



CLEVELAND CONTROLS

MODEL 6650

DIGITAL MANOMETER

INSTRUCTION MANUAL DM-6650.02



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I.0 INTRODUCTION

1.1 GENERAL DESCRIPTION

The **Cleveland Controls Model 6650 Digital Manometer** provides accurate measurement of differential pressure up to **10" wc**. Pressure readings are digitally displayed on the 3-½ digit LCD display, in two common engineering units (Inches H₂O and kPa). **High and low air sample ports** located on the front of the instrument accept ¼" ID flexible tubing. Included with the manometer is a 10-foot (10') length of **flexible vinyl tubing**, to be cut following guidelines in this manual. The manometer is compatible with air and other dry, clean, non-corrosive gases that will not attack polyester, vinyl, silicone, or silicone-based adhesives.

In addition, an **electrical continuity test circuit** is provided for convenient testing and calibration of pressure sensing switches. NO, NC, and COM continuity test connections, plus red and green LED indicators, are located on the front panel. A **3-prong continuity test cord**, six-feet (6') long is included with the manometer.

An **analog output signal (0-1 VDC)** is provided to permit remote pressure recording or monitoring. Analog output terminals are located on the rear panel.

The manometer is powered by a **internal rechargeable battery** pack. It can also be connected to an AC line via the power receptacle located on the rear panel and the provided **AC cord**.

The **Model 6650 Digital Manometer** is factory calibrated and requires no routine maintenance.

1.2 SPECIFICATIONS

Range: 0–10.00" wc

Units of Measurement: 0.0–10.00" wc; 0.0–2.49 kPa; 0.0–1.999" wc;
0.0–0.497 kPa.

Maximum Pressure Input: 5 psi.

Over Range Indication: Digit blanking.

Accuracy: ±1.5% full scale, ±1 digit, typical at 77 °F (25 °C).

Temperature Error: ±0–0.014%/°F, typical; ±0–0.025%/°C, typical.

Ambient Temperature Limits: 40–122 °F (5–50 °C).

Analog Output: 0–1 VDC.

Operator Controls: Power On/Off, Zero Adjustment; Pressure-units Selector; Display Hold.

Display: 3-½ digit LCD with low battery indication.

Settling Time: 5 seconds.

Pressure Input Connection: ¼" ID flexible tubing.

Continuity Connection: ⅛" miniature banana jacks with test cable.

Analog Output Connection: 5-way miniature binding post (⅛").

Power Input Connection: IEC universal connector with cord.

Power Requirements: 120V, 50/60 Hz., 4W.

Battery Pack: Rechargeable nickel-cadmium.

Operating Time: 15 hours maximum from full charge.

Recharging Time: 16 hours maximum.

Media: Dry, clean gases that will not attack polyester, vinyl, silicone, or silicone-based adhesives.

Case: Black, high-impact plastic with tilt handle.

1.3 UNPACKING

The shipping carton contains the following items:

- Model 6650 Digital Manometer
- AC cord set (P/N 27560)
- Transparent flexible vinyl tubing, ¼" ID, ⅜" OD, 10' length (P/N 25781)
- 3-prong continuity test cord, 6' long (P/N 27636)
- Aspiration probe, 12" (P/N 31309)
- Impact probe, 12" (P/N 31310)
- Instruction Manual DM-6650.xx

Confirm that each of these items is in the carton. If any item is missing or damaged, please call **Customer Service** at **(216) 398-0330**.

1.4 OPERATOR CONTROLS

All operator controls are located on the front panel.

- The **Zero Control** is a single-turn potentiometer used to set the display to “000” when no differential pressure is present at the inputs.
- The **Power Control** is a double-action pushbutton switch that controls the AC line and battery power. Power is “ON” when the switch is pushed in. Power is “OFF” when the switch is depressed again and returns to the out position.
- The **Hold Control** is a double-action pushbutton switch. The pressure reading freezes at the moment the switch is pushed to the “in” position. Depressing the switch a second time releases the hold.
- The **Unit Selection Controls** are four pushbutton switches used to select the unit of measurement displayed. They are interlocked so that only one can be in the “in” position at a time ensuring that only one unit of measurement can be selected for display.

1.5. CONNECTIONS



Connections are located on the front and back panels.

- **Pressure Input Connections** are made to the **HI** and **LO** pressure ports located on the front panel. The ports are designed to accommodate ¼" ID flexible vinyl tubing (supplied with the Digital Manometer).
- **Electrical Continuity Test Circuit Connections** are the ⅛" miniature banana jacks located on the front panel. Connections are made with the test cable included with the Digital Manometer.
- **Analog Output Terminals** are the ⅛" binding posts located on the back panel. They accept ⅛" miniature banana plugs, tip jacks, or wire leads to provide output for a remote recording or monitoring device (not included).
- **AC Power Receptacle** is located on the rear panel and accepts the AC cord included with the Digital Manometer.

1.6 INITIAL CHECKOUT

- 1.6.1 Connect the power cord.
- 1.6.2 Press the ON-OFF switch to the “ON” position and push the desired unit of measurement switch.
- 1.6.3 When the display appears, adjust the Zero Control until it reads “0.00”.
- 1.6.4 Apply a known pressure to the **HI** port and confirm that a pressure reading appears. An alternative method is to press a finger tightly over the **HI** port. The air in the port will be compressed sufficiently to produce a reading.
- 1.6.5 Plug the continuity test cable into the three test jacks. Connect each color-coded wire to the matching, labeled jack.
- 1.6.6 Touch the Normally Open (NO) wire to the Common (C) wire, and confirm that the **NO LED** (red) lights up.
- 1.6.7 Touch the Normally Closed (NC) wire to the Common (C) wire, and confirm that the **NC LED** (green) lights up.

2.0 OPERATION

2.1 CONTINUITY TESTING



- 2.1.1 Prove circuit integrity, check and calibrate sensing switches using the continuity testing capability of the Digital Manometer. **Note: When testing an installed switch, first disconnect the power source from the switch to avoid shock hazard and damage to the continuity tester.**
- 2.1.2 The continuity circuit consists of two LED's and a series resistor in open circuit condition. Continuity between COMMON (C) and either Normally Open (NO) or Normally Closed (NC) illuminates the red (NO) or green (NC) LED.
- 2.1.3 A non-resistive 1/8 amp fuse is located in the power supply connection to protect the battery and manometer circuits if the continuity circuit is inadvertently connected to AC power or any other high potential source.
- 2.1.4 To determine the pressure at which a sensing switch opens or closes, connect the continuity test cable to the three continuity jacks on the front panel of the manometer (see Section 1.6, above).
- 2.1.5 Connect the color-coded wires of the test cable to the sensing switch contacts. Be sure to connect the common wire (**C**) to the common contact, the normally open (**NO**) wire to the normally open contact, and the normally closed (**NC**) wire to the normally closed contact.
- 2.1.6 Connect the manometer's pressure inputs in parallel with the switch. Press the manometer's ON/OFF switch to the ON position, and push the 0-10 In. H₂O unit of measurement switch. When the display appears, adjust the ZERO control until it reads "0.00."
- 2.1.7 At pressures below the sensing switch set point, the **green LED (NC)** will be on, indicating that this circuit is closed. The red LED (NO) will remain off.
- 2.1.8 At the switch's set point, as indicated on the manometer, the green NC LED will go out and the **red NO LED** will come on.

2.2 PRESSURE MEASUREMENT

- 2.2.1 The measuring element in the Model 6650 Digital Manometer is a piezoresistive pressure transducer. The transducer has a full scale input range of 0-10" wc and a linear output of 1-6 VDC. The Digital Manometer can be used to measure **gauge or differential pressures or vacuums**.
- 2.2.2 To measure **gauge pressure**, connect the pressure source to the **HI** input. Leave the **LOW** input open to atmosphere.
- 2.2.3 To measure **differential pressure**, connect the higher pressure source to the **HI** input and the lower pressure source to the **LOW** input. If a negative reading is displayed, **reverse** the high and low pressure sources.
- 2.2.4 To measure **gauge vacuum**, connect the vacuum source to the **LO** input. Leave the **HI** input open to atmosphere.
- 2.2.5 To measure **differential vacuum**, connect the lower vacuum source to the **LOW** input and the higher vacuum source to the **HI** input. If a positive reading is displayed, **reverse** the high and low pressure sources.

2.3. ANALOG OUTPUT CIRCUIT

- 2.3.1 The analog output circuit is a differential amplifier with a gain of x 1n.
- 2.3.2 The differential 0-5 volt signal on the main PC assembly is connected to an adjustable attenuator, which is set to provide a 0-1 volt signal to the differential amplifier.
- 2.3.3 This provides a buffered 0-1 volt signal for remote monitoring or recording.

2.4 NICKEL-CADMIUM BATTERY PACK

- 2.4.1 The internal rechargeable battery pack provides for cordless operation. When fully charged, it will operate for 15 hours before recharging is required.
- 2.4.2 To charge the battery, connect the manometer to the AC line with the manometer turned OFF. Charging time is 16 hours from fully discharged to fully charged. Additional charging is not harmful.

2.4.3 For maximum battery life, the battery should be fully discharged and recharged every 3 months.

2.4.4 When the battery voltage drops below 10V, the “**LO BAT**” symbol lights up on in the display.

2.5 FIELD MAINTENANCE

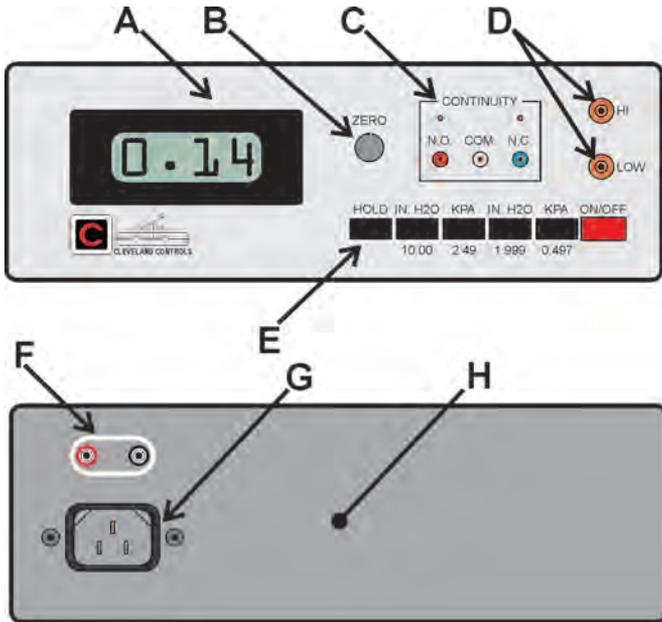
2.5.1 The Model 6650 Digital Manometer is a solid state device with no moving parts and no scheduled maintenance requirements other than the battery charging procedure described in Section 2.4.

2.5.2 The manometer is factory calibrated and does not require additional field calibration.

2.5.3 Do not exceed the maximum pressure rating (5 psi).

2.5.4 Use only with compatible media: dry, clean gases that will not attack polyester, vinyl, silicone, or silicone-based adhesives.

Figure 1: Model 6650 Digital Manometer



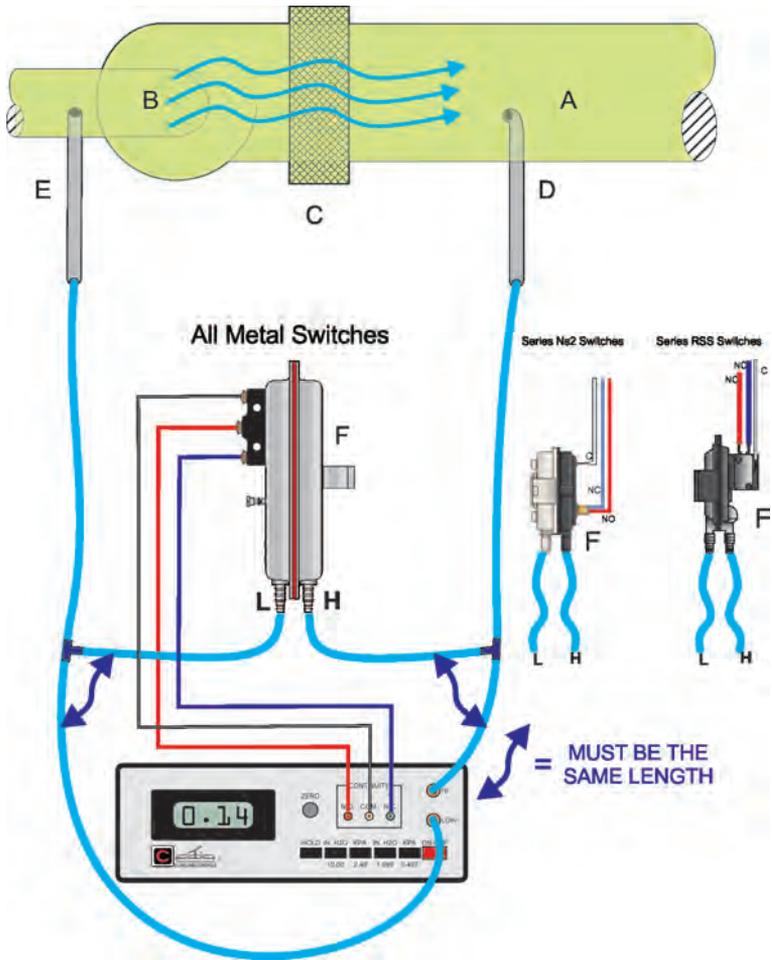
- A. Digital Readout: 3-½ digit liquid crystal display.
- B. Field calibration to null readout.
- C. Continuity tester to verify circuit integrity.
- D. Air sample ports accept ¼" ID flexible tubing.
- E. Operation selector allows various conversion factor readings.
HOLD freezes the readout for value comparison.
- F. Analog output terminals for remote recording or monitoring.
- G. 110 V AC power line receptacle.
- H. Rechargeable nickel cadmium battery pack.

Figure 2 (facing page): Digital Manometer/Integrated Pressure-Sensing System Connect the NO, NC & COM terminals on the air switch to the NO, NC & COM terminals on the manometer.

2. Tubing: Connect the HI side of the air switch to the HI side of the manometer. Connect the LOW side of the air switch to the LOW side of the manometer.

3. Tubing from manometer to "T" fitting and tubing from air switch to "T" fitting must be the same length. Also, keep these pieces as short as possible.

4. The tubing connecting the probe(s) to the tee(s) can be a different length. The manometer ships with a 10 ft. piece of tubing to be cut as needed. Illustration is not to scale!



- A. Duct
- B. Fan/blower.
- C. Filter/damper.
- D. Pressure Impact Probe (+).
- E. Pressure Aspiration Probe (-).
- F. Air sensing switch.

Note: use probes (D + E) together for differential pressure measurement.

Important! This illustration is not drawn to scale. It is intended to show the electrical and pressure connections as clearly as possible. Note that the pieces of tubing between the manometer and the tees must be the same length as the pieces running from the air switch connectors to the tees. Also, keep them as short as possible. The tubing connecting the probe(s) to the tee(s) can be a different length. The manometer ships with a 10' piece of tubing to be cut as needed.

Figure 3: Typical application of Series 6650 Digital Manometer for continuity testing and calibration of an air pressure sensing switch.



Cleveland Controls

DIVISION OF UNICONTROL INC.
1111 Brookpark Rd
Cleveland OH 44109

Tel: 216-398-0330

Fax: 216-398-8558

Email: saleshvac@unicontrolinc.com

Web page: <http://www.clevelandcontrols.com>