Instruction Manual

Terranova Scientific
Model 926 Dual Convection Gauge Controller
for use with Granville-Phillips CONVECTRON® Gauges or MKS/HPS Type 317 Convection tubes

TERRANOVA

rev092401sr

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Safety Information

Explosive Gases 

WARNING!
Do not use the Model 926 Dual Convection 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.

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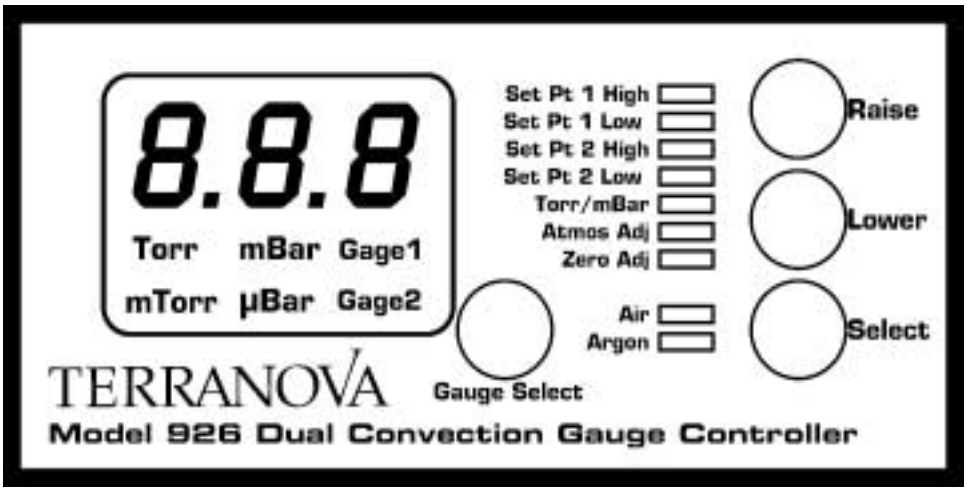

Figure 1: Model 926 front view

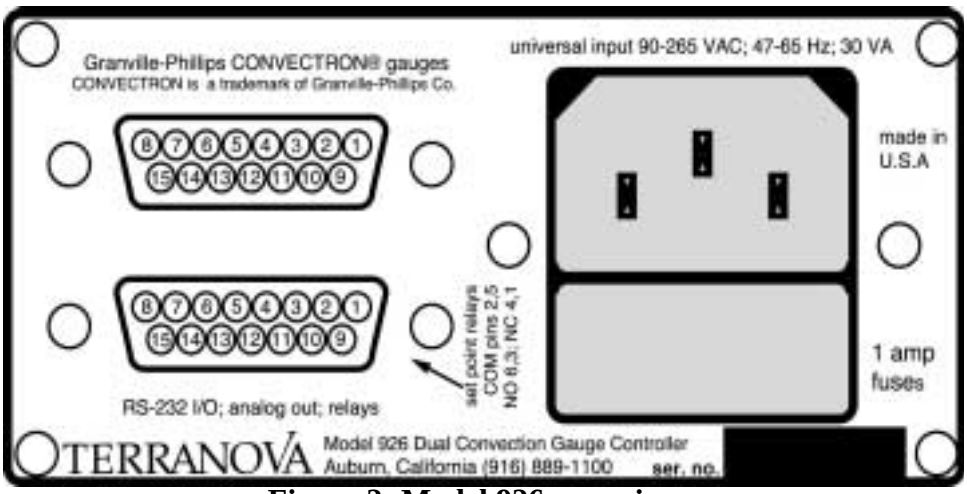

Figure 2: Model 926 rear view

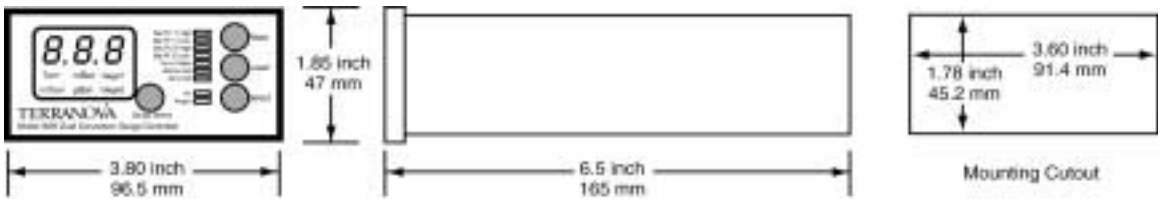

Figure 3: Model 926 Dimensions

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I Overview

A. General Description

The Terranova Scientific Model 926 Dual Convection Gauge Controller displays vacuum pressure as measured from a Granville-Phillips CONVECTRON® gauge tube or a HPS/MKS Type 317 Convection Enhanced Pirani gauge tube. It displays vacuum measurements based on thermal conductivity of air or nitrogen. The Model 926 controller covers the range from 0.1 mTorr to 1000 Torr or 0.1 µbar to 1000 mBar, and controls two relays with independent set points.

B. Specifications

1. Useful Measuring Range

0.1 mTorr (µbar) to 995 Torr (mBar), for air or nitrogen; (10^{-4} torr (mBar) to 10^{3} torr (mBar)); range selection is automatic

2. Display Range

-19 mTorr (µbar) to 995 torr (mBar); pressures lower than -19 mTorr (µbar) display **LO**; pressures higher than 995 torr (mBar) or no tube attached, display **HI**; if cable is not connected to the unit, display shows **OFF.**

3. Accuracy of Interface to Gauge

Pressure calculation algorithm is accurate to ±1% of published Granville-Phillips data for the CONVECTRON® gauge (this is for the 926 controller only, and does not include uncertainty of the CONVECTRON® gauge).

4. Units of Display

torr or mBar; user selectable

5. Vacuum Gauge

For both the Granville-Phillips CONVECTRON® and HPS/MKS Model 317 Convection Enhanced Pirani gauges; controller uses standard Granville-Phillips 15-pin connection.

6. Operating Temperature Range

+2 to +50 deg. Celsius

7. Pressure Display

3-digit bright red LED, 10 mm high

8. Display Indicators

red LED for set points and other parameters

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9. Display Resolution
varies; from 0.1 mTorr (µbar) below 10 mTorr (µbar), to 5 Torr (mBar) above 100 Torr (mBar)

10. VAC and ATM Adjust
adjusted by front panel push-button

11. Process Control Set Points
two, adjusted by front panel push-button

12. Process Control Relays
two relays, 2 amp, 240 VAC contacts; independent Normally Open and Normally Closed; +5 volts is provided for TTL applications; available through the D15 accessory connector

13. Nonvolatile Memory
for VAC, ATM and SET POINTS

14. Analog Output
calibrated, 12-bit resolution, logarithmic, 0.50 volts/decade; 0.0 mTorr (µbar) = 0 volts; 10 mTorr (µbar) = 0.50 volts; 100 mTorr (µbar)= 1.00 volts; etc.; available through the D15 accessory connector

15. RS-232 Input/Output
allows user to read pressure and set points; 9600 baud, 8-N-1; available through the D15 accessory connector

16. Operating Voltage
the Model 926 has a universal power supply, which operates on input voltages from 85 VAC to 265 VAC 50/60 Hz; standard IEC 320 instrument power input receptacle on rear panel; replacement fuse type: 5 mm X 20 mm, regular 1 amp

manufacturer	fuse type
Bussman	GDB-1A or GDC-1A
Littlefuse	217 001 or 218 001

17. Weight
1 lb. / 0.5 kg

18. Mounting

Side clips are provided for panel mounting in standard 1/8 DIN cutout.

19. Environmental Considerations

not for use with explosive or corrosive gases

20. Vacuum gauge tube:

the HPS/MKS Model 317 gauge and the Granville-Phillips CONVECTRON® gauge series 275 are available from Duniway Stockroom or the maunufacutrers listed below:

Duniway Stockroom
1305 Space Park Way
Mountain View, CA 94043
Telephone: (800) 446-8811 or (650) 969-8811
Facsimile: (650) 965-0764
Internet: www.duniway.com

HPS Division, MKS Instruments, Inc.
5530 Sterling Drive
Boulder, CO 80301
Telephone: (800) 367-1967 or (303) 449-9861
Facsimile: (303) 442-6880

Granville-Phillips Company
5675 Arapahoe Avenue
Boulder, CO 80303
Telephone: (800) 776-6543 or (303) 443-7660
Facsimile: (303) 443-2546

II Installation

A. Unpack the Controller

Carefully unpack the Model 926 Convection Gauge Controller.
The shipment includes these components:

- controller unit
- power cord
- gauge cable
- mounting clips
- D15 accessory connector
- this instruction manual

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

B. Mount the Controller

You can mount the controller unit freestanding 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 44 mm by 92 mm. 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 until the central tongue locks the clip in place. Then slide the unit into the panel; the clips will hold the unit in place.

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

C. Select the Gauge Tube

The Model 926 controller is designed to work with the HPS/MKS Model 317 and Granville-Phillips CONVECTRON® gauge tubes, series 275. See **Specifications** for availability of gauges. If you have difficulty obtaining a gauge, please contact us at Duniway Stockroom.

CAUTION
Use of a gauge tube other than those listed above may cause improper readings, and may cause damage to the gauge tube.

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D. Connect the Gauge Tube

Make sure that the gauge tube is securely connected to the vacuum system, using good vacuum practice. The gauge tube must be mounted with its axis horizontal, and the port pointing down; large errors may result at higher pressures if the gauge axis is not horizontal.

E. Attach the Gauge Cable

The CONVECTRON® gauge cable has a special socket for the gauge on one end and a 15-pin D-sub connector on the other; the cable uses standard Granville-Phillips pin assignment for both ends of the cable. For the HPS/MKS Model 317 gauge tube, the gauge cable has a 9-pin D-sub connector for the gauge on one end and a 15-pin D-sub connector on the other end. See the table below for pin connection information.

CAUTION

Make sure that the power to the controller unit is off before you connect the gauge tube to the controller unit. Unplugging and then plugging in the gauge cable with the power on can cause the HPS/MKS or Granville-Phillips gauge to burn out.

For the HPS/MKS tube, connect the 9-pin D-sub connector the the matching connector on the tube. For the CONVECTRON®, align the keyway of the connector with the key on the gauge tube, and push the connector onto the gauge tube's pins until it seats firmly.

Connect the 15-pin D-sub plug of the gauge cable to the 15-pin D-sub jack on the back of the controller unit. Push the plug onto the jack until it is firmly in place. Tighten the retaining screws to make certain the connector remains in place. Loose connections can damage the gauge tubes.

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NOTE

If you have a cable from one of the analog display Granville-Phillips CONVECTRON® gauge controllers, it is an easy task to convert the cable for use with the Model 926. The analog controller uses a combination cable for the CONVECTRON® gauge and for AC power input. To convert the cable:

- You must have a D15 connector with male pins; a connector with solder cups is an easy version to work with. If you have difficulty locating one of these, call us and we will send you one.
- Identify the cable which plugs into the CONVECTRON® gauge.
- Follow the cable to the edge-connector and cut the cable, separating the cable from the edge-connector.
- Remove the jacket of the cable, about 1.5 inch (40 mm).
- Strip the wires, about 0.25 inch (0.5 mm).
- Observe the pin numbers identified on the CONVECTRON® gauge connector and the D15 connector.
- Connect as follows; you should verify the connections with a continuity checker:

926 D15 connector	CONVECTRON® tube	HPS/MKS 317 tube D9
pin 1	no connection	no connection
pin 2	ground	gauge 1, pins 2,4,5 & 9
pin 3	ground	gauge 1, pins 2,4,5 & 9
pin 4	no connection	gauge 1, pins 2,4.5.& 9
pin 5	gauge 1, pin 2	gauge 1, pin 7
pin 6	gauge 1, pin 5	gauge 1, pin 8
pin 7	gauge 1, pin 1	gauge 1, pins 1,3 & 6
pin 8	gauge 1, pin 1	gauge 1, pins 1,3 & 6
pin 9	ground	gauge 2, pins 2,4,5 & 9
pin 10	no connection	gauge 2, pins 2,4,5 & 9
pin 11	gauge 2, pin 2	gauge 2, pin 7
pin 12	gauge 2, pin 5	gauge 2, pin 8
pin 13	gauge 2, pin 1	gauge 2, pins 1,3 & 6
pin 14	gauge 2, pin 1	gauge 2, pins 1,3 & 6
pin 15	ground	gauge 2, pins 2,4,5 & 9

F. Make Relay Connections

You can set two process control set points from the front panel of the controller (SET PT 1) and (SET PT 2). The set points control two relays that are accessible through the connector on the back of the controller. SET PT 1 controls relay #1, and SET PT 2 controls relay #2. Relay contacts are available through the D15 Accessory Connector. See pin connection table below.

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G. Make Accessory Connections

The 15-pin D-sub Accessory Connector is on the rear panel of the 926, see fig. 2, page 6. 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:

15-pin	**Accessory Connector**
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 926; 9600-N-8-1
pin 8	Rx, RS-232 signal into the 926
pin 9	ground, RS-232 and analog common
pin 10	no function
pin 11	no function
pin 12	no function
pin 13	analog output, 1K output, 0.5 volts/decade
pin 14	no function
pin 15	no function

H. Check Supply Voltage

The Model 926 incorporates a universal power supply. This allows the 926 to operate on any input voltage from 90 VAC to 265 VAC, 47 to 65 Hz.

I. Attach the Power Cord

Plug the power cord into the receptacle in the power module on the rear of the 926.

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III 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, µBAR, 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, **926**
- display shows software version, e.g. **1.01**

The 926 will go into normal operation and begin measuring pressure. If a gauge cable is not connected to the 926, the display will show **OFF**. If the system pressure is greater than 990 Torr (mBar) or if a gauge is not connected to the cable, the display will show **HI.**

B. Front Panel Controls

The Model 926 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 the 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:

1. 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 to 4.0 mTorr.

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 926 is in this mode, the set point may be assigned to either GAGE 1 or GAGE 2 by pressing the GAUGE SELECT button.

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2. 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 to 3.0 mTorr.

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 926 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.

3. Set Pt 2 High

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

4. Set Pt 2 Low

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

5. 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.

6. Setting Atmosphere

You should know the local barometric pressure before proceeding; your local airport may have this information. Normal pressure is approximately 760 Torr (1000 mBar) at sea level.

Press the button labeled SELECT until the ATM LED is flashing. You may now use RAISE and LOWER to set the pressure to the desired pressure. Initially, the display may read a value which is substantially higher than atmospheric pressure, or even “HI”. Just proceed to use the LOWER button to bring it into range. If you try to set ATM pressure when the pressure is less than approx. 200 torr (350 mBar), you will get a long beep from the loudspeaker. As the display changes, you will hear a series of ‘chirps’ from the loudspeaker.

7. Zero

This allows the user to adjust the zero for each gauge. Before making this adjustment, the gauge should be connected to a vacuum system at a pressure lower than 0.1 mTorr. 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 gauge to be adjusted is attached to a system that has another gauge which has been independently calibrated, the gauge may be made to read the same as the calibrated gauge. The ZERO function may be adjusted only when the gauge reading is lower than 50 mTorr. If you try to set zero pressure when the instrument is greater than 50 mTorr (65 mBar), you will get a long beep from the loudspeaker.

8. 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 926 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.

C. Set Point Operation

See description of operation under **Front Panel Controls**.

D. Reading Pressure

Pressure display and ranging are automatic in the 926. Most readings will take place between zero pressure and the full scale of the 926. For pressure lower than the minimum capability of the 926, the display will show -LO. For pressure greater than the maximum full scale of the 926, the display will show HI.

E. 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:

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

where V is the Analog Output in volts; P is the pressure in mTorr or µbar.

Some examples follow; because of normal tolerances in the electronics, there may be minor differences in the values you observe compared to those shown:

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displayed pressure	Analog Output - volts
LO	0.00
0 mTorr (µBar) or less	0.00
0.10 mTorr (µBar)	0.50
0.20 mTorr (µBar)	0.65
1.0 mTorr (µBar)	1.00
10.0 mTorr (µBar)	1.50
100 mTorr (µBar)	2.00
1.00 torr (mBar)	2.50
10.0 Torr (µBar)	3.00
100 Torr (mBar)	3.50
999 Torr (mBar)	4.00
OFF or **HI**	4.00

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

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

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

where P is pressure in mTorr or µbar; V is the Analog Output in volts.

Analog Output - volts	pressure
0.10	0.016 mTorr (µbar)
0.50	0.10 mTorr (µbar)
1.00	1.00 mTorr (µbar)
1.10	1.58 mTorr (µbar)
2.00	100 mTorr (µbar)
3.50	100 Torr (mBar)
4.00	1000 Torr (µBar)

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

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F. 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 6.

pin 7 is Tx (signal from the 926 to the terminal)
pin 8 is Rx (signal from the terminal to the 926)
pin 9 is return (ground).

The serial port allows reading pressure and other parameters of the 926; it is not possible to modify stored parameters over the serial port.

The following commands are used in the 926:

1. Pressure

To read the pressure of both gauges

Send “p” (ASCII value 112); the 926 sends pressure for gauge 1 and gauge 2 to the terminal. Output is in the format:

ABCeD EFGeH

where
ABC is the multiplier and *D* is the exponent for gauge #1
EFG is the multiplier and *H* is the exponent for gauge #2

Some examples follow:

displayed pressure	Serial Output
OFF	Off
LO	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
HI	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.

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2. Full Scale Of The Gauges

To read the full scale range selected for each gauge

Send "f" (ASCII value 102); the 926 returns full scale which the user has selected for each gauge in the format:

JKLeM NPQeR

where
JKL is the multiplier and *M* is the exponent for gauge #1
NPQ is the multiplier and *R* is the exponent for gauge #2

Some examples follow:

full scale	**Serial Output**
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 926 returns

Torr
or
mBar

4. Set Point #1

To read the setting and status of set point #1

Send "1" (ASCII value 49); the 926 returns information for set point #1 in the format:

STUeV WXYeZ A 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 926 returns information for set point #2 in the same format as for set point #1, above.

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6. Model And Software Revision

To read software identification.

Send "v" (ASCII value 118); the 926 returns the model number of the instrument and the revision number, as in the following example:

926 ver 1.02

7. Other Gases

If you need to measure the pressure of gases other than air or nitrogen, refer to the following table:

true pressure	**Indicated pressure on Model 926 display, torr**									
torr	Argon	CO2	Deuterium	Freon 12	Freon 22	Helium	Krypton	Methane	Neon	Oxygen
0	0	0	0	0	0	0	0	0	0	0
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0002	0.0001	0.0001
0.0002	0.0001	0.0002	0.0002	0.0003	0.0002	0.0002	0.0002	0.0003	0.0001	0.0002
0.0005	0.0003	0.0006	0.0006	0.0008	0.0007	0.0004	0.0003	0.0008	0.0003	0.0005
0.001	0.0007	0.0011	0.0019	0.0015	0.0014	0.0008	0.0005	0.0018	0.0007	0.0010
0.002	0.0013	0.0023	0.0024	0.0030	0.0029	0.0016	0.0010	0.0032	0.0014	0.0020
0.005	0.0033	0.0055	0.0060	0.0075	0.0068	0.0040	0.0023	0.0077	0.0035	0.0049
0.01	0.0065	0.0109	0.0120	0.0147	0.0135	0.0080	0.0046	0.0152	0.0070	0.0097
0.02	0.014	0.022	0.024	0.030	0.027	0.016	0.009	0.031	0.014	0.020
0.05	0.033	0.055	0.060	0.073	0.069	0.041	0.024	0.077	0.035	0.049
0.1	0.064	0.107	0.120	0.142	0.136	0.082	0.046	0.158	0.070	0.097
0.2	0.126	0.208	0.247	0.270	0.259	0.163	0.085	0.310	0.140	0.192
0.5	0.307	0.494	0.673	0.599	0.582	0.427	0.214	0.764	0.353	0.477
1	0.59	0.93	1.51	1.03	1.01	0.92	0.39	1.56	0.73	0.95
2	1.12	1.67	4.02	1.59	1.62	2.16	0.68	3.23	1.60	1.90
5	2.36	3.24	261	2.38	2.54	13.2	1.25	13.3	5.10	4.85
10	3.86	4.84		2.86	3.29		1.74	28.6	21.5	10.1
20	5.67	6.39		3.21	3.61		2.23	359	584	22.4
50	7.72	8.00		3.68	4.02		2.50	845		85.7
100	8.71	9.02		4.56	4.78		2.66			226
200	9.65	12.0		5.81	6.23		3.07			303
300	11.1	16.8		6.69	7.31		3.49			383
500	15.9	29.4		8.06	8.98		4.10			603
700	21.9	48.8		9.20	10.4		4.60			861
760	23.9	56.0		9.52	10.8		4.63			943
900	29.2	88.2		10.2	11.7					
1000	33.8	129		10.8	12.4					

For example, if you are measuring the pressure in a system that is backfilled with argon, and the Model 926 display shows an indicated pressure of 23.9 torr, the true pressure is 760 torr. If the indicated pressure is 14 mTorr (0.014 torr), the true pressure is 20 mTorr (0.02 torr).

These data were compiled from a variety of sources, and are believed to be reliable, however Duniway Stockroom Corp. takes no responsibility for errors in the data. If your application is critical, we suggest you use the services of an independent laboratory to calibrate the HPS/MKS 317 or CONVECTRON® gauge and Model 926 controller to your specific application.

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IV 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 926; 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 1 amp

manufacturer	fuse type
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.

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V 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 display comes on dimly and does not indicate the correct pressure, check to see that the proper voltage has been selected on the power input module.

If pressure readings are unreliable or noisy: Check the connection to the gauge tube. Check that the gauge tube is clean and not contaminated; a contaminated or dirty gauge tube can cause erratic readings. Use an ohmmeter to check that none of the CONVECTRON® gauge pins are shorted to the metal housing of the tube.

If readings at VAC or ATM seem wrong: A new gauge is calibrated by the manufacturer to be within 5 mTorr of true zero at vacuum, and within 20 torr at 760 torr. If recovery of factory settings (see **Operation** section) does not give readings which appear reasonable, it is possible that your gauge has become contaminated or damaged. You may try cleaning the gauge using acetone or TCE (1-1-1 trichloroethane). Be careful when using flammable solvents, so that you do not risk explosion from the flammable vapors.

You can measure the CONVECTRON® gauge to see if it has the correct internal resistance values. If the measured values differ from those shown, it is possible that your gauge has become damaged. These measurements must be made while the gauge is at atmospheric pressure; do not use a method which applies more than 10 mA to the pins or you will damage the fine internal wires.

between pins	resistance
1 and 2	20 ohm to 30 ohm
2 and 3	50 ohm to 60 ohm
1 and 5	175 ohm to 190 ohm

If the resistance between pins 1 and 2 measures approx. 800 ohms, it means the internal sensor wire is broken and the CONVECTRON® gauge must be replaced.

VI Return Procedure

If you need to return the gauge controller for service, first contact Duniway Stockroom to get authorization. Then pack the instrument securely. Use the original packaging if it is available. If you do not have appropriate packing materials, a commercial packing and shipping firm can provide them.

Notes

VII 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 prepay 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

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 926 Dual Convection Gauge Controller
Model 908A Dual Capacitance 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)

Safety of Electrical Equipment for Laboratory Work
UL3101-1, 1st Edition
CAN/CSA C22.2 No. 1010.1-92

CE

August 30, 2001

by: Sherman Rutherford
Compliance Manager

Duniway Stockroom Corp.
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