



## Digivac Model 22W<sup>™</sup> and 22wLcd<sup>™</sup> *Wide Range* Linearized Vacuum Controller/Transmitter/232

Thank you for purchasing the Digivac Model 22W (LCD) Vacuum Transmitter. This instrument works in conjunction with a DC powered Vacuum Gauge tube to produce a linear and RS-232 output proportional to the sensed vacuum. It also has a set point enabling it to control external equipment. Its range is from Atmosphere (760 Torr/1000 millibars) to 0 millitorr / millibar

The 22wLcd is similar to the 22W and includes a 24 character LCD display (12 characters on two lines)

The unit, as shipped, is pre-tested, pre-calibrated and ready for operation.

The unit consists of the instrument housing with interface connector and a Vacuum Gauge tube. It can be powered by an external source of 12 to 24 vdc or with an external 115/230 VAC power adapter. An LED that protrudes from the case will light when the control relay is energized.

### Installation.

Mount the unit into a clean, dry part of a vacuum system.

The Gauge Tube should be stem down to facilitate drainage.

The axis of the tube should be vertical although angles of up to 45 degrees are generally well tolerated.

Make Electrical connections as follows:

(It is not necessary to connect everything; only the features you wish to use)

- Pin 1 Analog Input (Set point)
- Pin 2 RS 232 Transmit Output (9600 N81)
- Pin 3 no connection
- Pin 4 Analog Output
- Pin 5 Power and Signal ground
  
- Pin 6 Relay Normally Open
- Pin 7 Relay Common
- Pin 8 Relay Normally Closed
- Pin 9 See packing list! 5 to 24 VDC (adjacent to pin 5)

Power Connection: Check your packing list! Some Digivac gauges have a separate power supply connector.

All units operate internally on 5 volts, Dc. Some have a voltage regulator that allows them to be powered by 24 Vdc. Do not assume that your unit has this feature!

It is best to avoid mounting the unit where it will be subjected to excessive vibration or oil vapors. For this reason, the unit should not be mounted directly on a vacuum pump. If it must be placed close to a vacuum pump, it is desirable to have at least two 90 Degree turns in the piping. In this way, there will be no direct optical path for oil vapors, and gauge tube life and calibration will be maximized. One way to protect the tube is to use a pressure gauge "siphon" such as McMaster-Carr 4031K11 (\$1.81 in catalog 99).

The vacuum sensor has a 1/8 pipe thread connection. If any significant torque is to be applied to this connection, Use a 7/16 open-end wrench. Do not use the body of the instrument as a wrench!

Operation. When the unit is energized, it will produce an output of 0 to 4000 millivolts when sensing a pressure of 0 to 760 Torr.

### RS-232 Operation

The RS-232 output will put out a text string displaying the level of vacuum and the current set point. Its parameters are 9600 baud 8 data bits, no parity, one stop bit. Data is sent unsolicited at one-second intervals; no handshaking or troublesome commands are required.

Simply connect pins 2 and 5 to a female 9 pin D-sub connector, and connect that to any pc serial port.

Data is formatted as follows:

9.40 torr Set=10.0 cts=6210 High

This output includes actual pressure, Set point, Linearizer input counts, and relay status  
The a to d converter input counts are displayed primarily for factory use.

Data may be monitored by any PC with running Hyperterm, or Windows Terminal. Data may be saved to the user's PC using "Receive File" and "Save File" instructions, which are included. Data may be plotted using Microsoft Excel or any other spreadsheet program.

Special monitoring, logging, and plotting programs, written in Visual Basic are available from the Digivac Company.

Description of parts:

Power Supply: When external DC is not used, a compact external switching power supply converts any input power 115 to 230 VAC or VDC to 5 volts DC to operate the unit.

Voltage Regulator: The unit has an internal voltage regulator that reduces the external DC voltage (when used) to 5 Volts DC

Amplifier An integrated circuit operational amplifier senses the millivolt signal from the vacuum gauge tube and multiplies it by 499.

Microprocessor A microprocessor that reads the analog signal performs mathematical calculations to convert the non-linear input to a linear output and transmits the output to D to A converter.

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The microprocessor contains EEprom memory that stores calibration constants and enables user adjustments.

Adjustment pins appear on the circuit board. See instructions below.  
The Microprocessor also provides an RS232 output at 9600 8N1.

Set point the unit has an internal potentiometer that provides the control set point  
This potentiometer is located adjacent to pin 3 of the microprocessor. Remove the top cover of the unit to adjust the pot. If desired, an external set point can be connected to pin 1 of the connector and an external set point can be used.

The settings are scaled, linear-by-decade, as follows:

0.0 to 0.999 volts = 0 to 999 millitorr  
1.1 to 1.99 volts = 1.0 to 9.9 torr  
2.1 to 2.99 volts = 10.0 to 99 torr  
3.1 to 3.76 volts = 100 to 760 torr

examples:

0.100 volts = 100 millitorr  
0.250 volts = 250 millitorr  
0.999 volts = 999 millitorr  
1.050 volts = not possible  
1.105 volts = 1.05 torr  
1.110 volts = 1.10 torr  
1.200 volts = 2.00 torr  
1.450 volts = 4.50 torr  
2.100 volts = 10.0 torr  
2.870 volts = 87.0 torr  
3.500 volts = 500 torr

Note that some readings of the analog output are not possible; it jumps directly from .999 millivolts to 1.100 volts so there will be no readings in between.

If the unit is not operating at the desired set point, it may be adjusted using the potentiometer and using the above numbers as a guide.

Relay The unit includes an Spdt solid-state relay, which energizes whenever the sensed pressure is below the set point. The relay is rated 240 vac 150 milliamps.

Analog Output The unit has an analog output, which can be used to transmit vacuum to external equipment such as PLC's or chart recorders.

This analog output is normally scaled Linear by decade, the same as the set point encoding described above.

<u>Torr</u>	<u>Display</u>	<u>scale</u>	<u>Volts</u>
.000	0 0 0	0	0.000
.100	1 0 0	0	0.100
.200	2 0 0	0	0.200
.500	5 0 0	0	0.500
.925	9 2 5	0	0.925
1.00	1.0 0	1	1.100
2.20	2.2 0	1	1.220
5.18	5.1 8	1	1.518
8.86	8.8 6	1	1.886
11.9	11. 9	2	2.119
34.7	34. 7	2	2.347
55.3	55. 3	2	2.553
71.9	71. 9	2	2.719
96.4	96.4	2	2.964
110	110	3	3.110
340	340	3	3.340
550	550	3	3.550
760	760	3	3.760

If a different scale is desired, it can usually be accommodated for a modest one-time fee. Certain freeze dryer customers prefer 0 to 5 volts = 0 to 10 torr.

Plc's can usually take a voltage input. A 4 to 20-milliamp output is available at extra charge.

### Principle of operation

The unit's vacuum gauge tube produces a millivolt output proportional to its temperature rise above ambient. This millivolt signal is amplified by 499 and is sensed by the microprocessor.

A control algorithm in the processor adjusts the excitation of the gauge tube so as to hold the tube at an essentially constant temperature. Pressure is inferred from the power level required to hold this temperature.

When pressure is below the user set point, the control relay is energized.

The pressure is communicated with the user as a signal on the unit's serial port, and as an analog voltage.

Special units. It is the policy of the Digivac Company to manufacture custom vacuum instrumentation for special applications whenever it is economically feasible to do so. Visit our web site [www.digivac.com](http://www.digivac.com) for examples. The Model 22W has a socketed, flash microprocessor which is programmed in a high level language. It can often be economically reprogrammed for custom time delays and other special functions. We encourage inquiries about your special needs.

For repair or recalibration, return gauges to:

The Digivac Company  
105B Church Street  
Matawan, NJ, 07747.  
(732) 765 0900 (732) 765 1800Fax  
[www.digivac.com](http://www.digivac.com)

The Digivac Company manufactures a complete line of Vacuum Gauges and Vacuum Process Computers. Contact us or your distributor if you wish for further information.

Calibration: The unit arrives factory calibrated, and re-calibrations are best performed by the Digivac Company. User calibrations are possible however using the following procedure:

Remove the four screws holding the top housing in place and carefully remove the top and bottom housings, exposing the printed circuit board.

High End: At atmosphere, adjust the potentiometer adjacent to the INA122 and set it so that pin 2 of the microprocessor, (same as Pin 6 of the INA122) is at 4.25 Vdc at atmospheric pressure.

Low End: Locate the markings on the printed circuit board adjacent to pins 26, 27, and 28 of the microprocessor. It reads "+ Z -"  
Connect the serial output of the unit to a PC set at 9600 baud  
Observe the readings on the PC screen  
Operate the unit at the lowest attainable vacuum value. (Must be 100 mtorr or lower)  
Short pin 27 ("Z") to pin 28 ("+") to increase the reading.  
Short pin 27 ("Z") to pin 26 ("-") to decrease the reading.

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INSTRUCTION MANUAL

DIGIVAC 22W Series

Wide Range Linearized Vacuum Transmitter  
and Controller

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