# Non-Linear Systems

# X-32 3-Digit
Short Depth
Digital Panel Meter


# INSTRUCTIONS

## OVERVIEW

The X-32 Digital Panel Meter is a unipolar, three-digit, fixed-range, DC voltmeter. It features auto zeroing, eliminating zero drift. The X-32 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-32 is built to a standard 1 volt range, yet is also available in five other ranges. (Select 100 mV, 10 V, 100 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 100 nano amperes full scale (F.S.) to 1 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:

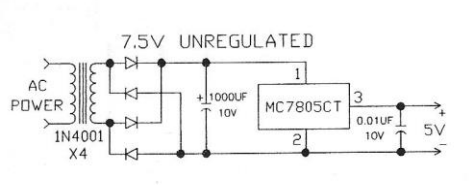



**Figure 1:** Power Supply Schematic

## SPECIFICATIONS

**Accuracy:** ± 0.2% Full Scale

**Normal-Mode Rejection:**
40 dB minimum.

**Common-Mode Rejection:**
80 dB minimum.

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

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

**Decimal Location:** Positioned by internal jumper to any one of three locations: X,X,X, (1V F.S. range reads mV XXX)

**Input Voltage Protection:**
± 250 Vdc on four lowest ranges.
±1200 Vdc on 1000 V range.

**Input Z:** 100 MΩ, 100 mV Full Scale,1 MΩ,1V, 10V, and 100V Full Scale, 4MΩ, 1000V Full Scale

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

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

**Overload or Negative Indication:**
Display is blank for inputs exceeding full scale or for negative polarity input.

**Power:** +5 Vdc ±5% @ 175 mA

**Ranges:**

| | |
|---|---|
| 0 to | 100mV |
| 0 to | 1V |
| 0 to | 10V |
| 0 to | 100V |
| 0 to | 1000V |

**Ratio Operation:** Ratio measurements may be made by using an external reference.

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

**Update Rate:** 3readings/sec nominal

**Temp Coefficient:** 100ppm/C typical

**Warm-up Time:** 10 seconds to ± 0.1% accuracy.

**Weight:** 2 oz (56.7 grams) approx.

**Zero Stability:** Auto-zeroing eliminates zero drift.

## INSTALLATION

1. Mount the X-32 as follows:

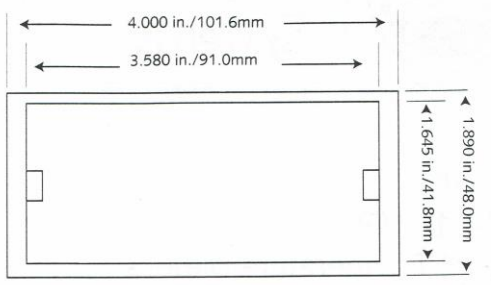
   a. Cut hole in panel 3.622" (92mm) W x 1.693": (43mm) H.

   b. Insert meter from the front, through panel cutout.

   c. Fit mounting clips (2) into slots located on top and bottom of meter. The foot of the clip should face forward.

   d. Thread screws (2) into clips & tighten screws against rear surface of panel.

2. 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, 5 and 8 do not have sockets.



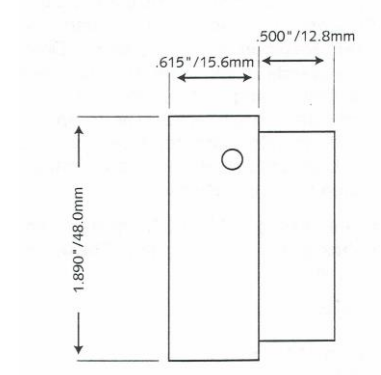




**Figure 2:** Outline drawing of X-32 case

**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. |

## 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, M or R on the inside of the meter, See below:

| | | | | | | |
|---|---|---|---|---|---|---|
| Decimal Location | **X** | **.** | **X** | **.** | **X** | **.** |
| Pad Location | | **L** | | **M** | | **R** |

5. **Readings.** With +5 Vdc power and positive signal voltage applied (within range of meter) , the X-32 will display the correct reading ± 0.1% 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 ±10% to pin 10.

## Voltage Range Modification

The X-32 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.

**Table II.**
Resistor Values in
Range Modification Kit

| Range | 100mV | 1V | 10V | 100V | 1000V |
|---|---|---|---|---|---|
| R8 | - | 100k | 10k | 1k | 402Ω |
| R9 | Jumper | 909k | 1M | 1M | - |
| R10 | - | - | - | - | 1M |
| R11 | - | - | - | - | 1M |
| R12 | - | - | - | - | 1M |
| R13 | - | - | - | - | 1M |

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 , see Calibration section.

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

## Calibration

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

| Range of Instrument | Recommended Calibration Voltage |
|---|---|
| 100 mV | 90 mVDC |
| 1 V | 900 mVDC |
| 10 V | 9.00 VDC |
| 100 V | 90.0 VDC |
| 1000 V | 900 VDC |

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

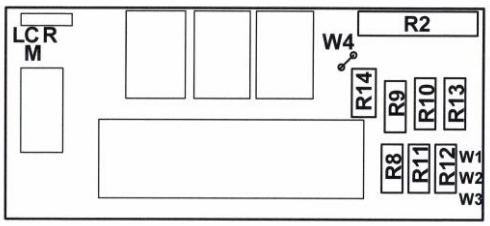



**Figure 3. Component Location**

## Current Operation

Current Range Kit NLS P/N 53-108 provides all the resistors required to measure DC currents. The meter must be in the 100 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.*** See Table III for resistor values.
(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.**

**Table III. Shunt Resistor Values**

| Full Scale Current Range | Shunt Resistor Value |
|---|---|
| 100 Nanoamperes | 1 Megohm |
| 1 Microampere | 100 Kilohms |
| 10 Microamperes | 10 Kilohms |
| 100 Microamperes | 1 Kilohm |
| 1 Milliampere | 100 Ohms |
| 10 Milliamperes | 10 Ohms |
| 100 Milliamperes | 1 Ohm |
| 1 Ampere | 0.1 Ohm |

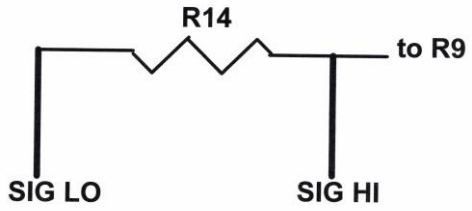



**Figure 4. Current Shunt Location**

***Specifications Subject to Change without Notice***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