

## X-34 Short Depth Digital Panel Meter



## INSTRUCTIONS

### OVERVIEW

The X-34 Digital Panel Meter is a bipolar, three and one half digit, fixed-range, DC voltmeter. It features auto zeroing, eliminating zero drift. The X-34 is a short depth meter of which requires only one-half inch to mount behind panel. Calibration at full-scale can be accomplished by adjusting a single potentiometer accessible from the front of the meter.

A mating connector option provides plug-in connections of the external leads. This connector, if required, must be ordered separately. (Part number 53-106.)

The X-34 is built to a standard 2 volt range, yet is also available in five other ranges. (Select 200 mV, 20 V, 200 V or 1000 V range) The factory can make this range modification, or, you can accomplish this range change by purchasing the range change kit. (Part number 53-107)

A current measurement option is available, permitting measurement of DC current from 200 nano amperes full scale (F.S.) to 2 amperes full scale (F.S.). (Part number 53-108)

An external +5Vdc regulated power supply is recommended for operation. A typical configuration for a suitable power supply is:

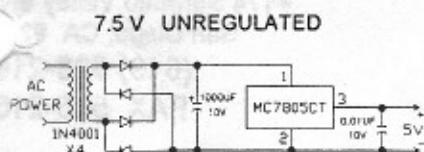


Figure 1: Power Supply Schematic

### SPECIFICATIONS

Ranges: 0 to 200mV  
0 to 2V  
0 to 20V  
0 to 200V  
0 to 1000V

Accuracy:  $\pm 0.1\%$  Full Scale

Power: +5 Vdc  $\pm 5\%$  @ 175 mA

Update Rate: 3 readings/sec nominal

Display: 0.56" bright Red LED, also available in yellow, green, or orange LEDs.

Operating Temperature:  
0°C to +50°C ambient

Temp Coefficient: 100 ppm/°C typical

Warm-up Time: 10 seconds  
to  $\pm 0.1\%$  accuracy.

Input Z: 100 M $\Omega$ , 200 mV Full Scale;  
1 M $\Omega$ , 2V, 20V, and 200V Full scale;  
4M $\Omega$ , 1000 V Full Scale

Settling Time: 1 sec. F.S. input chg.

Normal-Mode Rejection:  
40 dB minimum.

Common-Mode Rejection:  
40 dB minimum.

Common-Mode Voltage:  
-1.5 V to +4 V between signal LO and  
negative terminal of power supply.

Decimal Location: Positioned by  
internal jumper to any one of four  
locations: X.X.X.X.

Input Voltage Protection:  
 $\pm 250$  Vdc on four lowest ranges.  
 $\pm 1200$  Vdc on 1000 V range.

Measurement Method: Integration; input  
integration time - 80 mSec.

Overload Indication:  
+1 for positive inputs  
-1 for negative inputs

Ratio Operation: Reference is brought  
out to connector for ratio operation.

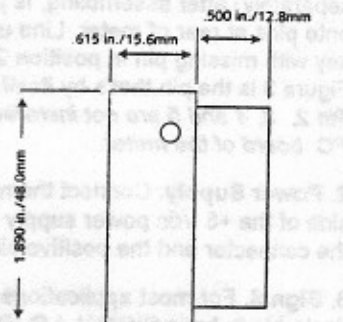
Zero Stability: Auto-zeroing eliminates  
zero drift.

Weight: 2 oz (56.7 grams) approx.

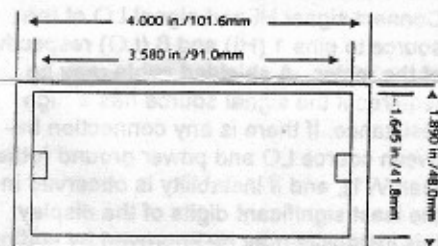
### OPERATING PRINCIPLES

**A/D Circuit.** Analog-to-digital conversion is performed by simultaneous integration of analog signals and counting of clock pulses. Input integration time is fixed at 80 milliseconds.

Total conversion, including automatic compensation for zero drift, takes approximately 330 milliseconds. All logic signals are handled by a C-MOS integrated circuit.



X-Series, Short depth case - Side View



X-Series, Short depth case - Front View

Figure 2: Outline drawing of X-34 case

### Installation

- Mount the X-34 as follows:
  - Cut hole in panel 3.622" (92mm) W x 1.693" (43mm) H.
  - Insert meter from the front, through panel cutout.
  - Fit mounting clips (2) into slots located on top and bottom of meter. The foot of the clip should face forward.
  - Thread screws (2) into clips & tighten screws against rear surface of panel.
- If you have purchased the mating connector option (NLS P/N 53-106), install a keying tab in the connector (Position 2) and attach the hookup wire to the individual connector sockets. Insert the sockets into the connector block making sure the keying tab and sockets are in the proper position to latch into the rectangular holes on the block. (Refer to Table 1). Positions 3, 4, and 5 do not need sockets. Position 10 is used only in Ratio Operation.

Table 1. Connector Pin Information

1. Signal HI	6. Signal LO
2. Key	7. Ground
3. N/C	8. N/C
4. N/C	9. +5Vdc
5. N/C	10. Ext. Ref.

## X-34 Instructions - continued

### Operation

1. **Connector.** The connector (purchased separately) after assembling, is plugged onto pins at rear of meter. Line up connector key with missing pin in position 2. Pin 1 in Figure 3 is the pin that's by itself. Pin 2, 3, 4 and 5 are not installed on the PC board of the meter.

2. **Power Supply.** Connect the negative side of the +5 Vdc power supply to pin 7 of the connector and the positive side to pin 9.

3. **Signal.** For most applications it is desirable to have SIGNAL LO (Pin 6) connected to power ground (pin 7). As shipped, the meter makes this connection with a printed circuit trace labeled "W1." Connect signal HI and signal LO of the source to pins 1 (HI) and 6 (LO) respectively of the meter. A shielded cable may be required if the signal source has a high resistance. If there is any connection between source LO and power ground (other than W1), and if instability is observed in the least significant digits of the display, this instability may be improved by cutting the "W1" PC trace.

4. **Decimal Location.** Depending upon which decimal point is to be illuminated, install a jumper wire between circuit board C and circuit board L, LM, RM or R on the inside of the meter. See below:

Decimal Location	X	.	X	.	X	.	X	.
Pad Location	L	LM	RM	R				

5. **Readings.** With +5 Vdc power and positive signal voltage applied (within range of meter), the X-34 will display the correct reading  $\pm 0.2\%$  within 10 seconds.

### Ratio Operation

For ratio measurement applications, an external reference voltage may be used as follows: (In the ratio mode, the calibration potentiometer, R2, has no effect.)

- Remove jumper W2 by cutting PC trace.
- Install jumper W3. (See Figure 3)
- Connect an external reference voltage of +0.1 volt  $\pm 10\%$  to pin 10.

### Voltage Range Modification

The X-34 may be range-changed from any range to another by the installation of various precision resistors.

1. Remove faceplate in front of display by pressing in on sides of bezel and pulling faceplate out by bowed center. Remove two screws located at either end of display.

2. Carefully remove meter from front of case.

3. Observe resistor values that are in meter and compare to figure 3 and Table II. Install resistors specified in Table II to attain desired range.

Range	200mV	2V	20V	200V	1000V
R8	-	100k $\Omega$	10k $\Omega$	1k $\Omega$	402 $\Omega$
R9	Jumper	909k $\Omega$	1M $\Omega$	1M $\Omega$	-
R10	-	-	-	-	1M $\Omega$
R11	-	-	-	-	1M $\Omega$
R12	-	-	-	-	1M $\Omega$
R13	-	-	-	-	1M $\Omega$

4. If a decimal point is desired, see #4 under Operation.

5. Clean solder joints & adjacent areas on printed circuit board to minimize leakage paths.

6. Reassemble meter.

7. Calibrate meter, refer to the Calibration section.

8. Range change modification sets are available. (NLS P/N 53-107)

### Calibration

1. Set power supply voltage +5Vdc  $\pm 2\%$ .
2. Allow 5 minutes for warm up.
3. Precision DC power supply voltages:

Range of Instrument	Recommended Calibration Voltage
200 mV	190.0 mVDC
2 V	1.900 VDC
20 V	19.00 VDC
200 V	190.0 VDC
1000 V	900 VDC

4. Adjust potentiometer R2 at side of meter until readout agrees with input.

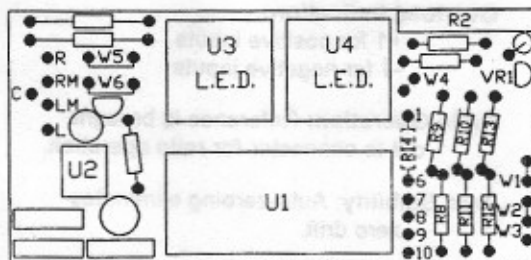


Figure 3. Component Location

**NOTE:** To inhibit polarity display, remove jumpers W5 and W6 from upper left of printed circuit board.

### Current Range Modification.

For DC current modification, the meter must be in the 200 mV range to accomplish this. Refer to Figure 3 & 4 and Table III, for position of R14. Higher currents are measured by using an external current shunt. (Call factory for requirements)

**Warning:** This meter is frequently used on the high side of the current source to be measured. This arrangement may cause a short between the circuit high side and ground with possible damage to the meter and circuit. To prevent this, an isolated meter power supply is recommended.

Full Scale Current Range	Shunt Resistor Value
200 Nanoamperes	1 Megohm
2 Microampere	100 Kiloohms
20 Microamperes	10 Kiloohms
200 Microamperes	1 Kiloohm
2 Milliampere	100 Ohms
20 Milliampere	10 Ohms
200 Milliampere	1 Ohm
2 Amperes	0.1 Ohm

The NLS part number 53-108 provides all the resistors required to measure DC currents.

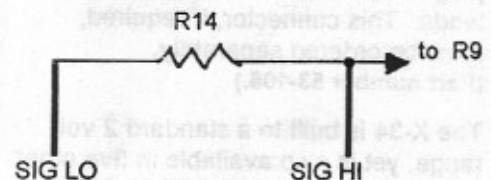


Figure 4. Current Shunt Location

### Specifications Subject to Change without Notice

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

### Non-Linear Systems

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