hazards, the following statements and/or questions **MUST** be answered by you. Fill out this document in its entirety and either fax or e-mail it to GOW-MAC Instrument Co., Attn: Repair Dept, **BEFORE** returning the product.

The instrument/part being returned **will not** be accepted into GOW-MAC's facility until we receive this completed document, along with a **PO or Credit Card**. Once approved for return by our Chemical Safety Officer, a **Return Materials Authorization (RMA) number** and shipping instructions will be issued. *All applicable regulations should be followed when returning instrumentation, and/or parts.*

**Customer to Record the Following:**

Model # / Part # _____

Serial #: _____

Service Technician spoken to: _____

Today's Date: _____

**IF THIS FORM IS NOT APPROVED BY OUR CHEMICAL SAFETY OFFICER, THE INSTRUMENT/PART WILL NOT BE PERMITTED INTO OUR FACILITY FOR SERVICING!**

A] Brief explanation of issue: _____

B] Briefly list the application(s) for which the instrument/part was used, as well as any and all chemicals, gases, and/or materials analyzed and their concentrations. (**Must be filled in**): _____

C] Is there the possibility of internal or external contamination on or in this instrument/part?

☐ Yes – see below ☐ No – proceed to D.

*Please check the appropriate box.*

- ☐ Chemicals or Substances That Are Hazardous to Health
- ☐ Blood, Body Fluids, (e.g. Urine, Secretions), Pathological Specimens
- ☐ Regulated Medical Wastes
- ☐ Infectious Substances or other Bio-Agents (e.g. Protein, Enzymes, Antibodies)
- ☐ Radioactive Isotopes used in the area. Detail type (ECD, Isotopic Labels, etc) and Activity in Micro Curies
- ☐ Biodegradable Material That Could Become Hazardous
- ☐ Other Hazards _____

***If any of the above boxes are checked the following statements and/or questions must be answered.***

1. Specifically describe where (on or in) the instrument/part there could be any residual contamination (for example: blood spill on the surface). _____
2. Provide details of these hazards. Include names, Material Safety Data Sheets (MSDS), and concentration of contaminants, where possible. _____
3. Describe the method of decontamination used. Attach Procedure. _____

D] I declare that the above information is true and complete to the best of my knowledge. I acknowledge that any inconsistencies between the condition of the instrument and the statements made on this form will delay the repair process.

Authorized signature _____ Date: _____

Name (Printed) _____ Phone number: _____

Company name: _____ Fax number: _____

Shipping address: _____

City: _____ State/Country: _____ Zip : _____

E-mail address: _____

**BEFORE item can be shipped, fax completed form to: (610) 954-0599 or e-mail it to: repairs@gow-mac.com**

**For GOW-MAC Use Only:** Signed: _____ Date ___/___/___

☐ **Passed** Safety Inspection. **OK** to proceed to Repair Dept.

☐ **Failed safetyInspection. DO NOT** proceed to Repair Dept.

Chemical Safety Officer

**RMA No:** _____

Comments: ( ) None ( ) On Back >>>>

GOW-MAC® INSTRUMENT CO.

REP-005
Health-Safety Declaration Doc – ONLINE
Rev.7 1/28/2022, kj