



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

INSTRUCTIONS



INTRODUCTION

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

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/AC/XX VDC are made via two card-edge connectors. Connections to the RM-350TB/AC/XX VDC are made via two terminal blocks. The meters are available in any one of four ranges: 1.999V F.S., 19.99V F.S., 199.9V F.S. or 1000V F.S.

Modification from one range to another may be accomplished by the substitution, addition or removal of one to three resistors and one capacitor. Calibration is readily accomplished by adjusting one potentiometer accessible at the front of the instrument.

SPECIFICATIONS

RANGE	RESOLUTION	INPUT IMPEDANCE	MAXIMUM INPUT VOLTAGE
1.999 VAC	1 mV	1 MR, 20pF	100 VAC
19.99 VAC	10 mV	1 MR, 20pF	400 VAC
199.9 VAC	100 mV	10 MR, 20pF	1000 VAC
1000 VAC	1 V	10 MR, 20pF	1000 VAC

Accuracy: $\pm(0.7\% \text{ Rdg.} \pm 2 \text{ digits})$

Frequency Range: 50 to 400 Hz

Display: 0.5" high, LED, Red

Operating Temp: 0°C to +50°C

Power: The instrument is powered from a 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/AC/12 VDC the power supply should be 12 VDC $\pm 5\%$. Power required is less than 3 watts.

Size: See figures 1 and 2

Weight: 7.6 ounces (215 g)

Common-Mode Rejection: 80 DB minimum

Common-Mode Compliance: $\pm 100V$ 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.

AC Converter Response: Average-responding, calibrated to display RMS value of sine wave.

CONSTRUCTION

The RM Series AC reading, DC powered panel meters 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 AC/DC converter and power supply assembly. For the RM-350/AC/XX VDC all interconnections between the upper and lower assemblies are made via mating connectors. For the RM-350TB/AC/XX VDC all interconnections between upper and lower assemblies are made via terminal blocks.

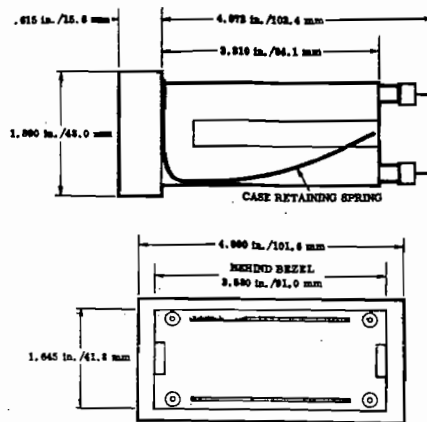


Figure 1. Card-Edge Configuration

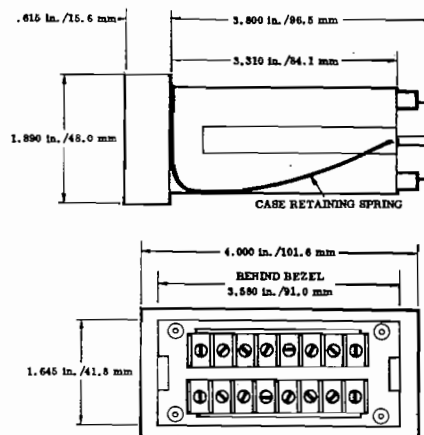


Figure 2. Terminal Block Configuration

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/NEHA 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/AC/XX VDC)

1. SOURCES. Any of the following connectors may be used to mate with the RM-350/AC/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 AC/DC converter and 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 1, 3, 9 and 11 of the upper connector to the corresponding contacts on the lower connector. Connect AC signal HI to contact 6 of the upper connector; a shielded lead may be needed if the signal has a high source resistance. Connect AC signal LO to contact 3 of the upper connector. 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 following decimal location/contact number information.

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

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.

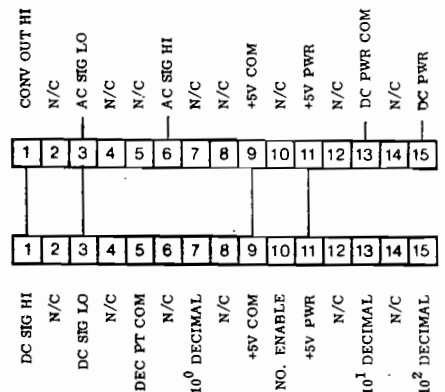


Figure 3. Connector Diagram for RM-350/AC/XX VDC

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

Figure 4 provides wiring information for the terminal blocks. Connect terminals 1, 2, 5 and 6 of the upper terminal block to the corresponding terminals on the lower terminal block. Connect AC signal HI to terminal 3 of the upper terminal block; a shielded lead may be needed if the signal has a high source resistance. Connect AC signal LO to terminal 2 of the upper terminal block. 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.

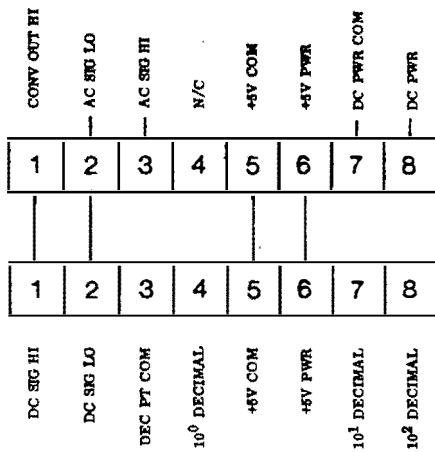


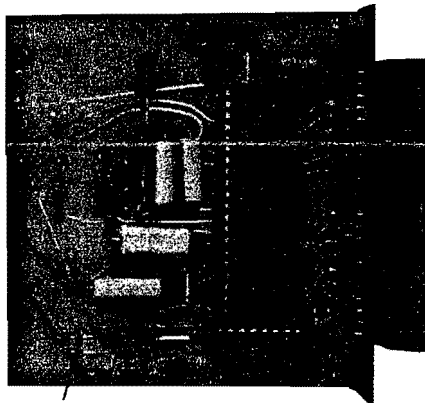
Figure 4. Terminal Block Diagram for RM-350TB/AC/XX VDC

DISPLAY BLANKING OR DIMMING.

The 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/AC/XX VDC meters, blanking or dimming 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.



NUMBER DISPLAY JUMPER

Figure 5. Location of Blanking and Dimming Jumper

CALIBRATION.

- Using a knife or a small screwdriver blade, carefully pry off the front panel to gain access to the calibration potentiometer.
- Adjust power supply voltage to within 2% of its nominal value.
- Allow for a five-minute warm-up period.
- Apply AC input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
2 VAC	1.900 VAC
20 VAC	19.00 VAC
200 VAC	190.0 VAC
1000 VAC	900.0 VAC

- Adjust potentiometer at lower right of display panel until display agrees with input.
- Disconnect calibration voltage and power supply input.
- Replace front panel.

RANGE MODIFICATION.

A range modification kit containing the components needed to modify the instrument to any of its four ranges is available from your distributor. Specify NLS part number 46-130. The procedure for changing ranges is as follows:

- Remove all sources of power and signal voltage from the meter.
- (RM-350/AC/XX VDC only) Remove the four screws fastening mating connectors to meter case and unplug the two mating connectors.
- Remove front panel (see step 1 under Calibration).
- Remove the two screws and the two retaining brackets behind front panel.
- Slide meter out of case.
- Install resistors and capacitor specified in Table I to attain desired range. See figure 6 for component location. Note that these components should be placed in the upper board assembly.
- Reassemble meter.
- Calibrate Meter.
- 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	R1	R2	R3	C5
2V	JUMPER	1 MΩ, ±5%	100 kΩ, ±5%	0.1 μF, 250V
20V	909 kΩ, ±1%	100 kΩ, ±1%	JUMPER	0.1 μF, 250V
200V	10 MΩ, ±1%	100 kΩ, ±1%	JUMPER	0.1 μF, 250V
1000V	10 MΩ, ±1%	10 kΩ, ±1%	JUMPER	0.01 μF, 1 kV



C5 R2 R1 R3

Figure 6. Component Location

CURRENT MEASUREMENT.

A shunt resistor may be connected between AC signal HI and AC signal LO for current measurement. The meter should be in the 2-volt range or be so modified. Table II shows the shunt resistor value required. The accuracy of the measurement will be determined largely by the accuracy of the shunt resistor.

Table II. Shunt Resistor Values

FULL SCALE CURRENT RANGE	SHUNT RESISTOR VALUES
2 mA	1000 Ohms
20 mA	100 Ohms
200 mA	10 Ohms
2 A	1 Ohm

MAINTENANCE.

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

Prices and Specifications Subject to Change without Notice



Non-Linear Systems
Originator of the digital voltmeter.

San Diego, CA
P: 619-521-2161
sales@nonlinearsystems.com

RM-350AC/XX VDC
RM-350TB/AC/XX VDC LITHO IN USA