

# Model 215 Series



## Operational Manual

### Digivac Models

Model 215H

Model 215V

**YOU MUST READ THIS MANUAL BEFORE USE**

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## Section 1: Overview

The DIGIVAC 215 series gauges are compact digital vacuum sensing instruments. They use a thermocouple gauge tube to sense vacuum and display the reading in either milliTorr, mBar or kilopascal. The Digivac Model 215 can either be panel mounted or sit on a bench top, and comes standard with 2 SPDT controls, analog output and RS232 data. The Digivac Model 215 can use different thermocouple gauge tubes. If in doubt about what gauge sensor you have, consult the Digivac packing list that came with your instrument for positive identification.

Major models and variations are as follows:

- **Model 215H**  
1/8 DIN enclosure that is shipped with a Hastings DV-6M thermocouple vacuum gauge sensor. (Range is 1 millitorr - 1,999 millitorr)
- **Model 215V**  
1/8 DIN enclosure that is shipped with an Agilent 531 Thermocouple vacuum gauge sensor (range is .001 Torr - 760 Torr)

Consult the Digivac website [www.digivac.com](http://www.digivac.com) for information about other Digivac vacuum controllers and gauges.

The Digivac Model 215H and 215V operate by measuring the temperature rise of an electrically heated thermocouple exposed to a vacuum. As vacuum increases, or more correctly, as absolute pressure decreases, fewer and fewer molecules of gas are available to cool the thermocouple. With less molecules the air temperature rises and the thermocouple gauge thus senses the vacuum. A precision reference inside the Digivac unit in conjunction with an integrated circuit amplifier controls the electrical excitation of the sensor filament. In gauges that use KJL6000 or Hastings tubes, a precision temperature compensated AC square wave oscillator is included in the electronics. The voltage response of the thermocouple is piped through a CPU and is translated to the current vacuum reading.

## Section 2: Construction

The Digivac product consists of the indicating and controlling instrument, the gauge tube, the gauge tube cable, interfaces for the 2 control connections, analog out, RS232 and an AC power adapter.

The instrument is housed in a rugged free-standing plastic enclosure. It can either be placed on a suitable surface, or can be mounted in a 1/8 DIN panel cutout. The gauge tube houses the various thermocouple sensing, heating and compensating elements and terminates in an octal connector. On this model, the connector wiring terminates at the instrument with a 6 position RJ24. Regulating circuitry in the Digivac product provides constant current for gauge tube excitation, and thus compensates for resistance in the probe leads.

## Section 3: Unpacking and Inspection

After the DIGIVAC package is received, it should be carefully unpacked and inspected for damage during shipment and for completeness. The package should contain, as a minimum, the instrument, the thermocouple gage tube, the tube connecting cable, and an instruction manual. In the event of a loss during shipment, a claim should immediately be made to the common carrier or the postal service, as applicable. The Digivac warranty pertains only to the instrument, and does not cover losses in shipping.

### Each 215 should come with:

- Display controller (black box with blue buttons) Power supply
- Gauge Tube Cable
- Varian 531 gauge tube
- Mounting Brackets
- RS232 (optional)
  - RS232 Port
  - 6' RS232 Cable
- Ethernet (optional, includes RS232) Ethernet Port
  - Null modem RS232 converter
  - 2' Ethernet Cable
  - Configuration CD

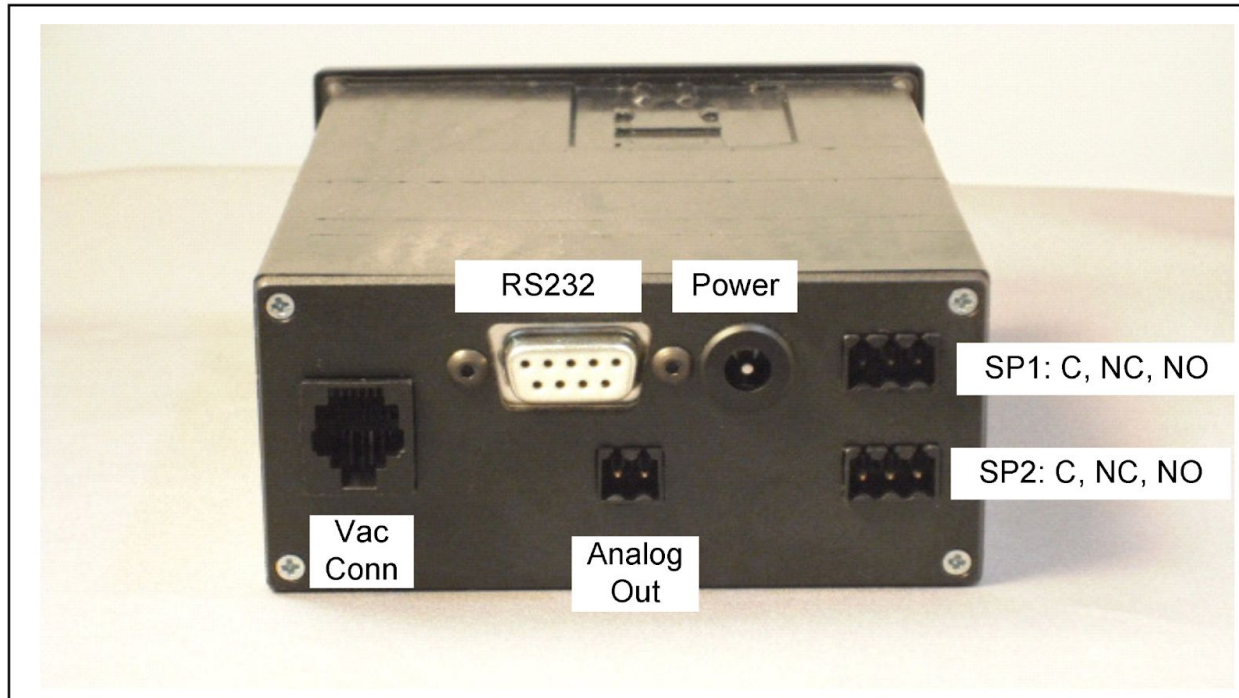
## Section 4: Installation

The instrument should be located in a clean, dry environment for best results. The unit can be panel mounted with the hardware provided in a 1/8" DIN panel cutout (3.64" x 1.78" [92mm x 45 mm]). Alternatively, the unit can be placed on a desktop by placing the 4 rubber feet included with your gauge on the underside of the unit. The gauge tube cable should be identified by wire tags or markings specific to your environment.

Thermocouple gauge tubes must be installed in a thread-down orientation in a clean, dry vacuum system. While threading the gauge tube into the manifold, the gauge tube cable should be disconnected to avoid damage. In this way, twisting of the cable and the octal socket on the tube is avoided. Care should be exercised to install the tubes in a dry part of the system. Since the instrument works on the principle of temperature rise, the probes will not work if they become filled with a liquid such as vacuum or diffusion pump oil. The gauge tube should be protected against oil and other contaminants by installing it in such a way to protect it. A good practice is to mount the gauge tube in the most vertically distant place from oil and other contaminants as applicable. The gauge tube should be mounted in the most stable pressure region of the vessel to be measured. For example, it would be better to install the gauge tube on a tank rather than on the pipe that is directly connected to a vacuum pump. In the event of contamination, see section 6.0 for gauge tube cleaning instructions.

The set point connections are in the back of the unit. There are 2 rows of pins. The top row of pins is for set point 1, and the bottom row of pins is for set point 2. The top 3 pins are in the order:

1. Common – The common line of a switch



2. N.C. – Normally closed. This means that above the set point value there is a current path between the common and the N.C. terminal. Put another way the switch is “ON” between these 2 terminals. At the set point value and below (higher vacuum, lower pressure) the connection is open. Put another way, the switch is “OFF” between the common and the N.C. connection at higher vacuum (a lower vacuum reading).
3. N.O. – Normally open. This means that above the set point value there is no current path between the common and N.O. connection. Put another way the switch is “OFF” between these 2 terminals. When the vacuum indication goes below the set point value (higher vacuum, lower pressure) the current path closes. Put another way the switch is “ON” between the N.C. and N.O. connections at absolute vacuum readings below the set point value.

Take care in ensuring that the wire connections are made fast, and the voltage and current does not exceed 250V or 7A. If you need to control a device that draws more

power, consider another relay in between the Digivac output and the device to be controlled.

The Analog output is located in the center of the back panel, and should be connected to a high impedance input. The output impedance is 1KΩ.

The RS232 connection can be made to a PLC or computer via a male DB9 cable connection to the female DB9 connection on the Digivac product. The Digivac product acts as a DCE, so a straight serial connection is appropriate.

Please use the supplied 5V AC adapter with your Instrument. This adapter provides clean short protected power to protect and insure accuracy of the internal circuitry.

## Section 5: Operation

After installation, the DIGIVAC gauge is ready for immediate operation. The unit will normally provide accurate readings immediately however, occasionally a gauge tube will have absorbed material during storage, and may require as much as 24 hours of operation before accurate readings are attained. It is recommended that the DIGIVAC gauge be energized continuously during vacuum system operation. In this way, the hot filament will not allow contaminants to condense.

In cases where the system has contaminants, as is often the case with metalizing and coating equipment, it is often effective to isolate the gauge tube with a solenoid or manual valve during periods when contamination is most active.

The Digivac controller can be easily set to the desired units on the fly:

1. Press the "sel" key three times during normal operation. The currently selected units will blink
2. Press the ^ and ˇ to get to the desired unit.
3. Press "Ent" to complete your selection.

**The Digivac 215 has 2 set points that can be used to actuate external equipment. These 2 set points can be adjusted from the front of the gauge in your currently selected units.**

1. To change SP1:
  - a. Press the “sel” key once to enter in set point 1. The SP1 LED should now blink
  - b. Press the “ ” and “ ” to get to the desired set point value. Note the set point units are in milliTorr. For example a set point of 1000 is equal to one Torr.
  - c. Press enter to accept the new set point value. Normal run mode will resume.
2. To change SP2:
  - a. Press the “sel” key twice to enter in set point 2. The SP1 LED should now blink
  - b. Press the “ ” and “ ” to get to the desired set point value
  - c. Press enter to accept the new set point value. Normal run mode will resume.
3. If you don't want the set points to actuate or the LEDs to illuminate at all, set the set point for “000”.

One of the units LEDs to the right of the LCD will always be lit during normal operation to indicate which pressure range the display is indicating.

The Instrument has additional outputs which can be used:

- **RS232** – The instrument puts out a standard RS232 serial stream with settings 9600, 8, N, and 1. The unit transmits but does not receive, and displays the current vacuum indication in the current units.
- **Analog out** – This output reads from 0 to 5 Volts from a pressure of 1 micron all the way up to 5 Torr. There is a graduation of 1 milliVolt per milliTorr. Therefore, 10 milliVolts = 10 milliTorr, and 4 Volts = 4 Torr.

## Section 6: Servicing

### GAUGE TUBE SERVICING

In many cases, a gauge tube may become fouled with oil or other foreign matter. Regular cleaning of sensors is safe and recommended. We recommend acetone for fully-welded stainless steel sensors such as the Agilent 531/536, and isopropyl alcohol for the VGT-500.



After cleaning with solvents, the gauge tube should be completely dried, either under vacuum or in ambient air, prior to reinstalling it. ***Do not attempt to dry the sensor with a cotton swab or compressed air.***

## **FACTORY REPAIR AND CALIBRATION**

The vacuum gauge assembly is designed to provide years of trouble-free service, and the liberal internal use of plug-in components makes it easily repairable. No field servicing of the unit is recommended, but factory servicing and calibration are available at a nominal cost and turn-around times of 24 hours are typical.

## **FIELD CALIBRATION**

Each Digivac vacuum gauge controller is calibrated to the particular sensor that is shipped with the unit. While switching out the sensor is possible, it will result in inaccurate readings without re-calibrating the gauge. We recommend contacting us for specific instructions if field calibration is unavoidable and the gauge cannot be returned to us.

## **Section 7: Notes on Calibration**

The DIGIVAC unit is calibrated in nitrogen, which has thermal properties virtually identical to air. Other gasses will affect the readings by an amount proportional to the thermal conductivity of the gases. In most cases, the gases present in a vacuum system will be air, nitrogen, or oxygen, and no appreciable errors will occur.

Certain other gases, however, have thermal conductivity significantly greater than air and will cause the instrument to read higher than the actual amount of pressure. Examples of such gasses are water vapor, fluorocarbon refrigerants, and acetone. Conversely, other gasses have thermal conductivity significantly lower than air and will cause the instrument to read lower than actual pressure. Examples of such gasses include helium, oxygen and to a lesser extent, CO<sub>2</sub>.

When interpreting readings using gasses other than air, it should be borne in mind that the DIGIVAC reads Torr, which is a measure of absolute pressure - that is the opposite of vacuum. Thus, a lower numerical reading actually is a higher level of vacuum. For more information, refer to section 8.0.

When in doubt, consult Digivac.

## Section 8: Understanding Torr

The DIGIVAC and many similar instruments are calibrated in microns or "milliTorr." It is appropriate to discuss what microns are and to relate microns to other measures of pressure and vacuum. Microns are not really a measure of vacuum at all, but rather of absolute pressure. It will be recalled that the pressure of the atmosphere is 14.696 or approximately 14.7 pounds per square inch at sea level. This pressure is due to the weight of all of the air in the earth's atmosphere above any particular square inch. This 14.696 psi is equivalent to the pressure produced by a mercury column of approximately 29.92 inches high or .76 meters (about 3/4 of a yard) or 760 millimeters of mercury. Atmospheric pressure varies greatly with altitude. It decreases approximately 1 inch of mercury per thousand feet of altitude. It also varies widely with local weather conditions. (Variations of one half inch in a single day are common.) The word vacuum means pressure lower than atmospheric or "suction," but, in describing negative pressure, the atmosphere is only a satisfactory reference if we are dealing with values of vacuum down to about 27 inches of mercury. Below that, it is much more useful to talk in terms of absolute pressure, starting from absolute zero. The DIGIVAC unit and all similar instruments do just this.

One TORR, a commonly used unit, is an absolute pressure of one millimeter of mercury. A milliTorr is equal to one thousandth of a TORR. A MICRON is the same as a milliTorr. The full scale reading of a DIGIVAC is 1999 microns and is equivalent to 1.999 TORR of approximately 2/760 of atmospheric pressure. This is less than .1 inches of mercury, and less than .05 PSI.

## SPECIAL REQUIREMENTS

It is the policy of the DigiVac Company to customize instruments for specialized requirements whenever it is economically feasible to do so. We encourage inquiries about your special needs.

For repair or recalibration, return gauges to:

### The DigiVac Company

1020 Campus Drive

Morganville, NJ 07751

Ph: 732.765.0900

Fax: 732.765.1800

E-mail: Direct from our website [www.digivac.com](http://www.digivac.com)

The DigiVac Company manufactures a complete line of vacuum gauges and computers. Contact us or your distributor if you wish for further information.

See [www.digivac.com](http://www.digivac.com) for our latest offerings

## Section 10: Specifications

<b>Range</b>	.001-760 (215V), 1 mT - 1,999 mT (215H)
<b>Units</b>	Torr, mbar or kPa (215v), mTorr, uBar and Pa (215H)
<b>Vac Interface</b>	1/8 inch MNPT or KF/NW
<b>Sensor</b>	Agilent 531 (215v), Hastings DV6-M (215H)
<b>Sensor Cable Length</b>	10 feet
<b>Display</b>	.56 inch high 4 Digit Red LED
<b>Dimensions</b>	1.7" high, 3.52" wide, 5.35" deep
<b>Analog Output</b>	(if applicable): 0-5 VDC
<b>Power</b>	100-240VAC 50/60 Hz CE rated
<b>Controls</b>	7 Amp, 250 Volt (If Applicable)

Mounting	1/8 DIN or Bench Top
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## ACCURACY

0 to .009 Torr	+/- 1 milliTorr
.010 to .099 Torr	+/- 7% of reading
.100 to 0.999 Torr	+/- 10% of reading
1.0 to 5.0 Torr	+ /- 15% of reading
6 to 760 Torr	Continuous and monotonic

## Section 11: Terms of Use, Limited Warranty, and Liability Waiver

**THE DIGIVAC COMPANY ("DIGIVAC")** offers all of its products with the following terms and conditions and notices as follows. By accepting and/or using a DIGIVAC product, you hereby acknowledge and agree to the following terms and conditions, and acceptance of these terms and conditions are a condition precedent to any purchase/sale agreement between you and DIGIVAC.

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