

# Instruction Manual

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## Terranova Scientific Model 908 Dual Capacitance Diaphragm Gauge Controller



# TERRANOVA

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## Safety Information

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### Explosive Gases



**WARNING!**

Do not use the Model 908 Dual Capacitance Diaphragm Gauge Controller to measure the pressure of combustible gas mixtures. The gauge normally operates at low temperatures, but it is possible that momentary transients or controller malfunction may cause ignition of combustible mixtures, which then might explode and cause damage to equipment and injury to personnel.



### Limitation on use of Compression Mounts

**WARNING!**

Do not use a compression mount (quick-connect) for attaching the gauge tube to the vacuum system in applications that may develop positive pressures. Positive pressures may cause the tube to be blown out of a compression fitting and damage equipment and injure personnel.



### Chemicals



**WARNING!**

Many organic cleaning solvents, such as acetone, produce fumes that are toxic or flammable. Use such solvents only in areas that are well ventilated to the outdoors and away from electronic equipment, open flames, or other potential ignition sources.

## Please let us Know...

Terranova products are the most advance instruments of their type available from any manufacturer. We have made this Instruction Manual as complete and clear as possible. Let us know if you have any comments that can make this manual or our products more useful.

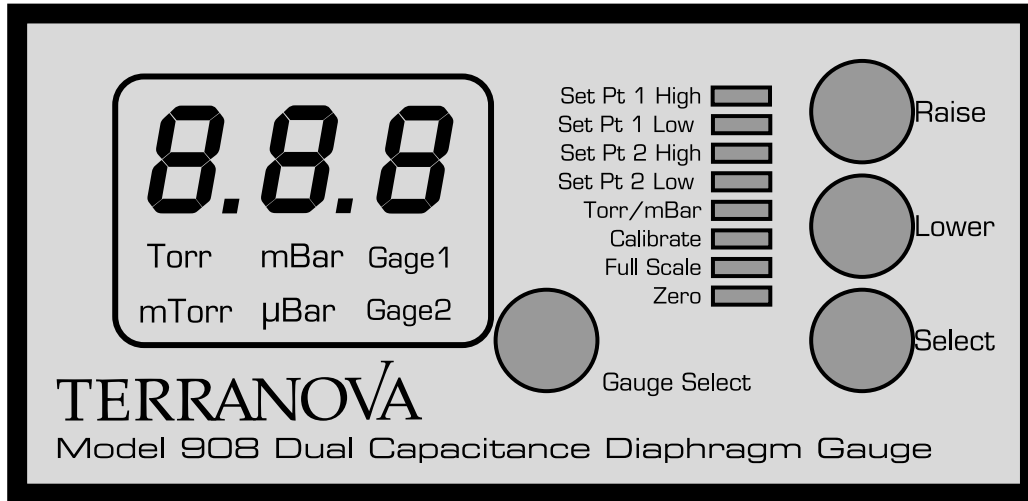


Figure 1: Model 908 front view

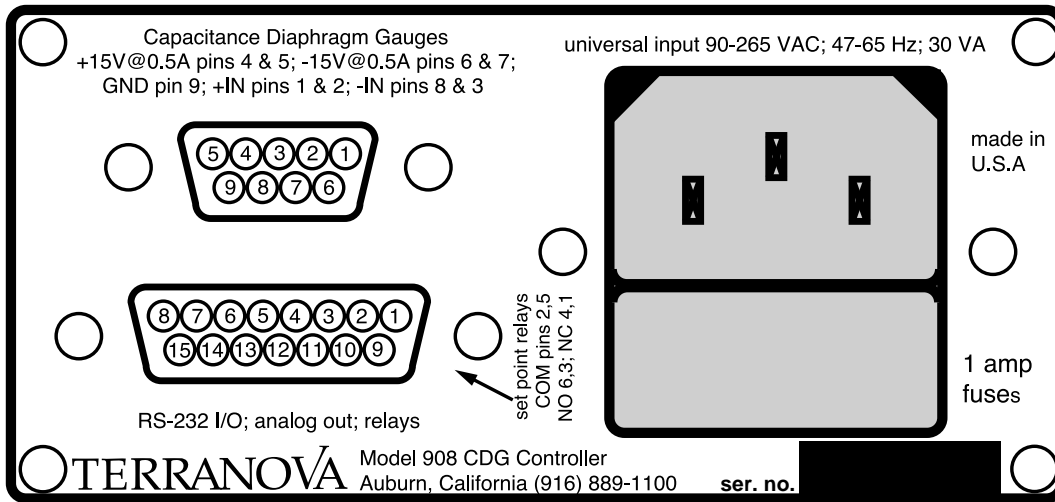


Figure 2: Model 908 rear view

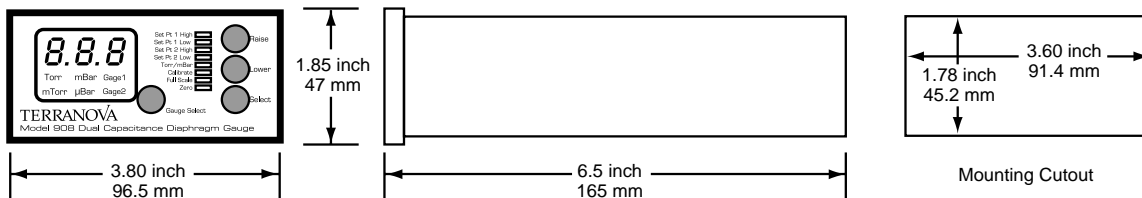


Figure 3: Model 908 dimensions

## I

## Overview

### A. General Description

The Terranova Scientific Model 908 Dual Capacitance Diaphragm Gauge (CDG) Controller displays vacuum pressure as measured from capacitance diaphragm gauges. The 908 supplies  $\pm 15$  volts at up to 0.5 amp; this is sufficient to operate most heated capacitance diaphragm gauges. The 908 precisely measures the 0 to 10 volt signal from the CDG to determine pressure. The Model 908 controller covers full scale ranges from 50 mTorr to 1000 Torr. The 908 is housed in a 1/8 DIN enclosure and is simple to operate.

### B. Specifications

1. **Useful Measuring Range**  
4 decades; full scale of 20 mTorr to 1000 torr; full scale range selection is entered on the front panel by the user
2. **Display Range**  
-9.9 torr to 999 torr; pressures higher than 999 torr display **HI**;
3. **Display Resolution**  
varies according to full scale range, from 0.01 mTorr to 1 Torr
4. **Gauge Interface**  
The 908 incorporates a high-resolution input circuit which allows the use of the capacitance diaphragm gauge over its entire 4 decades.
5. **Input to the 908 Controller**  
0 to 10 volts for full scale of the gauge
6. **Units of Display**  
torr or mBar; user selectable
7. **Full Scale**  
user may select range to match CDG: 20, 50, 100 mTorr; 1, 2, 10, 100, 1000 torr
8. **Calibration Adjust**  
for calibration of display; allows user to multiply CDG response by 0.50 to 2.00
9. **Vacuum Gauge**  
one or two capacitance diaphragm gauges which require up to 0.5 amp total from  $\pm 15$  volt supplies; this is sufficient to operate most heated gauges



10. Operating Temperature Range

+2 to +50 deg. Celsius

11. Process Control Set Points

two, with independent High and Low set points for each relay, for flexible control of hysteresis

12. Process Control Relays

two relays; contacts rated at 2 amp/240 VAC, 300 VDC

13. Nonvolatile Memory

for all user specified parameters

14. Analog Output

logarithmic, 0.5 volts/decade; 0.10 mTorr=0.5 volts

15. Output Power

+15 at 0.5 amp and -15 volts at 0.5 amp; sufficient to operate temperature-controlled gauges

16. Mounting

The 908 may be used as a bench-top instrument or it may be mounted in an instrument panel. Clips are provided for panel mounting.

17. RS-232 Input/Output

allows user to read pressure and set points; 9600 baud, 8-N-1; available through the accessory connector

18. Operating Voltage

The Model 908 has a universal power supply, which operates on input voltages from 90 VAC to 265 VAC 47 to 65 Hz; input is through a standard IEC 320 instrument power input receptacle on the rear panel; input power is protected by fuses in both lines of the input power.

19. Weight, Model 908 only; does not include cable or CDG

0.9 lb. /0.4 kg

**C. Controls and Indicators**

1. GAUGE SELECT button

allows the user to select which of the two gauges are shown on the digital display

2. SELECT button

Allows selection of parameters to be adjusted, e.g. Set Points



3. RAISE and LOWER buttons  
used for adjustment of gauge and instrument parameters
4. Digital Display  
3-digit 7-segment bright red LED, 10 mm high
5. Display Indicators  
bright red individual LED for miscellaneous indicators

#### **D. Capacitance Diaphragm Gauge**

CDGs may be ordered from several sources, including the following:

**Duniway Stockroom Corp.**  
**1305 Space Park Way**  
**Mountain View, California 94043**  
**USA**

<b>telephone</b>	<b>(650) 969-8811</b>
<b>toll-free</b>	<b>(800) 446-8811</b>
<b>facsimile</b>	<b>(650) 965-0764</b>
<b>email</b>	<b>info@duniway.com</b>

Varian Vacuum Products  
121 Hartwell Avenue  
Lexington, Massachusetts 02173  
USA  
telephone (781) 861-7200  
toll-free (800) 882-7426  
facsimile (781) 860-5437

MKS Instruments, Inc.  
Six Shattuck Rd.  
Andover, Massachusetts 01810  
USA  
telephone (978) 975-2350  
toll-free (800) 227-8766  
facsimile (978) 975-0093

Millipore Corporation  
Micro Electronics Division  
915 Enterprise Drive  
Allen, Texas 75013  
USA  
telephone (781) 533-8125  
toll-free (800) 221-1975  
facsimile (781) 533-8873

Balzers Instruments  
USA Headquarters  
8 Sagamore Park Road  
Hudson, New Hampshire 03051  
USA  
telephone (603) 595-3200  
toll-free (800) 555-3173  
facsimile (800) 555-3172

## II Installation

### A. Unpack the Controller

Carefully unpack the Model 908 Dual Capacitance Diaphragm Gauge Controller. The shipment includes these components:

- controller unit
- power cord
- mounting clips
- D-sub 15 accessory connector
- this instruction manual
- dual gauge cable, for connection to the Model 908

If your controller does not have all of these items, call Duniway Stockroom. If anything appears to have been damaged in shipment, contact the shipper.

*Do not plug the power cord in yet.*

### B. Mount the Controller

You can rest the controller unit on a bench, table top, or shelf, or you can mount it in a rack or cabinet. The controller unit is housed in a standard 1/8 DIN box. If you are mounting the unit in a panel, the cutout dimensions are 1.78 inch by 3.60 inch (45.2 mm by 91.4 mm), see fig. 3, page 9. One mounting clip attaches to each of the sides of the controller unit. To attach the clip, slide the beveled surfaces of the clip under the cutout on the side of the box and push the clip toward the back of the unit.

Be sure to leave enough clearance at the back of the controller unit for easy access to cable connections.

### C. Select the CDG

The Model 908 controller is designed to work with standard capacitance diaphragm gauges which operate on  $\pm 15$  volts. If you have difficulty obtaining a CDG, please contact us at Duniway Stockroom.

#### **CAUTION**

**Use of a CDG other than those which operate from  $\pm 15$  volts may cause damage to the CDG.**

**D. Connect the CDG**

Make sure that the CDG is securely connected to the vacuum system, using good vacuum practice.

**E. Attach the CDG Cable**

The CDG cable has a 9-pin D-sub connector on one end, which plugs into the 908, see fig. 2 on page 5. There are a variety of conventions for connection to the CDG; you may assemble or modify the cable to adapt to the CDG as needed. Connect the 9-pin D-sub plug of the gauge cable to the 9-pin connector on the back of the 908 controller unit. Push the plug onto the connector until it is firmly in place. Tighten the retaining screws to make certain the connector remains in place. Loose connections can cause faulty readings.

**NOTE**

The following information will allow you to make modifications to the cable as needed to interface with your CDG. Please refer to fig. 2 on page 6; this shows the 9-pin connector which is on the rear panel of the 908. This connector has female sockets; the mating connector on the CDG cable must have male pins

<b>908 9-pin 'D'</b>			<b>to Varian Ceramical 15 pin 'D'</b>	
<u>908 Pin</u>	<u>Terranova Name</u>	<u>Color</u>		<u>Tube Pin/Connection Name</u>
1	Tube #1 Signal	white	to:	Tube#1, Pin 2/Signal Output
2	Tube #2 Signal	white	to:	Tube#2, Pin 2/Signal Output
3	Tube #2 Signal Return	brown	to:	Tube#2, Pin 12/Signal Common
4	+15 volts	red	to:	Tube#1, Pin 7/+15 VDC
5	+15 volts	red	to:	Tube#2, Pin 7/+15 VDC
6	-15 volts	green	to:	Tube#1, Pin 6/-15 VDC
7	-15 volts	green	to:	Tube#2, Pin 6/-15 VDC
8	Tube #1 Signal Return	brown	to:	Tube#1, Pin 12/Signal Common
9	Electronics Common	black/shield	to:	Tube#1, Pins5/Pwr.Comm & 15/& Chassis Gnd
9	Electronics Common	black/shield	to:	Tube#2, Pins5/Pwr.Comm & 15/& Chassis Gnd
<b>908 9-pin 'D'</b>			<b>to MKS Baratron 15-pin 'D'</b>	
<u>908 Pin</u>	<u>Terranova Name</u>	<u>Color</u>		<u>Tube Pin/Connection Name</u>
1	Tube #1 Signal	white	to:	Tube#1, Pin 2/Signal Output
2	Tube #2 Signal	white	to:	Tube#2, Pin 2/Signal Output
3	Tube #2 Signal Return	brown	to:	Tube#2, Pin 12/Signal Common
4	+15 volts	red	to:	Tube#1, Pin 7/+15 VDC
5	+15 volts	red	to:	Tube#2, Pin 7/+15 VDC
6	-15 volts	green	to:	Tube#1, Pin 6/-15 VDC
7	-15 volts	green	to:	Tube#2, Pin 6/-15 VDC
8	Tube #1 Signal Return	brown	to:	Tube#1, Pin 12/Signal Common
9	Electronics Common	black/shield	to:	Tube#1, Pins5/Pwr.Comm & 15/& Chassis Gnd
9	Electronics Common	black/shield	to:	Tube#2, Pins5/Pwr.Comm & 15/& Chassis Gnd



<b>908 9-pin 'D'</b>			<b>to MKS Baratron 5-pin Molex</b>	
<u>908 Pin</u>	<u>Terranova Name</u>	<u>Color</u>	<u>Tube Pin/Connection Name</u>	
1	Tube #1 Signal	white	to:	Tube#1, Pin 3/Pressure Out
2	Tube #2 Signal	white	to:	Tube#2, Pin 3/Pressure Out
3	Tube #2 Signal Return	brown	to:	Tube#2, Pin 4/Output Return
4	+15 volts	red	to:	Tube#1, Pin 1/+15 VDC
5	+15 volts	red	to:	Tube#2, Pin 1/+15 VDC
6	-15 volts	green	to:	Tube#1, Pin 2/-15 VDC
7	-15 volts	green	to:	Tube#2, Pin 2/-15 VDC
8	Tube #1 Signal Return	brown	to:	Tube#1, Pin 4/Output Return
9	Electronics Common	black/shield	to:	Tube#1, Pin 5/Pwr.Comm & none
9	Electronics Common	black/shield	to:	Tube#2, Pin 5/Pwr.Comm & none

Current available for +15 volts from pins 4 and 5, and for -15 volts from pins 6 and 7 is internally protected and limited to approximately 0.5 amp total for each supply. For example, this allows CDG #1 and CDG #2 to draw 0.25 amp each; or CDG #1 may draw 0.50 amp and CDG #2 may draw 0.03 amp. If excessive current is taken through any of the power output pins, the internal protection will shut off the power for the affected voltage. It will be necessary to disconnect power for the 908 for a few minutes to allow the internal protection device to cool down and reset itself.

## F. Make Accessory Connections

The 15-pin D-sub Accessory Connector is on the rear panel of the 908, see fig. 2, page 5. The connector has female pins; the mating connector must have male pins. Mating D-sub 15 connectors are available from many of the normal electronic sources. If you need help identifying a source, please contact us.

Following are pin assignments for the Accessory Connector:

<u>15-pin</u>	<u>Accessory Connector</u>
pin 1	set point #1 relay, normally closed
pin 2	set point #1 relay, common
pin 3	set point #1 relay, normally open
pin 4	set point #2 relay, normally closed
pin 5	set point #2 relay, common
pin 6	set point #2 relay, normally open
pin 7	Tx, RS-232 signal out of the 908; 9600-N-8-1
pin 8	Rx, RS-232 signal into the 908
pin 9	ground, RS-232 and analog common
pin 10	no function
pin 11	CDG#2 buffered analog signal; 1K output
pin 12	no function
pin 13	analog output, 1K output, 0.5 volts/decade
pin 14	no function
pin 15	CDG#1 buffered analog signal; 1K output

### **G. Check Supply Voltage**

The Model 908 incorporates a universal power supply. This allows the 908 to operate on any input voltage from 90 VAC to 265 VAC, 47 to 65 Hz.

### **H. Attach the Power Cord**

Plug the power cord into the receptacle in the power module on the rear of the 908.



## II Operation

### A. Turn Power On

Plug the AC power end of the power cord into an electrical outlet. The loudspeaker will “beep” and test all indicators while the controller executes its self test. After being turned on, the instrument will go through the following sequence:

- “beeper”
- indicators for TORR, MTORR, MBAR,  $\mu$ BAR, GAGE 1, GAGE 2
- 10 LED indicators for set points and other functions
- all three digits will light, including decimal points
- display shows the model number of the instrument, **908**
- display shows software version, e.g. **1.01**

The 908 will go into normal operation and begin measuring pressure. If the a CDG is not connected, the display will show **OFF**. If the system pressure is greater than 990 Torr (mBar) the display will show **HI**.

### B. Front Panel Controls

The Model 908 allows flexible configuration of operation using simple entry from the front panel buttons labeled GAUGE SELECT, SELECT, RAISE and LOWER. Parameters which you may adjust are selected by scrolling through list which begins with SET PT 1 HIGH. Each time the SELECT button is pushed, the led indicator advances to the next parameter. The LED indicators will be lit to indicate which parameter is being adjusted, and the digital display will flash to indicate the value of the parameter being adjusted.

Each push of a button will give a short “beep” from the loudspeaker to confirm the button was pushed. If you have reached the limit of adjustment or if the button push is not allowed, the loudspeaker will give a long “beep”.

Following is detail description of the parameter selection and adjustment:

### C. Set Pt 1 High

This sets the high limit of the set point. Above this pressure, the set point relay will be de-energized. Press the RAISE and LOWER buttons to enter the value desired. The minimum value is OFF; this shuts the set point off. The next increment is 0.2% of the full scale range; for example, if the full scale range is 1 torr, the increment sequence is: OFF, 2.0 mTorr, 3.0 mTorr, etc.

When the RAISE and LOWER buttons are pressed, the display will change slowly at first. If you hold the button down for a few seconds, the rate of change will increase to allow you to make large changes more quickly.

SET PT 1 HIGH operates in conjunction with SET PT 1 LOW. While the 908 is in this mode, the set point may be assigned to either GAGE 1 or GAGE 2 by pressing the GAUGE SELECT button.

## D. Set Pt 1 low

This sets the low limit of the set point. This is the pressure at which the set point relay will be energized. Operation is similar to that of SET PT 1 HIGH above. The minimum value is OFF; this shuts the set point off. The next increment is 0.1% of the full scale range; for example, if the full scale range is 1 torr, the increment sequence is: OFF, 1.0 mTorr, 2.0 mTorr, etc.

*SET PT 1 LOW operates in conjunction with SET PT 1 HIGH.*

### NOTE

The High and Low set point allow the user to set the hysteresis of the set point operation. As the system is pumped down, the set point relay will be energized (set point turns on) as the pressure drops below SET PT 1 LOW. The relay will remain energized until the pressure rises above SET PT 1 HIGH.

It is not possible to adjust the High set point to be lower than the Low set point. If you adjust the High set point below the pressure previously selected for the Low set point, the 908 will automatically reduce the value for the Low set point so that it is the next increment lower than that of the High set point.

## E. Set Pt 2 High

This operates in the same manner as SET PT 1 HIGH, described above.

## F. Set Pt 2 Low

This operates in the same manner as SET PT 1 LOW, described above.

## G. Torr/mBar

This allows selection of the units to be used in display of the pressure. Press either the RAISE or LOWER buttons to alternate between Torr and mBar. You will notice that both the GAGE 1 and GAGE 2 indicators will be lit also. This is to let you know that the units of measure apply to both gauges; it is not possible to select Torr for one gauge and mBar for the other gauge.

## H. Calibrate

This allows the user to modify the reading for either gauge by multiplying by a value between 0.500 and 2.000. This is convenient for calibration of the CDG. CDGs are calibrated by the manufacturer before shipment; we suggest you use this adjustment only if you have reliable calibration data. The multiplier is internal, and is not seen by the user. The digital display shows the result of the pressure multiplied by the internal multiplier.



This adjustment may also be used to set the display to some value which is unique to your application or experiment.

*NOTE*

This adjustment is applicable to either gauge; please select the appropriate gauge by pressing GAUGE SELECT until the desired gauge is indicated. Use RAISE and LOWER as described above to set to the desired value.

The CALIBRATE function may be adjusted only when the CDG pressure is at 50% of full scale or higher.

*NOTE — ATMOSPHERIC PRESSURE*

You can use this function to set the atmospheric pressure reading for 1000 Torr CDGs. You should know the local barometric pressure before proceeding; your local airport may have this information. Normal barometric pressure is approximately 760 Torr (1000 mBar) at sea level.

**I. Full Scale**

This adjustment is applicable to either gauge; please select the gauge by pressing GAUGE SELECT until the desired gauge is indicated. Use RAISE and LOWER as described above to set to the desired value.

This allows the user to select the full scale range for each CDG. Press RAISE or LOWER to set the desired full scale range. The full scale ranges available are 20 mTorr, 50 mTorr, 100 mTorr, 1 Torr, 2 Torr, 10 Torr, 100 Torr and 1000 Torr. Because the 908 display has 3 digits, the 1000 Torr range is shown as 999 Torr, however internal calculations are all made on the basis of 1000 Torr.

**J. Zero**

This allows the user to adjust the zero for each CDG. Before making this adjustment, the CDG should be connected to a vacuum system at a pressure lower than 0.01% of the full scale for the CDG. This adjustment may also be used to set the display to a specific value if you know the pressure through other means. For example, if the CDG to be adjusted is attached to a system that has another CDG which has been independently calibrated, the CDG may be made to read the same as the calibrated gauge.

The ZERO function may be adjusted only when the CDG pressure is at 10% of full scale or lower.



*NOTE: INITIAL ZERO*

When using installing a CDG for the first time, it is good practice to reset the 908 internal settings. This will prevent errors in set up, e.g. if the CDG has not had its internal zero properly adjusted. To reset the 908, see **Reset of Stored Values**, just below. To adjust the zero, the vacuum system to which the CDG is connected should be at a pressure lower than 0.001 times the full scale range of the CDG. For example for a 10 Torr CDG, the system should be at a pressure lower than 0.01 torr, or  $10^{-2}$  torr.

Adjust the zero adjustment on the CDG (usually a trimpot) until the 908 display shows a value close to zero. After this initial adjustment, the display may be conveniently be set to zero using front panel controls on the Model 908.

*NOTE: HEATED CDGs*

When using heated or temperature-controlled CDGs, you should wait for an hour or two before making any adjustments to the 908 or the CDG. This will allow the CDG to come to its regulated temperature. When you are confident the CDG is at a stable temperature, adjust the zero adjustment on the CDG until the 908 display shows a value close to zero.

### K. Reset of Stored Values

This allows you to recover the factory settings for all stored values and resets the SET POINTS to off. For a system that is far out of calibration, the factory settings provide a good starting point for re-calibrating or adjusting the gauge controller. To recover the factory settings, unplug the 908 from its power source. Press and hold RAISE and LOWER buttons at the same time; while holding the RAISE and LOWER buttons depressed, plug the power cord in. You will hear a few short ‘chirps’ from the loudspeaker confirming the factory settings have been entered. The digital display will show RST to confirm the reset has been entered.

### L. Set Point Operation

See description of operation under Front Panel Controls.

### M. Reading Pressure

Pressure display and ranging are automatic in the 908. Most readings will take place between zero pressure and the full scale of the 908. For pressure lower than the minimum capability of the 908, the display will show -LO. For pressure greater than the maximum full scale of the CDG, the display will flash. For pressure greater than approx. 1.3 times the full scale of the CDG, the display will show OFF. The following table will help explain operation:



	<u>shows -LO</u>	<u>flashes</u>	<u>shows OFF</u>
	<u>at pressures</u>	<u>at pressures</u>	<u>at pressures</u>
<u>CDG range</u>	<u>lower than</u>	<u>greater than</u>	<u>greater than</u>
50 mTorr	-.49 mTorr	50 mTorr	65 mTorr
100 mTorr	-.99 mTorr	100 mTorr	130 mTorr
1 Torr	-9.9 mTorr	1.00 Torr	1.30 Torr
2 Torr	-19 mTorr	2.00 Torr	2.60 Torr
10 Torr	-99 mTorr	10.0 Torr	13.0 Torr
100 Torr	-.99 Torr	100 Torr	130 Torr
1000 Torr	-9.9 Torr	999 Torr; maximum display	

	<u>shows -LO</u>	<u>flashes</u>	<u>shows OFF</u>
	<u>at pressures</u>	<u>at pressures</u>	<u>at pressures</u>
<u>CDG range</u>	<u>lower than</u>	<u>greater than</u>	<u>greater than</u>
50 mBar	-.99 mBar	50 mBar	65 mBar
100 mBar	-.99 mBar	100 mBar	130 mBar
1 Bar	-9.9 mBar	1.00 Bar	1.30 Bar
2 Bar	-9.9 mBar	2.00 Bar	2.60 Bar
10 Bar	-99 mBar	10.0 Bar	13.0 Bar
100 Bar	-.99 Bar	100 Bar	130 Bar
1000 Bar	-9.9 Bar	999 Bar; maximum display	

## N. Analog Output

The analog output is calculated from the value of the digital display. The output is logarithmic, 0.5 volt/decade; the source impedance for the output is 1 K ohm. The output voltage is calculated from:

$$V=0.50*(\log_{10}(100*Pressure))$$

where V is the Analog Output in volts; P is the pressure in mTorr or  $\mu$ bar. Some examples follow; because of normal tolerances in the electronics, there may be minor differences in the values you observe compared to those shown:

<u>displayed pressure</u>	<u>Analog Output - volts</u>
<b>LO</b>	0.00
0 mTorr ( $\mu$ Bar) or less	0.00
0.10 mTorr ( $\mu$ Bar)	0.50
0.20 mTorr ( $\mu$ Bar)	0.65
1.0 mTorr ( $\mu$ Bar)	1.00
10.0 mTorr ( $\mu$ Bar)	1.50
100 mTorr ( $\mu$ Bar)	2.00
1.00 torr (mBar)	2.50
10.0 Torr ( $\mu$ Bar)	3.00
100 Torr (mBar)	3.50
999 Torr (mBar)	4.00
<b>OFF or HI</b>	4.00

The pressure as a function of the Analog Output voltage is:

$$P=0.01*\log^{-1}(2V) \quad \text{or}$$

$$P=0.01*10^{(2V)}$$

where P is pressure in mTorr or  $\mu$ bar; V is the Analog Output in volts.

<u>Analog Output - volts</u>	<u>pressure</u>
0.10	0.016 mTorr ( $\mu$ bar)
0.50	0.10 mTorr ( $\mu$ bar)
1.00	1.00 mTorr ( $\mu$ bar)
1.10	1.58 mTorr ( $\mu$ bar)
2.00	100 mTorr ( $\mu$ bar)
3.50	100 Torr (mBar)
4.00	1000 Torr ( $\mu$ Bar)

**NOTE:**

The analog output is valid for the gauge which is selected on the display.

**O. Serial Interface**

The RS-232 serial port gives pressure readings when requested by the terminal. The interface is standard RS-232 format; 9600 baud, 8-bits, no parity, 1 stop bit. The interface is through the 15-pin D-sub accessory connector, see fig. 2, page 5.

- pin 7 is Tx (signal from the 908 to the terminal)
- pin 8 is Rx (signal from the terminal to the 908)
- pin 9 is return (ground).

The serial port allows reading pressure and other parameters of the 908; it is not possible to modify stored parameters over the serial port.

The following commands are used in the 908:

1. Pressure

To read the pressure of both gauges

Send “p” (ASCII value 112); the 908 sends pressure for gauge 1 and gauge 2 to the terminal. Output is in the format:

***ABCeDFGeH***

where

*ABC* is the multiplier and *D* is the exponent for CDG #1

*EFG* is the multiplier and *H* is the exponent for CDG #2

Some examples follow:

<u>displayed pressure</u>	<u>Serial Output</u>
<b>OFF</b>	Off
<b>LO</b>	Low
0.0 mTorr	0.00e-3
0.8 mTorr	0.80e-3
2.8 mTorr	2.80e-3
-1.6 mTorr	-1.6e-3
57.1 mTorr	57.1e-3
2.34 torr	2.34e+0
135 torr	135e+0
<b>HI</b>	999e+0

Since both gauges are maintained in an active state, pressure data taken over the serial port are always valid for both gauges at the same time, regardless of which gauge is shown on the digital display.

2. Full Scale Of The Gauges

To read the full scale range selected for each gauge

Send “f” (ASCII value 102); the 908 returns full scale which the user has selected for each gauge in the format:

***JKLeMNPQeR***

where

*JKL* is the multiplier and *M* is the exponent for CDG #1

*NPQ* is the multiplier and *R* is the exponent for CDG #2

Some examples follow:



<u>full scale</u>	<u>Serial Output</u>
50 mTorr	50.0e-3
100 mTorr	100e-3
1 Torr	1.00e+0
100Torr	100e+0

### 3. Units Of Measurement

To read the chosen units of measure for both gauges

Send “u” (ASCII value 117); the 908 returns

**Torr**

or

**mBar**

### 4. Set Point #1

To read the setting and status of set point #1

Send “1” (ASCII value 49); the 908 returns information for set point #1 in the format:

***STUeV WXYeZA B***

where

*STU* is the multiplier and *V* is the exponent for set point #1 high

*WXY* is the multiplier and *Z* is the exponent for set point #1 low

*A* is the gauge to which the set point #1 has been assigned: either 1 or 2

*B* is set point relay status; 0= relay is not energized, 1=relay is energized

### 5. Set Point #2

To read the setting and status of set point #2

Send “2” (ASCII value 50); the 908 returns information for set point #2 in the same format as for set point #1, above.

### 6. Model And Software Revision

To read software identification.

Send “v” (ASCII value 118); the 908 returns the model number of the instrument and the revision number, as in the following example:

**908 ver 1.02**

## III Maintenance

### A. Changing Fuses

The controller contains two fuses. Both fuses are held in the fuse assembly that is part of the power module located on the back panel of the controller. To change fuses, unplug the line cord from the power entry module at the rear of the 906; locate the fuse block immediately below the line cord socket. Press the tab of the fuse assembly and withdraw the fuse assembly from the power module.

Turn the fuse assembly around so that the fuses are facing you. Check both fuses; replace the burnt-out fuse with a fuse of the appropriate rating (refer to **Specifications** section). Reinsert the fuse assembly into the power module; push it in until the ears click into place.

Replacement fuse type: 5 mm X 20 mm, regular or slow-blow 1 amp

<u>manufacturer</u>	<u>fuse type</u>
Bussman	GDB-1A or GDC-1A
Littlefuse	217 001 or 218 001

### B. Schematic Diagrams

Because of the proprietary nature of our products, we do not supply schematic diagrams or software listings. If you have any problem with operation or interface to any of our products, please contact us; we will do everything we can to serve your needs.

## IV      **Trouble Shooting**

If the self-test fails, run the self-test again by turning the power off and then on again. If it fails again, call Duniway Stockroom.

If fuses burn out, check to see that the proper voltage has been supplied to the power input module.

If fuses burn out repeatedly call Duniway Stockroom. If the digital display consistently shows -LO, OFF or HI, it may be that one of the internal power supply protection devices has removed power to the CDG. You may check this by measuring the voltage at the connector or cable for the unaffected gauge. Since power for both gauges use the same protection device, either connector will show the power supply voltages. Normal range for the voltages are 14.5 to 15.5 volts for both +15 volts and -15 volts. +15 may be measured on the red wire; -15 is on the green wire; power return is on the black wire. If the power supply protection has shut the power off, you will typically measure less than 4 volts on the affected supply.

If you verify that either power supply is shut off, remove power from the CDG for a few minutes to allow the protection device to reset itself. The protection device does not need to be replaced; it is a reusable thermal fuse.

You may wish to determine the cause for the loss of power supply voltage before applying power again. The 908 will protect itself if it finds excessive power draw again.

It is normal for the 908 to feel warm to touch along the left side of the case. This is especially true when operating heated CDGs because of the greater power they require.





## VI Warranty

*Terranova products of Duniway Stockroom Corp. are warranted to be free of defects in material and workmanship for a period of one year from the date of shipment. At our option, we will repair or replace products which prove to be defective during the warranty period. Liability under this warranty is limited to repair or replacement of the defective items. Shipping damage is excluded from the scope of this warranty. Gauge tubes of all types are excluded from this warranty.*

*Terranova products are warranted not to fail to execute programming instructions due to defects in materials and workmanship. If Duniway Stockroom receives notice of such defects during the warranty period, Duniway Stockroom will repair or replace firmware that does not execute its programming instruction due to such defects. Duniway Stockroom does not warrant that the operation of the firmware or hardware will be uninterrupted or error-free.*

*If this product is returned to Duniway Stockroom for warranty service, Buyer will pre-pay shipping charges and will pay all duties and taxes for products returned to Duniway Stockroom. Duniway Stockroom will pay for return of products to Buyer, except for products returned to a Buyer from a country other than the United States.*

**LIMITATION OF WARRANTY:** *The foregoing warranty does not apply to the defects resulting from:*

- 1. Improper or inadequate maintenance by Buyer;*
- 2. Buyer-supplied interfacing;*
- 3. Unauthorized modification or misuse;*
- 4. Operation outside of the environmental specifications of the product; or*
- 5. Improper site preparation and maintenance.*

**THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. DUNIWAY STOCKROOM DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**EXCLUSIVE REMEDIES:** *The remedies provided herein are Buyer's sole and exclusive remedies. In no event will Duniway Stockroom be liable for direct, indirect, special, incidental, or consequential damages, including loss of profits, whether based on contract, tort, or any other legal theory.*

# DECLARATION OF CONFORMITY

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**We, Duniway Stockroom Corp., declare under our sole responsibility,  
that the following products, displaying the CE mark on the rear panel:**

Model 906 Convection Gauge Controller  
Model 908 Dual Capacitance Diaphragm Gauge Controller  
Model 921 Cold Cathode Gauge Controller  
Model 924 Thermocouple Vacuum Gauge  
Model 926 Dual Convection Gauge Controller

**to which this declaration relates, are in conformity with the following  
standards or normal documents**

EMC Directive (89/336/EEC//93/68/EEC)  
Electromagnetic Compatibility  
Standards: EN 50081-1: 1992, EN 50082-1: 1993

Low Voltage Directive (73/23/EEC//93/68/EEC)  
Electrical/Technical Safety  
Standard: EN 61010-1: 1993/A2: 1995

**following the provisions of the EMC directive (89/336/EEC)**



August 30, 1998

Duniway Stockroom Corp.  
1305 Space Park Way  
Mountain View, California 94043

**by: Sherman Rutherford**  
Compliance Manager

rev061099sr