Non-Linear Systems

CM-1TB

Current Loop Meter

INSTRUCTIONS

OVERVIEW

The CM-1TB is a digital current loop meter with a unique feature that requires no power supply for its operation. All the power it needs are derived from the current being measured. With field-programmable scaling and offset capability, you will find wide applications in 4-20 mA and 10-50 mA current loops. The display is 3½ digit with a 0.6-inch liquid crystal display.

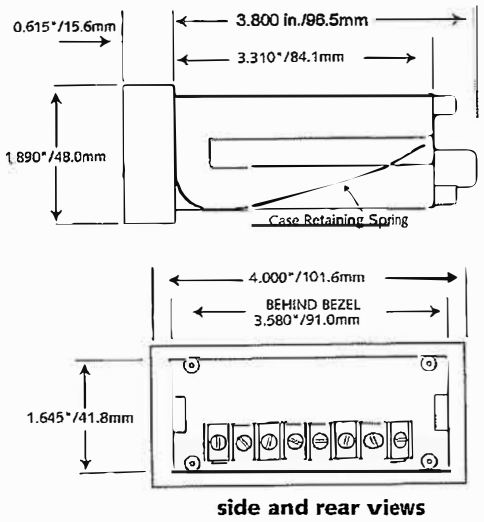

Figure 1. Outline Drawing

SPECIFICATIONS

Accuracy: ± 0.1% rdg. ± 1 digit

Decimal Loc: Field selectable, X.X.X.X

Display: 0 to ± 1999 digits, 0.6-inch liquid crystal display

Maximum Input Current: 50 mA

Minimum Input Current: 4 mA

Voltage Drop Across Meter:
- Negative Input Lead connected to Terminal 3-(0.015I +2.5) volts ±2%*
- Negative Input Lead connected to Terminal 4-(0.030I +2.5) volts ±2%*

**I is the loop current in mA.*

Power: None required. The meter derives the power it needs from the current being measured.

Operating Temperature: 0 degrees C to +45 degrees C

Overload Indication: With inputs exceeding full scale - if positive, +1 is displayed; if negative, -1 is displayed.

Polarity: Automatic

Size: See Figure 1

Update Rate: 3 rdg/sec, nominal

Weight: 5 ounces (142 g)

MOUNTING DATA

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

92 millimeters (3.622 inches) by 43 millimeters (1.693 inches).

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

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

To mount the meter; insert the meter from the front side of the panel cutout. Place the retaining spring in the rear holes in the sides of the meter 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.

CONNECTIONS

For all applications, the positive input lead (current going into the meter) must be connected to terminal 2.

For most applications, including 4-20 mA operation, the negative lead should be connected to terminal 4. In applications where it is necessary to reduce the voltage drop across the meter, terminal 3 may be used for the negative lead. See below.

Voltage Drop Across Meter With 50 mA Current	
Negative Lead Connected To Terminal 4	Negative Lead Connected To Terminal 3
4.13 Volts	3.37 Volts

DECIMAL POINT POSITION

If a decimal display is desired, install a jumper between terminals 8 and 5, 6 or 7, depending upon which decimal point is to be illuminated. See below.

Dec. Location	X	•	X	•	X	•	X
Terminal		7		6		5	

If decimal point. is not desired, omit jumper

Terminal	Terminal
1. Cal	5. Dec Right
2. Loop (+)	6. Dec Mid
3. Loop (-) 50 mA	7. Dec Left
4. Loop (-) 20 mA	8. Dec Com

Figure 2. Input Connections

CALIBRATION

Unless special factory calibration is ordered, the CM-1TB meters are factory calibrated so that a 4 mA input causes a display of 000, and a 20 mA input causes a display of 100. If different calibration is required, proceed as follows:

1. Calculate A, the counts per mA, from the equation A = C-c/I-i where i is the smaller of two currents in milliamperes, I is the larger current, c is the number of counts displayed corresponding to i and C is the number of counts corresponding to I.

2. Set switches S1 and S2, the coarse scale adjustments, as shown below. The location of these switches is shown in figure 3.

A = COUNTS/mA

Negative Current Input Connected to Term 3	Negative Current Input Connected to Term 4	S1	S2
0 - 24	0 - 49	On	Off
25 - 39	50 - 79	Off	Off
40 - 63	80 - 125	Off	On

3. Calculate B, the offset counts, from the equation B=Ic-iC/I-i. For most applications, B can be negative or postive.

Switches:	S5	S6	S7	S8
Negative Offset	On	Off	Off	Off
Positive Offset	Off	On	Off	Off

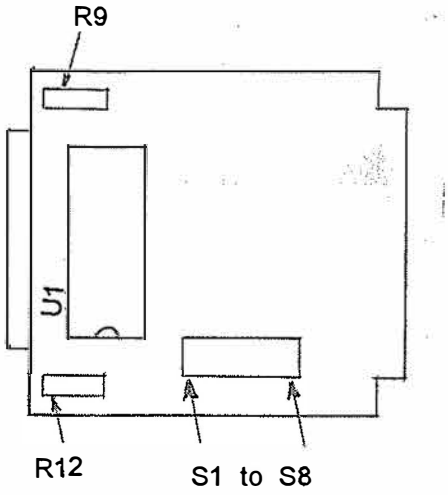

Figure 3. Component Location

4. Set switches S3 and S4, the coarse offset adjustments as shown below.

B=Offset (Counts)	S3	S4
0 to -700	On	Off
-700 to -1000	Off	Off
-1000 to -1500	Off	On

5. Apply a current with a value between 4 and 20 mA to terminals 2 (+) and 1 (-) to obtain a meter display. Connecting the negative current input to terminal 1 forces the Ai value in the equation C = Ai + B to zero regardless of the magnitude of the current.

6. Adjust potentiometer R9 (figure 3) until the display equals the value of B calculated in step 3.

7. Refer to the paragraph under Connections and to the Table in Step 2 above. Move the minus current connections from terminal 1 to terminal 3 or 4.

8. Set the loop current to a known value at or near the maximum which will be used.

9. Adjust potentiometer R12 (figure 3) until the display shows the proper value corresponding to the input.

10. Step 9 completes the calibration. However, the meter should be checked at two or three widely spaced inputs to insure its proper functioning.

Sample Computation

Input	Display
4mA	000
20mA	100

i = 4mA; I = 20mA; c = 000; C = 100

$$A = \frac{100-0}{20-4} = \frac{100}{16} = 6.25 \text{ counts/mA}$$

$$B = \frac{20 \times 0 - 4 \times 100}{20 - 4} = \frac{400}{16}$$

= -25 counts offset

Therefore, if the negative current input is connected to terminal 4, the Table in step 2 shows that switch S1 should be set to ON, and S2 should be set to OFF. The Table in step 4 shows that switch S3 should be set to ON and S4 should be set to OFF. The table in Step 3 shows that switch S5 should be on and S6, S7 and S8 should be off.

Specifications Subject to Change Without Notice

Thank you for choosing Non-Linear Systems for your needs.

Non-Linear Systems

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