Non-Linear Systems

RM-453TB
Digital Panel Meter

INSTRUCTIONS

OVERVIEW

The Model RM-453TB is a four and one-half digit, fixed-range, digital panel meter for making DC voltage measurements. DC current may also be measured using internal or external shunt resistors. The instrument is available in any one of four ranges: ±1.9999 volts factory scaled, ±19.999 volts factory scaled, ±199.99 volts factory scaled, or ±1000 volts factory scaled.

Modification from any on range to another is easily accomplished by changing one or two resistors. Calibration is readily accomplished by the adjustment of one potentiometer accessible at the front of the instrument.

The value of the measured voltage (or current) is displayed on 0.4 inch LCD numerals.

An active filter at the signal input provides 60 db of normal-mode rejection at 50 Hz.

For operation, an external +5 Vdc ± % power supply is required. See figure 1 for a typical power supply circuit.

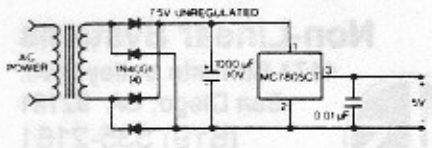

Figure 1. Power supply schematic

SPECIFICATIONS

Accuracy: ± 0.02% Full Scale (FS)

Common-mode Compliance: Signal LO may be anywhere in the range from -0.1 volt to +1 volt with respect to power supply common. Not that if the power for the meter is supplied from an isolated power supply, the effective common-mode compliance is the isolation voltage rating of the power supply.

Common-mode Rejection: 80 db, minimum.

Normal-mode rejection: 60 db typical, 40 db minimum @ 50-60 Hz

Decimal Location: may be positioned by jumper on connector to any of the four locations, X.X.X.X.X

Display: 0.4" LCD

Input Current: 250 pA

Input Voltage Protection: ± 100 Vdc or Peak Vac , 2V range: ± 350 Vdc or peak Vac , 20V range; ± 1000 Vdc or peak Vac , 200V and 1000 ranges.

Input Z: 2V range 1000 megohms; 20V range, 1 megohm; 200V and 1000V ranges, 10 megohms

Overload Indication: On all ranges except the 1000V range, an input exceeding full scale is displayed as four flashing zeros

Operating Temp: 0°C to +50°C

Power: +5 VDC ± 5% @ 10 mA, max.

Range: 0 to 2V
0 to 20V
0 to 200V
0 to 1000V

Settling Time: 2 seconds, including polarity change

Size: see Figure 2

Speed: 3 readings/sec nominal

Turn-on Time: 10 seconds to ± 0.05% accuracy

Temperature Coefficient: ± (0.01% rdg + 0.001% FS) C°

Weight: Approximately 6 ounces

MOUNTING DATA

Any panel thickness from 1.524 mm (0.060 inch) to 4.57 mm (0.18 inch) may be used. The recommended dimensions for the rectangular panel cutout are:

92 millimeters +1, -mm (3.622 inches +0.040, -0 inch.) by 43 millimeters +1, -0 mm (1.693 inches +0.040, -0 inch)

The meters will also fit the DIN/NEMA 1/8 standard cutout.

To mount the meter, remove the retaining spring from it's 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.

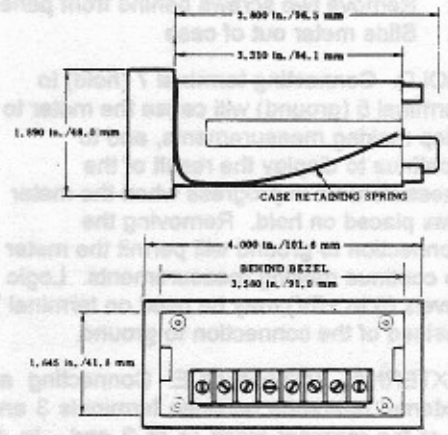

Figure 2. Outline Drawing

OPERATION

POWER AND SIGNAL CONNECTIONS

1. Connect power supply common to terminal 5 of the terminal block.
2. Connect. +5V power to terminal 6.
3. Connect SIGNAL LO of the source being measured to terminal 2.
4. Connect SIGNAL HI to terminal 1.
5. Connect analog common (terminal 4) to SIGNAL LO of the source. For max accuracy and stability, make the connection at the source, not term. 2.
6. Connect negative terminal of the power supply to SIGNAL LO of the source. For max accuracy and stability, make connection at the source, not term. 2.

NOTE

In an electrically noisy environment it may be desirable to use a shielded lead for this connection. If a shielded lead is used, connect the shield to SIGNAL LO of the source.

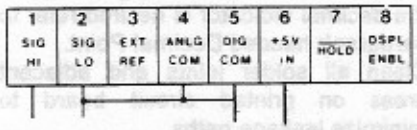

Figure 3. Connection Information

Decimal Point. The position of the decimal point is determined by the position of an internal jumper on the PC board assembly. Jumper between terminal pads E12 and terminal pads E8, E9, E10, or E11 depending upon which decimal point is to be illuminated. See below.

Dec. Location +1	.0	.0	.0	.0
Terminal Pad	E8	E9	E10	E11

If decimal pt. is not desired, omit jumper.

DISASSEMBLY

To gain access to the PC board assembly, proceed as follows:

1. Remove all sources of power and signal from the meter.
2. Using a knife or a small screw driver blade, carefully pry off the front panel
3. Remove two screws behind front panel.
4. Slide meter out of case

HOLD. Connecting terminal 7 (hold) to terminal 5 (ground) will cause the meter to stop making measurements, and to continue to display the result of the measurement in progress when the meter was placed on hold. Removing the connection to ground will permit the meter to continue making measurements. Logic levels (0 to +5V) may be used on terminal 7 instead of the connection to ground.

EXTERNAL REFERENCE. Connecting an external reference between terminals 3 and 4 of the terminal block (+ to 3 and - to 4) overrides the internal reference. under these conditions, the ratio of the input signal to the external reference is displayed. Since the internal calibration potentiometer has no effect in this mode, an external adjustable voltage divider may be required if exact calibration is needed.

For best results, the value of the external reference voltage should be between +0.5 and +2.0 volts.

The input resistance between terminals 3 and 4 is 59 kilohms, minimum. This resistance may be increased by gaining access to the P.C. board as described under Disassembly, and removing R24 and R26. This will increase the reference input resistance to 1000 megohms.

RANGE MODIFICATION.

1. Perform steps 1 thru 4 under Disassembly.
2. Observe resistor values for R17 & R18; compare to fig. 4 and table I below. Install resistors of values specified in table I to obtain desired range.
3. If a decimal indicator is desired refer to paragraph headed Decimal Point.
4. Clean all solder joints and adjacent areas on printed circuit board to minimize leakage paths.
5. Reassemble meter.

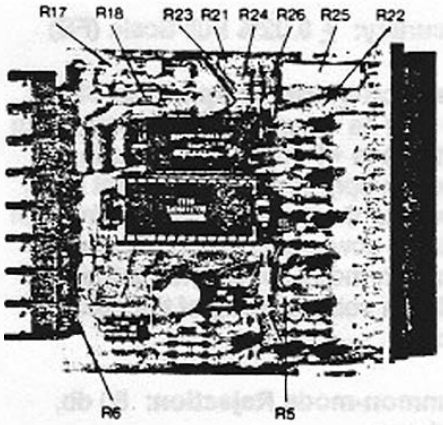

Figure 4. Component Location

Table I.
Resistor Values in Range MOD

RANGE	R17	R18
2V	JUMPER	OMIT
20V	909kOHM 1%	100kOHM 1%
200V	10mOHM 1%	100kOHM 1%
1000V	10mOHM 1%	10kOHM 1%

CURRENT MEASUREMENT

DC current measurements can be made using an internally or externally mounted shunt resistor. For internal mounting, replace R18 with the shunt resistor, and replace R17 with a jumper. For external mounting, use meter in the two volt range and connect shunt resistor between terminals 1 and 2 of the terminal block. If the current being measured enters terminal 1 and exits from terminal 2 the polarity displayed will be positive.

The value of the shunt resistor should be chosen as set forth in table II. Note that at full scale, the voltage drop across the shunt resistor is 1.9999 volts. The measuring circuit should be carefully examined to insure that this voltage drop does not introduce excessive error into the measurement.

Table II.
Shunt Resistor Values
for Current Measurement

FULL SCALE CURRENT	SHUNT RESISTOR
19.999 uA	100 kOHM
199.99 uA	10 kOHM
1.9999 mA	1 kOHM
19.999 mA	100 OHM
199.99 mA	10 OHM
1.9999 A	1 OHM*

*External mounting only. This resistor dissipates 4 watts at full scale.

SCALING AND ZERO OFFSET

Provision is made on the lower board assembly to insert additional components required for zero offset. This offset capability together with special scaling greatly increases the versatility of the meter so that virtually and engineering unit may be displayed.

The components required for zero offset are R21, R22 and R23. Unless zero offset is specified, these components are not furnished. However, they may be added at any time, either at the factory or in the field. The values of these components depend upon the amount of zero offset required. However, the total resistance, R21+R22+R23, should not be less than 100 kilohms.

In addition to R21, R22 and R23, changes in internal jumpering are necessary to obtain zero offset. The P.C. pads involved with zero offset are numbered E1 through E7. Unless the meter has been ordered with specific zero offset, it will be shipped from the factory with no zero offset. E1 will be connected to E5, and E2 will be connected to E4. E6 and E7 will have no connections.

CALIBRATION

1. Using a knife or a small screw driver blade, carefully pry off the front panel to gain access to the calibration potentiometer.
2. Allow the meter to warm up for at least five minutes.
3. Set the power supply voltage to +5 volts +-2%.
4. Apply DC input signal voltages as follows:

RANGE OF INSTRUMENT	CALIBRATION VOLTAGE
2 V	+1.9990 V
20 V	+19.990 V
200 V	+199.90 V
1000 V	+999.0 V

5. Adjust R25 at lower right of display panel until display agrees with input.
6. Disconnect calibration voltage and power supply input.
7. Replace front panel.

MAINTENANCE

The three largest integrated circuits and the LCD display module all have sockets for ease of replacement.

Specifications Subject to Change without Notice

Thank you for choosing Non-Linear Systems for your needs. Should you have any questions please call or FAX us.

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