



RM-350/XX VDC RM-350TB/XX VDC DIGITAL PANEL METERS

INSTRUCTIONS



INTRODUCTION

The RM-350/XX VDC and the RM-350TB/XX VDC are three and one-half digit, fixed-range digital panel meters for making DC voltage measurements. DC current may also be measured by internally or externally connecting a shunt resistor across the DC signal input terminals.

The alphabetical letters "XX", used in the model numbers throughout these instructions, designate the DC voltage required to operate the instruments. This numerical voltage value is displayed as part of the model number shown on the case of the instrument.

For example, if the model number is RM-350/12 VDC, the meter should be operated from 12 volts DC.

A DC-to-DC converter with transformer coupling provides a high degree of isolation between the power supply and the signal measurement circuits. Connections to the RM-350/XX VDC are made via two card-edge connectors. Connections to the RM-350TB/XX VDC are made via two terminal blocks. The meters are available in any one of five ranges: 1.999 mV F.S., 1.999V F.S., 19.99V F.S., 199.9V F.S. or 1000V F.S.

Modification among the highest four ranges may be accomplished by the substitution, addition or removal of one to two resistors. Calibration is readily accomplished by adjusting one potentiometer accessible at the front of the meter.

SPECIFICATIONS

Ranges: 0 to ±199.9 mVDC
or 0 to ±1.999 VDC
or 0 to ±19.99 VDC
or 0 to ±199.9 VDC
or 0 to ±1000 VDC

Accuracy: ±(0.05% Rdg. ±0.05% F.S.)

Update Rate: 3 rdg/sec, nominal

Display: 0.5" high, LED, Red

Operating Temp: 0° C to +50° C

Power: DC voltage source, preferably a voltage-regulated power supply. The voltage should be within 5% of the voltage shown in the model number on the instrument case. For example, if the model number is RM-350/12 VDC the power supply should be 12 VDC ±5%. Power required is less than 3 watts.

Size: See figures 1 and 2

Weight: Approx. 7 ounces (198 g)

Common-Mode Rejection: 80 DB minimum

Common-Mode Compliance: ±100V between signal low and power common.

Decimal Location: May be positioned by jumper on connector to any one of three locations: X.X.X.X

Overload Indication: Left-most digit is the numeral 1; remaining digits are blank.

CONSTRUCTION

The RM-350/XX VDC and the RM-350TB/XX VDC each contain two printed circuit board assemblies, mounted one above the other. The lower assembly is the display/main board assembly and the upper assembly is the power supply assembly. For the RM-350/XX VDC all interconnections between the upper and lower assemblies are made via mating connectors. For the RM-350TB/XX VDC all interconnections between upper and lower assemblies are made via terminal blocks.

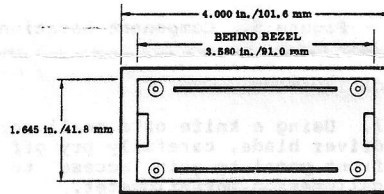
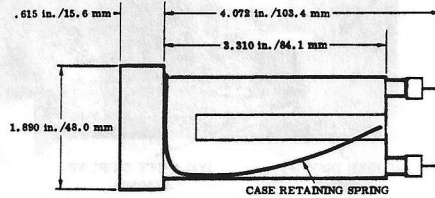


Figure 1. Card-Edge Configuration

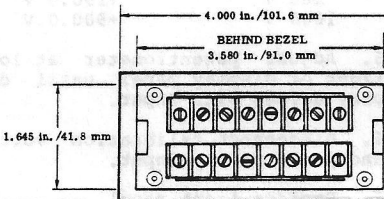
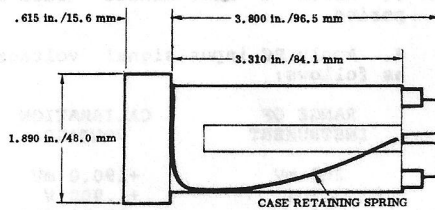


Figure 2. Terminal Block Configuration

MOUNTING DATA.

A rectangular panel cutout is recommended for mounting the instruments. The recommended dimensions are:

92 millimeters +1, -0 mm (3.622 inches +0.040, -0 in.)

43 millimeters +1, -0 mm (1.693 inches +0.040, -0 in.)

The meters will also fit the DIN/NEMA standard cutout, 92 mm x 45 mm (3.622 x 1.772 in.) and the widely used 99.7 mm x 42.72 mm (3.925 in. x 1.682 in.) cutout.

Any panel thickness from 1.524 mm (0.060 in.) to 4.57 mm (0.18 in.) may be used.

To mount the meter, remove the retaining spring from its holes in the sides of the meter at the rear. Insert the meter from the front of the panel cutout. Replace the retaining spring and slide it behind the mounting panel to fasten the meter in place. It does not matter whether the retaining spring swings from above or below the meter.

MATING CONNECTORS (RM-350/XX VDC)

1. SOURCES. Any of the following connectors may be used to mate with the RM-350/XX VDC:

Manufacturer	Connector Part No.
Viking	2VH15/1AB5 091-0024-000*
Stanford Applied Engineering	SAM-15S/1-2 007900*
Masterite Industries	S014GR15-SR-H-X 60217-1*
Microplastics, Inc.	MP-0156-15-SP-1 04-0001-000*

*Polarizing Key Part No.

The mating connector for the display/main board assembly (the lower assembly) should have a polarizing key installed between contacts 1 and 2. This connector with polarizing key installed is available from NLS; part number is 46-107-1. The mating connector for the power supply assembly (upper assembly) should have a polarizing key installed between contacts 2 and 3. The NLS part number for this connector with key installed is 46-107-2. One each of these connectors is furnished with each instrument.

2. MOUNTING. Before mounting the connectors, check to ensure that one of them has a polarizing key between contacts 1 and 2 and the other has a polarizing key between contacts 2 and 3. The first connector mounts between the lower bosses and the second between the upper bosses. The locations of the polarizing keys should correspond to slots in the printed circuit boards. Use the screws provided (4-40 x 7/16" RHD PHH) to fasten the connectors to the case.

3. WIRING. Figure 3 provides wiring information for the connectors. Connect contacts 9 and 11 of the upper connector to the corresponding contacts on the lower connector. Jumper pins 3 and 9 of the lower connector. Connect the DC voltage to be measured to contacts 1 and 3 of the lower connector (signal HI to 1 and signal LO to 3). To display a decimal point, jumper between contact 5 and contact 7, 13 or 15 on the lower connector, depending upon which decimal point is to be displayed. See below.

DECIMAL LOCATION + 1 . 0 . 0 . 0
CONTACT NO. 15 13 7

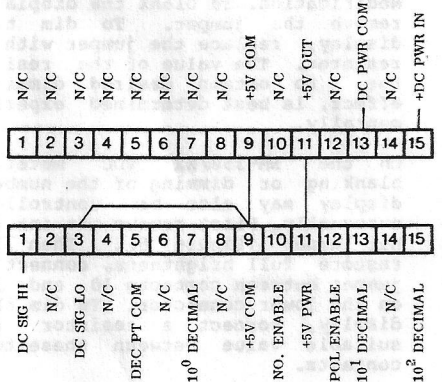


Figure 3. Connector Diagram for RM-350/XX VDC

Connect the DC power to contacts 13 and 15 on the upper connector; the negative side to contact 13 and the positive side to contact 15.

TERMINAL BLOCK WIRING (RM-350TB/XX VDC)

Figure 4 provides wiring information for the terminal blocks. Connect terminals 5 and 6 of the upper terminal block to the corresponding terminals on the lower terminal block. Jumper terminals 2 and 5 on the lower terminal block. Connect the DC voltage to be measured to terminals 1 and 2 of the lower terminal block (signal HI to 1 and signal LO to 2). To display a decimal point, jumper between terminal 3 and terminal 4, 7 or 8 on the lower terminal block, depending upon which decimal point is to be displayed. See below.

DECIMAL LOCATION + 1 . 0 . 0 . 0
TERMINAL NO. 8 7 4

Connect the DC power to terminals 7 and 8 of the upper terminal block; the negative side to terminal 7 and the positive side to terminal 8.

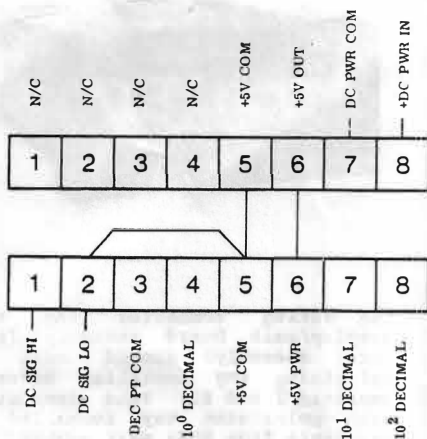


Figure 4. Terminal Block Diagram for RM-350TB/XX VDC

POLARITY DISPLAY BLANKING OR DIMMING.

The polarity display is energized via an internal jumper on the lower board assembly. See figure 5.

To gain access to the components within the instrument, perform the first five steps under Range Modification. To blank the display, remove the jumper. To dim the display, replace the jumper with a resistor. The value of the resistor, to obtain desired dimming effect, is best determined experimentally.

On the RM-350/XX VDC meters, blanking or dimming of the polarity display may also be controlled externally. First remove the internal jumper (figure 5). Then to restore full brightness, connect a jumper between contacts 11 and 12 on the lower connector. To dim the display, connect a resistor of suitable value between these two contacts.

NUMBER DISPLAY BLANKING OR DIMMING.

The number display is energized via an internal jumper on the lower board assembly. See figure 5.

To gain access to the components within the instrument, perform the first five steps under Range Modification. To blank the display, remove the jumper. To dim the display, replace the jumper with a resistor. The value of the resistor, to obtain desired dimming effect, is best determined experimentally.

On the RM-350/XX VDC meters, blanking or dimming of the number display may also be controlled externally. First remove the internal jumper (figure 5). Then to restore full brightness, connect a jumper between contacts 10 and 11 on the lower connector. To dim the display, connect a resistor of suitable value between these two contacts.

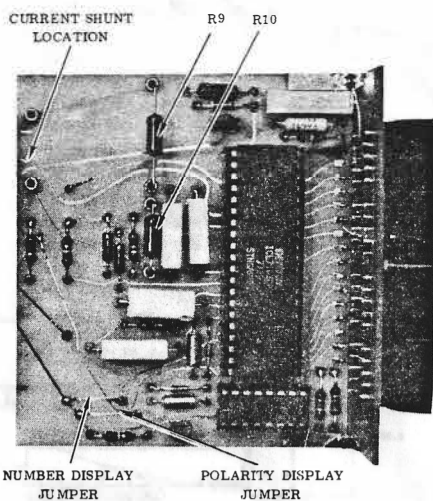


Figure 5. Component Location

CALIBRATION.

1. Using a knife or a small screwdriver blade, carefully pry off the front panel to gain access to the calibration potentiometer.

2. Adjust power supply voltage to within 2% of its nominal value.

3. Allow a five-minute warm-up period.

4. Apply DC input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
200 mV	+190.0 mV
2 V	+1.900 V
20 V	+19.00 V
200 V	+190.0 V
1000 V	+900.0 V

5. Adjust potentiometer at lower right of display panel until display agrees with input.

6. Disconnect calibration voltage and power supply input.

7. Replace front panel.

RANGE MODIFICATION. (Except 200 mV range.)

A range modification kit containing the components needed to modify the instrument within any of its four highest ranges is available from your distributor. Specify NLS part number 39-356. The procedure for changing ranges is as follows:

1. Remove all sources of power and signal voltage from the meter.

2. (RM-350/XX VDC only) Remove the four screws fastening mating connectors to meter case and unplug the two mating connectors.

3. Remove front panel (see step 1 under Calibration).

4. Remove the two screws and the two retaining brackets behind front panel.

5. Slide meter out of case.

6. Install resistors specified in Table I to attain desired range. See figure 5 for component location. Note that these components should be placed in the lower board assembly.

7. Reassemble meter.

8. Calibrate Meter.

9. If a decimal indication is required, refer to the applicable paragraphs on wiring (connectors or terminal blocks).

Table I. Component values for Range Modification

Range	R9	R10
2V	100 kΩ ±5%	OMIT
20V	909 kΩ ±1%	100 kΩ ±1%
200V	10 MΩ ±1%	100 kΩ ±1%
1000V	10 MΩ ±1%	10 kΩ ±1%

CURRENT MEASUREMENT

A shunt resistor may be plugged into the terminals shown in figure 5 to permit current measurement. Alternatively, an external shunt resistor may be connected between signal high and signal low. For current measurement, the meter should be connected in the 200 mV or 2V range, depending upon the full scale voltage drop which can be tolerated. Table II shows the shunt resistor value required. The accuracy of measurement will be determined largely by the accuracy of the shunt resistor.

Table II. Shunt Resistor Values

Full Scale Current Range	Shunt Resistor for Meter in 200 mV range
2 mA	100 Ohms
20 mA	10 Ohms
200 mA	1 Ohm
2 A	0.1 Ohm*

Full Scale Current Range	Shunt Resistor for Meter in 2V Range
2 mA	1000 Ohms
20 mA	100 Ohms
200 mA	10 Ohms
2 A	1 Ohm*

*Use external shunt only.

MAINTENANCE.

1. GENERAL. To facilitate maintenance, all six integrated circuits on the lower board assembly are plug-in components. They can be easily removed and installed without soldering. They include the four LED displays, the ICL7107-CPL chip and the CD4049AE chip.

2. COMPONENT ACCESS. To gain access to the components within the meter, perform the first five steps under Range Modification.



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