DUNIWAY STOCKROOM CORP.

Terranova® 908A

Dual Diaphragm Gauge Control Unit

Instruction Manual

rev1016NC

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Specifications

Operating Voltage	Universal: 100V to 240V AC @ 50Hz to 60Hz; 40VA 100V to 240V DC		
Pressure Display	4 Red LEDs - 4 digits (NNNN) with pressure unit auto ranging		
Pressure Units	Torr/mTorr [Default] mbar/µbar Pa/kPa None (ARBS)		
Measuring Range	Four pressure decades (or orders of magnitude) from full scale See Appendix 3 for full scale range options		
Display Range	-0.20 mTorr -0.27 µbar -27 Pa	to to to	1.5 x 10^4 Torr 2.0 x 10^4 mbar 2.0 x 10^6 Pa
Output Voltage	± 15 V DC at 0.75 A		
Relay Rating	Varies From: 2A at 30 VDC (60 VAC) To: 0.4A at 150 VDC (300 VAC) See Appendix 4 for more details		
Temperature Range	2ºC to 500ºC (in operation)		
Weight	1.0lb/0.5kg		

Accessories

Included	Instruction Manual (can be accessed at www.duniway.com/documents/manuals) One power cord Two replacement fuses Two panel mount clips One unterminated male 15-pin D-sub connector
Required (Sold Separately)	**CDG-CBL-2-10** Dual capacitance diaphragm gauge cable (10ft)* See Appendix 1 for a list of compatible pressure gauges
Optional	**RS232-TN9DIN** RS-232 serial communication cable (10ft)*

*Custom cable lengths available upon request

Explosive Gases

Do not use the Terranova® 908A to measure the pressure of combustible gas mixtures. Although the pressure gauge normally operates at low temperatures, it is possible that momentary transients or controller malfunction can raise the pressure gauge above the ignition temperature of combustible mixtures. This, in turn, can create an explosion which can damage equipment and/or injure personnel.

Limitation on use of Compression Mounts

Do not use a compression port to connect pressure gauges to a vacuum system in applications that may develop above-atmospheric pressures. Pressures above atmospheric pressures may cause the pressure gauge to eject from a compression fitting and damage equipment and/or injure personnel.

Chemicals

Many organic cleaning solvents, such as acetone, produce fumes that are toxic and/or flammable. Such solvents should only be used in well-ventilated areas and away from electronic equipment, open flames, or other potential ignition sources.

Introduction

The Terranova® 908A Dual Capacitance Diaphragm Gauge Controller is designed to simultaneously operate two capacitance diaphragm gauges such as the MKS 722B Baratron® capacitance manometer. The Terranova® 908A is able to output pressure readings from 1 x 10^4 Torr to 1 x 10^{-3} Torr (1 x 10^4 mbar to 1 x 10^{-3} mbar). The control unit is set to operate both standard and heated full scale capacitance diaphragm gauges between 1 x 10^4 Torr and 2 x 10^{-2} Torr (1 x 10^4 mbar and 2 x 10^{-2} mbar) that require a ± 15 V DC input and have a 0 V - 10 V DC output signal.

Installation

Mounting the Terranova® 908A

The Terranova® 908A is housed in a standard 1/8 DIN box to allow for mounting on most equipment racks or cabinets. The dashed call-out dimensions in Figure 1 illustrate the proper cutout dimensions for the 1/8 DIN box.

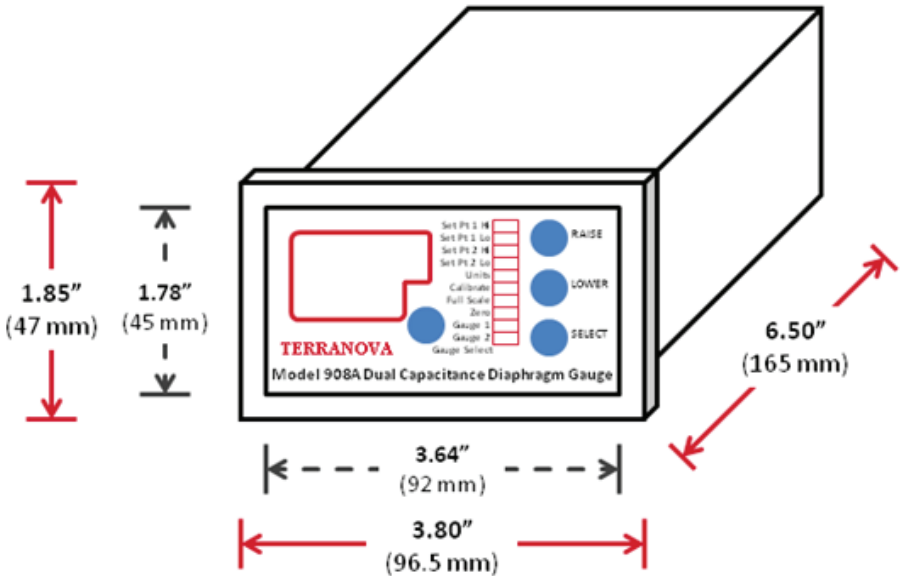

Figure 1 Terranova® 980A Dimensions

To properly mount the unit:

1. Locate the mounting clips included with the control unit
2. With the square end of the mounting clip facing towards the front panel, slide the beveled surfaces of the clip under the cutout located on each side of the control unit
3. Push the clip toward the back of the unit until the central tongue locks the clip
4. Tighten the rod against the rack or panel to secure the unit

If successful, the clips should hold the Terranova® 908A in place. User should provide enough clearance to access rear cable connections.

Connecting the Pressure Gauge

The Terranova® 908A has a single female 9-pin D-sub connection located on the back of the control unit labeled SENSOR CONNECTOR to connect the pressure gauge cable (see Figure 2). A dual cable is required to simultaneously connect both pressure gauges. User will require the Duniway gauge cable **CDG-CBL-2-10** to connect the sensors to the control unit.

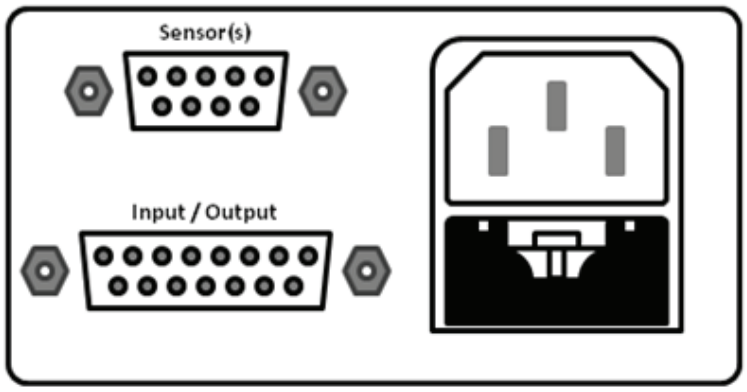

Figure 2 Terranova® 908A Back Panel

To properly connect the Terranova® 908A to the capacitance diaphragm gauge(s):

1. Secure the pressure gauge cable end to the pressure gauge
2. Secure the male 9-pin D-sub connector of the cable to the SENSOR CONNECTOR port
3. Fasten retainer screws on all cable connections

Use of a pressure gauge other than the suggested types may lead to improper readings and/or cause damage to the pressure gauge.

Operation

Self Test

The Terranova® 908A will perform a self test at power ON. The Self Test cycle is initiated by a BEEP sound followed by:

1. Pressure unit LEDs become illuminated
2. Parameter LEDs become illuminated
3. Numeric display indicators become illuminated
4. Display reads the model number (e.g. 908A)
5. Display reads the software version (e.g. 1.51)

The control unit will commence normal operation if Self Test is successful. Control unit fan will automatically start at power ON.

Setup Mode

Terranova® 908A unit parameters can be set or modified by the following nine-step operation:

1. Press the **SELECT** button to set or adjust the relay deactivation pressure for SET POINT 1. Use the **RAISE** or **LOWER** button to increase or decrease the SET PT 1 HIGH pressure value shown on the display. Default value is OFF. SER PT 1 HI LED will illuminate during adjustment.See **Set Point Operation**.

2. Press the **SELECT** button a second time to set or adjust the relay activation pressure for SET POINT 1. Use the **RAISE** or **LOWER** button to increase or decrease the SET PT 1 LO pressure value shown on the display. Default value is OFF. SET PT 1 LOW LED will illuminate during adjustment. See **Set Point Operation**.

3. Press the **SELECT** button a third time to set or adjust the relay deactivation pressure for SET POINT 2. Use the **RAISE** or **LOWER** button to increase or decrease the SET PT 2 HI pressure value shown on the display. Default value is OFF. SET PT 2 HIGH LED will illuminate during adjustment. See **Set Point Operation**.

4. Press the **SELECT** button a fourth time to set or adjust the relay activation pressure for SET POINT 2. Use the **RAISE** or **LOWER** button to increase or decrease the SET PT 2 LO pressure value shown on the display. Default value is OFF. SET PT 2 LO LED will illuminate during adjustment. See **Set Point Operation**.

Although the SET POINT HI and SET POINT LO parameter may be independently assigned to operate with either pressure gauge, both values will apply to the pressure gauge selected for the SET POINT LO value. Use the GAUGE SELECT button to choose between GAUGE 1 and GAUGE 2.

5.Press the **SELECT** button a fifth time to set the pressure units for both pressure gauges. Use the **RAISE** or **LOWER** button to select the proper UNITS value shown on the display. User can select between Torr and bar pressure units. Default pressure unit is Torr. UNITS LED will illuminate during adjustment.

Pressure units apply to both GAUGE 1 and GAUGE 2.

Pressure values in ARBS units are output in the same format as Torr units.

6. Press the **SELECT** button a sixth time to adjust the upper range pressure value of the capacitance diaphragm gauge. Use the **RAISE** or **LOWER** button to increase or decrease the CALIBRATE pressure value shown on the display. CALIBRATE LED will illuminate during adjustment. See **Pressure Adjustment**.

7. Press the **SELECT** button a seventh time to set or adjust the full scale range of the pressure gauges. Use the **RAISE** or **LOWER** button to select the proper FULL SCALE value shown on the display. Default full-scale range is 1.00 Torr. FULL SCALE LED will illuminate during adjustment. See Appendix 3 for permissible full scale ranges.

8. Press the **SELECT** button an eighth time to zero-adjust the control unit. Use the RAISE or LOWER button to increase or decrease the ZERO pressure value shwon on the display. Default value is 0.0. ZERO LED will illuminate during adjustment. See **Zero Adjustment**.

The FULL SCALE, CALIBRATE, and ZERO pressure values may be independently modified for GAUGE 1 and GAUGE 2. Use the GAUGE SELECT button to choose between GAUGE 1 and GAUGE 2.

9. Press the **SELECT** button a ninth time to return the unit to normal operation.

User must press and hold the **RAISE** or **LOWER** button until value changes. Pressing and holding the RAISE or LOWER button during Setup Mode allows for faster value change. Unit display will flash during all Setup Mode steps. Unit will return to normal operation in approximately 60 seconds if left unattended during Setup Mode; any changes will be saved. Timer is reset if any button is pressed during the 60-second timeout.

Zero Adjustment

Zero adjustment can be conducted through a combination of the Terranova® 908A ZERO value and capacitance diaphragm gauge ZERO trimmer. Pressure reading must be less than 10% of full scale to modify the ZERO value; otherwise, Error Code 21 will be output. To zero adjust, system pressure must be lower than 0.01% full scale of the capacitance diaphragm gauge.

The control unit may also be set to a specific pressure value. For example, if system pressure is indicated to be at 10 mTorr by a secondary pressure gauge, the unit can also be set to agree with said value. Heated or temperature-controlled capacitance diaphragm gauges should be at their regulated temperatures when zero adjusting for accurate pressure readings. Although the ZERO value is stored by the control unit, it will not be displayed in
subsequent adjustments. The ZERO value is appropriately converted when switching between pressure units. Zero adjustment should be conducted before upper range pressure adjustment.

Pressure reading range will shift if user accidentally changes the ZERO ADJ value during use. If this occurs, user should reset the Terranova® 908A and redo both the zero and atmospheric pressure adjustment.

Negative pressure readings during use or zero adjustment may indicate the control unit requires further adjustment. Negative pressure readings are to be used only as an indication of vacuum.

Pressure Adjustment

The upper range of the capacitance diaphragm gauge may be modified via the CALIBRATE value. This feature should only be used to calibrate a capacitance diaphragm gauge when reliable calibration data is available. Pressure reading must be greater than 50% of the full scale to modify the CALIBRATE value; otherwise, Error Code E22 will be output. The CALIBRATE value may be used to set the atmospheric pressure value for 1000 Torr full scale pressure gauges. Although the CALIBRATE value is stored by the control unit, it will not be displayed in subsequent adjustments. The CALIBRATE value is appropriately converted when switching between pressure units. Zero adjustment should be conducted before upper range pressure adjustment.

Pressure reading range will shift if user accidentally changes the CALIBRATE value during use. If this occurs, user should reset the Terranova® 908A and redo both the zero and atmospheric pressure adjustment

Pascal Mode

Pascal Mode disables the ability to change pressure units via the front panel and strictly outputs pressure measurements in Pascal units.

To enter or exit Pascal mode:

1. Disconnect AC power cord from control unit
2. Simultaneously depress the **RAISE, LOWER** and **SELECT** buttons
3. Reconnect AC power cord to control unit

Once power is restored, the unit will commence the Self Test. If successful, two BEEPs will be emitted and the software version with appended letter J (e.g. 1.51J) will appear on the unit display. Once the front panel buttons are released, the Self Test will continue and the Terranova® 908A will resume normal operation. See Appendix 3 for Pascal unit display format.

Restoring Default Values

Restoring default parameters provides a starting point for control unit readjustment in the event pressure measurements become unreliable.

To restore Terranova® 908A default parameters:

1. Disconnect AC power cord from unit
2. Simultaneously depress the **RAISE** and **LOWER** buttons
3. Reconnect AC power cord to unit

Once power is restored, the unit will commence the Self Test. If reset process is successful, two BEEPs will be emitted and the code ‘RST’ will appear on the unit display. Once the front panel buttons are released, the Self Test will continue and the Terranova® 908A will resume normal operation. Restoring default parameters does not exit Pascal Mode.

Pressure Measurement

Terranova® 908A operation is almost automatic and will commence after a successful Self Test. Pressure units will auto range during use as system pressure increases or decreases. Although the control unit is able to simultaneously operate two capacitance diaphragm gauges, only one pressure gauge will be displayed at a time. User can select between GAUGE 1 and GAUGE 2 via the GAUGE SELECT button to display the corresponding pressure readings. The selected pressure gauge LED will illuminate during use.

Display will read OFF if the gauge cable or sensor is disconnected or if pressure is greater than approximately 130 % of full scale. Display will read LO if system pressure is lower than the minimum allowed pressure value for the Terranova® 908A. Appendix 3 shows pressure display format for Torr / millibar and Pascal units.

The current to both pressure gauges is internally protected and limited to a combined current of approximately 0.75 A. For example, if GAUGE 1 draws approximately 0.72 A, GAUGE 2 may only draw approximately 0.03 A. If current exceeds the current limit, a protection device (e.g. resettable fuse) in series with the internal power supply will trip and restrict power to both sensors. To reset the protection device, user should remove power from the Terranova® 908A and allow the control unit to cool.

Control unit may become warm during operation; this is normal

Pressure readings are reliable to approximately 0.05 % of full scale

Display will flash if pressure reading is greater than the full scale value

Due to a number of system variables, pressure differences may result with each subsequent pressure measurement and/or between different pressure gauges.

Set Point Operation

The Terranova® 908A can be utilized for process control functions through the use of two independent, programmable set points, SET POINT 1 and SET POINT 2, and corresponding relays. Each set point has an adjustable activation (e.g. SET POINT LO) and deactivation (e.g. SET POINT HI) pressure value that allows the user to modify the relay hysteresis. SET PT 1 HI and SET PT 1 LO correspond to SET POINT 1; SET PT 2 HI and SET PT 2 LO correspond to SET POINT 2. Set point pressure values are adjusted via the front panel; relay output is accessible through the INPUT / OUTPUT 15-pin D-sub connector port located in the back of the control unit. See Table 1 for relay pin configuration.

Each relay will independently activate once the pressure reading is less than its corresponding SET POINT LO value. The relay will deactivate once the pressure reading is greater than its corresponding SET POINT HI value. Relays will be disabled if set point value is OFF. The Terranova® 908A will automatically increase the SET POINT HI value to the next pressure step from the SET POINT LO value if SET POINT LO is adjusted greater than SET POINT HI and vice versa. For example, if SET POINT HI is set to 1.00 Torr and SET POINT LO is set to 1.20 Torr, the SET POINT HI value will automatically be adjusted to 1.21 Torr. See Appendix 4 for relay use with inductive or capacitive load switching.

SET POINT HI pressure range is from 0.20 % to 99.9 % of full scale; SET POINT LO pressure range is from 0.19 % to 99.8 % of full scale. The set point pressure resolution for pressures greater than or equal to 10 % of full scale is in 0.1 % steps of full scale. Similarly, the set point pressure resolution for pressures less than 10% of full scale is in 0.01 % steps of full scale. For example, for a 1000 Torr full scale sensor, the SET POINT HI pressure range is from 2.0 Torr to 999.0 Torr; SET POINT LO pressure range is from 1.9 Torr to 998.0 Torr. Set point pressure resolution applies to all pressure units, rounded to the nearest resolution step.

Pin	Function	Description	Notes
1	Set Point 1 Relay	Normally Closed (NC)	See **Set Point Operation**
2	Set Point 1 Relay	Common	See **Set Point Operation**
3	Set Point 1 Relay	Normally Open (NO)	See **Set Point Operation**
4	Set Point 2 Relay	Normally Closed (NC)	See **Set Point Operation**
5	Set Point 2 Relay	Common	See **Set Point Operation**
6	Set Point 2 Relay	Normally Open (NO)	See **Set Point Operation**
7	Tx		See **Serial Communication**
8	Rx		See **Serial Communication**
9	Analog Common		See **Serial Communication**
10	N/A	N/A	N/A
11	GAUGE 2 Analog Output		See **Notes**
12	N/A	N/A	N/A
13	Analog Output		See **Analog Output**
14	N/A	N/A	N/A
15	GAUGE 1 Analog Output		See **Notes**

Table 1 INPUT/OUTPUT 15-pin D-Sub connector pin configuration

NOTES

PIN 11 Buffered signal; 1 kΩ output impedance
PIN 15 Buffered signal; 1 kΩ output impedance

Serial Communication

The INPUT / OUTPUT 15-pin D-sub port allows the user to remotely query the Terranova® 908A to read unit parameters. The serial communication standard used for data transmission is RS-232. The RS-232 format for communication with the Terranova® 908A unit is as follows:

RS-232 Settings
9600 baud
No parity
8 bits
1 stop bit
Full duplex

Figure 3 shows the pin configuration for RS-232 communication. User will have to utilize Duniway cable RS232-TN9DIN and a separate program, such as HyperTerminal, to send query characters and read output from the control unit. Query applies to both pressure gauges regardless of which gauge is selected on the control unit display. Table 2 lists the characters used by the Terranova® 908A to return unit parameters.

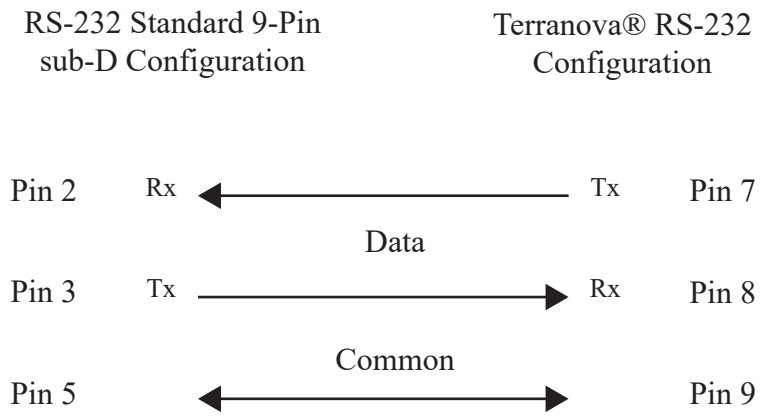

Figure 3 Terranova® 908A RS-232 pin configuration

The Terranova® 908A outputs pressure values in the following scientific notation format:

AeB XeY

in which A and X are the significand and B and Y are the exponent. A and B values correspond to GAUGE 1; X and Y values correspond to GAUGE 2. The control unit also utilizes the same format to output set point pressure values. However, two digits are appended to the output

AeB XeY R G

in which R indicates the set point relay state and G indicates the pressure gauge to which the set point applies. If the relay is active, R = 1; otherwise, R = 0. G = 1 corresponds to GAUGE 1 and G = 2 corresponds to GAUGE 2. When character 1 or 2 is transmitted to the control unit, pressure values correspond to SET POINT HI and SET POINT LO, respectively.

Character	Query	Output Format	Notes
1	SET POINT 1 value	AeB XeY R G	ASCII value 49
2	SET POINT 2 value	AeB XeY R G	ASCII value 50
f	Full scale range	AeB XeY	ASCII value 102
p	Pressure reading	AeB XeY	ASCII value 112
u	Pressure units	Torr/mBar/Pascal/ARBS	ASCII value 117
v	Model number; Software version	926; N.NN	ASCII value 118

Table 2 Serial communication query characters

Depending on selected unit, output values are either in torr or millibar

Examples @ 100 Torr Full Scale	
GAUGE 1 pressure: 2.34 mTorr GAUGE 2 pressure: OFF Output:	p 2.34e+0 OFF
GAUGE 1 pressure: OFF GAUGE 2 pressure: LO Output:	p OFF LOW
SET POINT 1 is assigned to GAUGE 1 (Relay ON) SET POINT 1 HI pressure: 0.60 Torr SET POINT 2 LO pressure: 0.57 Torr Output:	 1 0.60e-0.57e-0 1 1
SET POINT 2 is assigned to GAUGE 2 (Relay OFF) SET POINT 2 HI pressure: OFF SET POINT 2 LO pressure: OFF Output:	 2 0.0e+0 0.0e+0 0 2

Analog Output

The Terranova® 908A has a calibrated, 12-bit resolution, logarithmic analog output available for use as a secondary method to read measured pressure values. Analog output voltage can be accessed through the INPUT / OUPUT 15-pin D-sub connector port. The unit outputs 0.50 V per pressure decade (or order of magnitude). LO pressure value corresponds to 0.00 V; OFF pressure value corresponds to approximately 5.00 V. Analog output is valid only for the selected pressure gauge on the control unit. See Table 1 for pin configuration.

The analog output voltage can be approximated using the displayed pressure measurement by:

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

where P is the pressure reading in mTorr (or µbar) and V is the analog output in volts. For example, if P is equal to 10 mTorr (10 µbar), V (rounded to the nearest hundredth) is equal to 1.50 V. Table 3 lists sample analog output and corresponding pressure values. For example, if analog output is 3.00 V, the corresponding pressure reading is 10.0 Torr.

Analog Output [V]	Pressure
0.00	LO/P ≤ 0 mTorr
0.50	0.10 mTorr
1.00	1.0 mTorr
1.50	10.0 mTorr
2.00	100 mTorr
2.50	1 Torr
3.00	10 Torr
3.50	100 Torr
4.00	OFF/HI

Table 3 Analog Output and calculated pressure values

Pressure as a function of the analog output can be approximated by:

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

where V is the analog output in volts and P is pressure in mTorr (or µbar). For example, if V is equal to 2.50 V, P (rounded to the nearest one) is 1.00 Torr (or 1.00 mbar).

Source impedance for analog output is 1 kΩ

Troubleshooting

Problem	Possible Cause	Diagnostic
Unit fails Self Test	N/A	Restart unit; if restart fails, contact Duniway Stockroom
Fuse(s) repeatedly burn out	Incorrect AC input voltage	Verify AC voltage; if unit fails, contact Duniway Stockroom
Display is dim and reads incorrect pressure values	Incorrect AC input voltage	Verify AC voltage; if unit fails, contact Duniway Stockroom
Incorrect VAC/ATM values	Faulty pressure gauge	Replace pressure gauge

Error Code	Description
E01	Illegal operation
E02	Parameter at limit
E03	Timeout during Setup Mode
E11	ZERO adjustment not allowed at current pressure
E12	ATMOS adjustment not allowed at current pressure

If the Terranova® 908A repeatedly outputs LO or OFF at a known pressure, the protection device (e.g. resettable fuse) in series with the internal power supply may have tripped and removed power to the sensor(s). If the resettable fuse is open, the power supply should output a low voltage signal to both sensors – output voltage range is between 14.5 V to 15.5 V for both positive and negative polarity. To reset the protection device, user should remove power from the Terranova® 908A and allow the control unit to cool. If the cooling period does not resolve the issue, contact Duniway Stockroom.

Changing Fuses

The Terranova® 908A contains two Type F, regular (or slow-blow) 1 A fuses. As shown in Figure 4, both fuses are held in the fuse assembly located on the back panel of the unit.

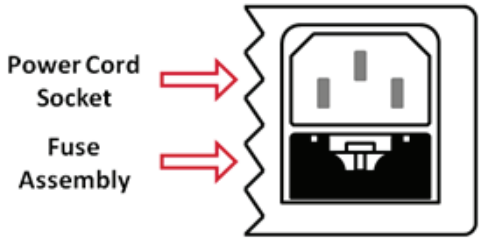

Figure 4 Terranova® 908A power module

To change fuses:

1. Unplug the line cord from the unit power module
2. Locate the fuse block immediately below the power cord socket
3. Press the tab of the fuse block and withdraw the assembly
4. Inspect and replace faulty fuse(s)
5. Reinsert fuse assembly into power module
6. Push fuse assembly into place until assembly tabs “click”

The following is a list of suggested replacement fuses:

Recommended Fuses
Bussman GDB-1A
Bussman GDC-1A
Littelfuse 217 001
Littelfuse 218 001

Legacy Terranova® 908

The legacy Terranova® 908 model has been discontinued and replaced by the Terranova® 908A to increase the current limit for heated sensors and add the ability to output pressure measurements in Pascal units. Furthermore, earlier legacy Terranova® 908 models did not possess universal power modules. User should verify proper input voltage by locating the stamped rating on the rear end of the unit. Although the Terranova® 908 has been discontinued, the control unit may still be sent to Duniway Stockroom for repairs. Contact your Duniway Stockroom customer service representative for further details.

1. Brooks Automation, Inc. ‘Granville-Phillips® Series 475 Convectron® Vacuum Measurement Controller Instruction Manual’. 2009. 81.
2. MKS Instruments. ‘HPS Series 947 Digital Convection Enhanced Pirani (CEP) Vacuum Sensor System Operation and Maintenance Manual’. 1999. 25.

Warranty

Duniway Stockroom Corporation ("DSC") warrants all Terranova® products 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 item(s). Shipping damage is excluded from the scope of this warranty. Pressure gauges 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 DSC receives notice of such defects during the warranty period, DSC will repair or replace firmware that does not execute its programming instruction due to such defects. DSC does not warrant that the operation of the firmware or hardware will be uninterrupted or error-free.

If this product is returned to DSC for warranty service, Buyer will prepay shipping charges and pay all duties and taxes for products returned to DSC. DSC will pay for the 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 the Buyer
2. Buyer-supplied interfacing
3. Unauthorized modification or misuse
4. Operation outside of the environmental specifications of the product
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. DSC 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 DSC be liable for direct, indirect, special, incidental, or consequential damages, including loss of profits, whether based on contract, tort, or any other legal theory.

Please contact your Duniway Stockroom customer service representative for a Return Merchandise Authorization (RMA) number if you need to return a Terranova® product.

Declaration of Conformity

Duniway Stockroom Corp. declares under its sole responsibility that the following products:

Terranova 906A Convection Gauge Controller
Terranova 908A Dual Capacitance Diaphragm Gauge Controller
Terranova 926A Dual Convection Gauge Controller

which display the CE mark 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
EN 61326: 1997/A1: 1998/A2: 2002

Low Voltage Directive (73/23/EEC//93/68/EEC)
Electrical / Technical Safety Standard: EN 61010-1: 1993/A2: 1995: 2001

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

UL and CSA Listing
Safety of Electrical Equipment for Laboratory Use
Conforms to UL61010A-1, Issued 2002/01/30
Certified to CAN/CSA C22.2 No. 1010.1-92, 97

Appendix 1 Terranova® 908A Compatible Pressure Gauges

Duniway Part No.	Description	Fitting*
722B-1000	MKS 722B Baratron® Absolute Capacitance gauge	1" OD Tube
722B-100	MKS 722B Baratron® Absolute Capacitance gauge	1" OD Tube
722B-10	MKS 722B Baratron® Absolute Capacitance gauge	1" OD Tube
722B-1	MKS 722B Baratron® Absolute Capacitance gauge	1" OD Tube
808-1000-NPT	Duniway Terranova® 808 Diaphragm gauge	1/8" Male NPT
808-1000C-NPT	Duniway Terranova® 808 Diaphragm gauge	1/8" Male NPT

* Other fittings available upon request

Appendix 2 Gauge Cable Diagrams

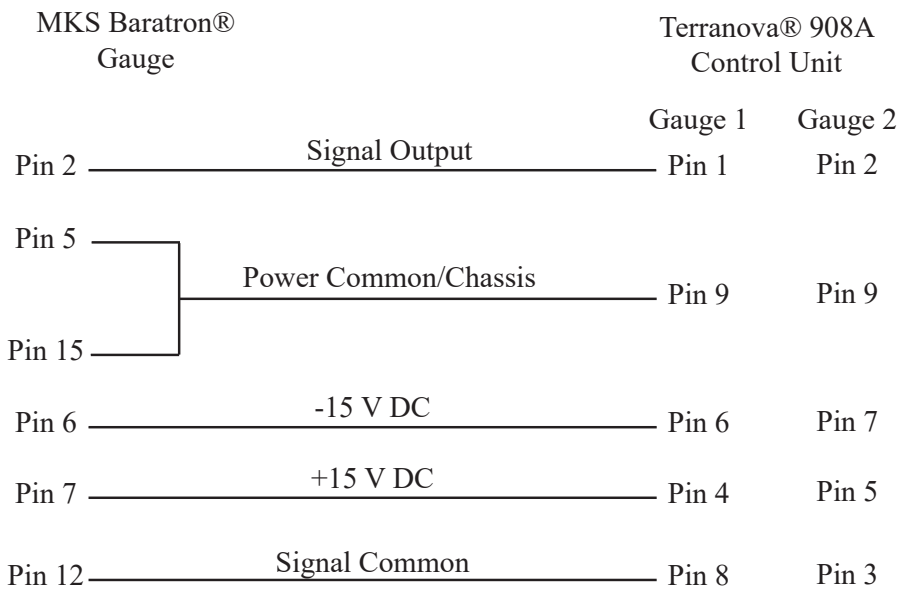

Figure 1 Terranova® 908A to MKS Baratron® with 15-pin D-sub connector cable diagram

Appendix 3 Full Scale Range Options

Full Scale		Display Format [Torr/mBar]*	
Torr	mBar	Upper Range	Lower Range
1.00×10^{4}	1.33×10^{4}	NNNN	N
5000	6650	NNNN	N.N
2000	2660	NNNN	N.N
1000	1330	NNN.N	N.N
500	665	NNN.N	N.NN
200	266	NNN.N	N.NN
100	133	NN.NN	N.NN
50	66.5	NN.NN	N.NNN
20	26.6	NN.NN	N.NNN
10	13.3	N.NNN	N.NNN
5	6.65	N.NNN	N.N [mTorr/µbar]
2	2.66	N.NNN	N.N [mTorr/µbar]
1	1.33	NNN.N	N.N [mTorr/µbar]
1×10^{-1}	1.33×10^{-1}	NN.NN [mTorr/µbar]	N.NN [mTorr/µbar]
5×10^{-2}	6.65×10^{-2}	NN.NN [mTorr/µbar]	N.NN [mTorr/µbar]
2×10^{-2}	2.66×10^{-2}	NN.NN [mTorr/µbar]	N.NN [mTorr/µbar]

Table 1 Torr/mBar display format

Full Scale	Display Format [Pa]*	
Pascal	Upper Range	Lower Range
1.33×10^{6}	NNNN [kPa]	N.N [kPa]
6.65×10^{5}	NNN.N [kPa]	N.NN [kPa]
2.66×10^{5}	NNN.N [kPa]	N.NN [kPa]
1.33×10^{5}	NNN.N [kPa]	N.NN [kPa]
6.65×10^{4}	NN.NN [kPa]	N
2.66×10^{4}	NN.NN [kPa]	N
1.33×10^{4}	NN.NN [kPa]	N
6650	NNNN	N.N
2660	NNNN	N.N
1330	NNNN	N.N
665	NNN.N	N.NN
266	NNN.N	N.NN
133	NNN.N	N.NN
13.3	NN.NN	N.NNN
6.65	N.NNN	N.NNN
2.66	N.NNN	N.NNN

Table 2 Pascal display format

*Display resolution is in single-digit increments within the respective pressure range

Appendix 4 Notes on Terranova® Set Point Relays

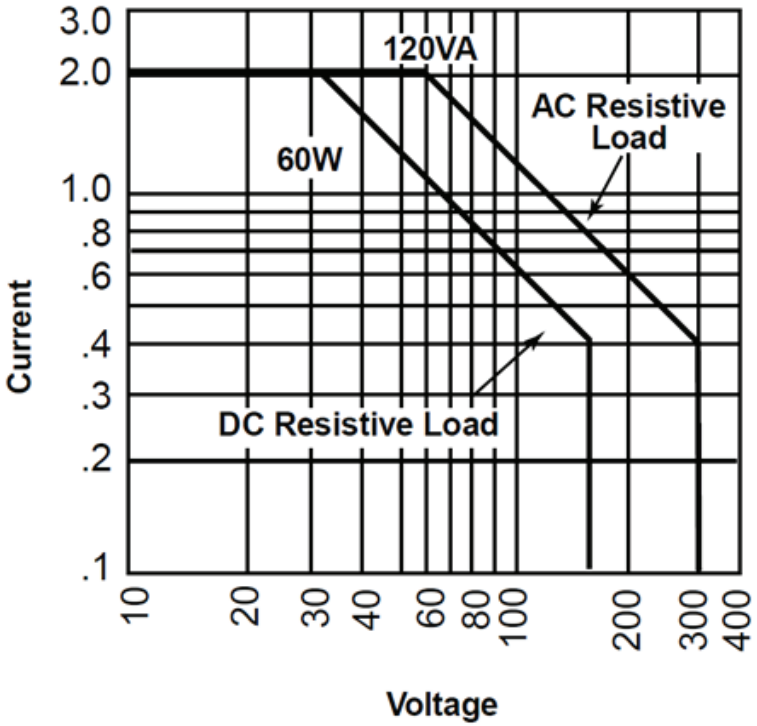

Figure 1 Heavy Duty Type AZ5 relay voltage-current relationship

The Heavy Duty Type AZ5 relay is used in the Terranova® 908A to control external functions. As shown in Figure 1, maximum current varies from 2 A at 30 V DC (60 V AC) to 0.4 A at 150 V DC (300 V AC) for resistive loads.

Protective Circuits for Inductive Loads

A protective circuit or component is recommended when switching inductive loads to suppress sudden voltage spikes. One method to suppress high voltage spikes in an AC circuit is through the use of a "snubber" circuit. A "snubber" circuit consists of a capacitor and resistor across an inductive load. As shown in Figure 2, the "snubber" circuit is parallel to the high-current relay.

Appendix 4. Notes on Terranova® Set Point Relays

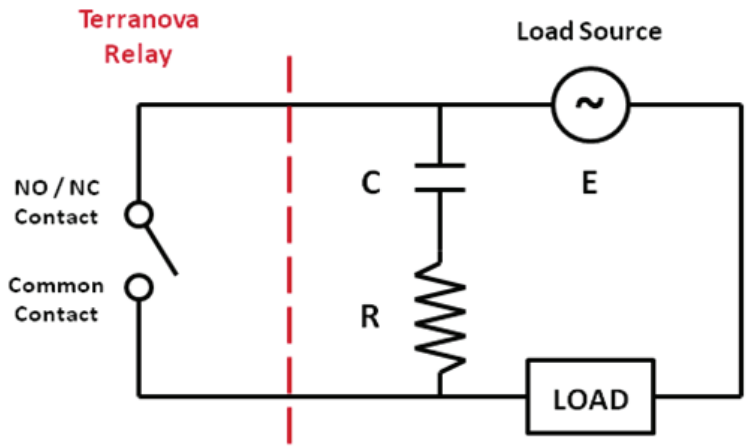

Figure 2 Example of a "snubber" circuit

To calculate the appropriate capacitor C in microfarads [μF] and resistor R in ohms [Ω] to use in the "snubber" circuit, Paktron Capacitors' Quencharc® technical note[1] suggests the following empirical equations:

$$C=I^2/10 \quad (1), \text{ and}$$

$$R=E/10I(1+50/E) \quad (2),$$

where I is the load current prior to contact opening in amperes [A] and E is the source voltage in volts [V]. For example, if Figure 2 shows a 1 A high-current relay with a 110 V AC source connected in series with the Terranova relay, I = 1 A and E = 110 V AC. Therefore, Equation 1 provides a capacitance value of 0.1 μF; Equation 2 provides a resistance value of approximately 8 Ω. Thus, a 0.1 μF capacitor and a 10 Ω resistor should be used for the "snubber" circuit. However, user must take into consideration the voltage and power rating of the capacitor and resistor, respectively, to meet the requirements of the circuit. Similar protective circuits or components should be considered to suppress current spikes in capacitive loads.

1. Pancon Corporation. '2012 Catalog'. 2012. 18-19. Web. http://www.panconcorp.com/PDFs/Catalogs/Paktron_2012catalog.pdf