



# **MS2001L**

## **LPR Corrosion Monitor**

**Metal Samples Company**

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## **I. Introduction**

The MS2001L is a microprocessor-based, field-mountable corrosion rate meter. This versatile instrument measures the instantaneous corrosion rate and electrochemical current between the electrodes of any standard linear polarization resistance (LPR) probe. Corrosion rate is displayed on the LCD display.

Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, instantaneous corrosion rate is calculated from polarization resistance.

Alloy multipliers for mild steel, copper, brass, and lead are incorporated into the instrument. The multiplier is selected using a switch on the front panel of the instrument. The MS2001L also offers a high precision zero resistance ammeter (ZRA) for measuring the electrochemical current between electrodes. This function may be used to measure the galvanic current between electrodes of dissimilar alloys.

The instrument is housed in a NEMA-4X enclosure, making the MS2001L suitable for use in almost any indoor or outdoor environment.

## II. Product Specifications

### *LPR Measurement Specifications (For an electrode area of 5cm<sup>2</sup>)*

	<u>Range</u>	<u>Resolution</u>
Mild Steel Electrodes	0 to 40 mpy	0.02 mpy
Copper Electrodes	0 to 70 mpy	0.03 mpy
Admiralty Brass Electrodes	0 to 60 mpy	0.03 mpy
Lead Electrodes	0 to 80 mpy	0.04 mpy
Zero Resistance Ammeter	+/- 0 to 80 $\mu$ A	0.04 $\mu$ A

### *General Information*

Enclosure:	NEMA-4X
External Connections:	Probe Connector Power Receptacle
Dimensions:	5.91”H x 5.91”W x 3.57”D (15cm x 15cm x 9.1cm)
Instrument Weight:	1.75 lb. (0.79 Kg)
Total Weight w/ Accessories:	3 lb. (1.36 Kg)
Power:	100 to 240 VAC, 50/60 Hz
Bolt Mounting Pattern	4.72”H x 6.55”W (12cm x 16.7cm) 0.188” (0.48 cm) Diameter Bolt Holes
Operating Temperature:	32° to 122°F (0° to 50°C)
Storage Temperature:	-4° to 158°F (-20° to 70°C)
Maximum Distance to Probe:	2000 feet

### III. Receipt

Upon receipt of your order, ensure that you have received the following items. Any shortages should be reported to Metal Samples immediately.

**Item**

MS2001L Instrument

Probe Cable

Power Cord

Calibration Probe

Enclosure Mounting Brackets and Screws

5 x 20mm Fuse (pre-installed)

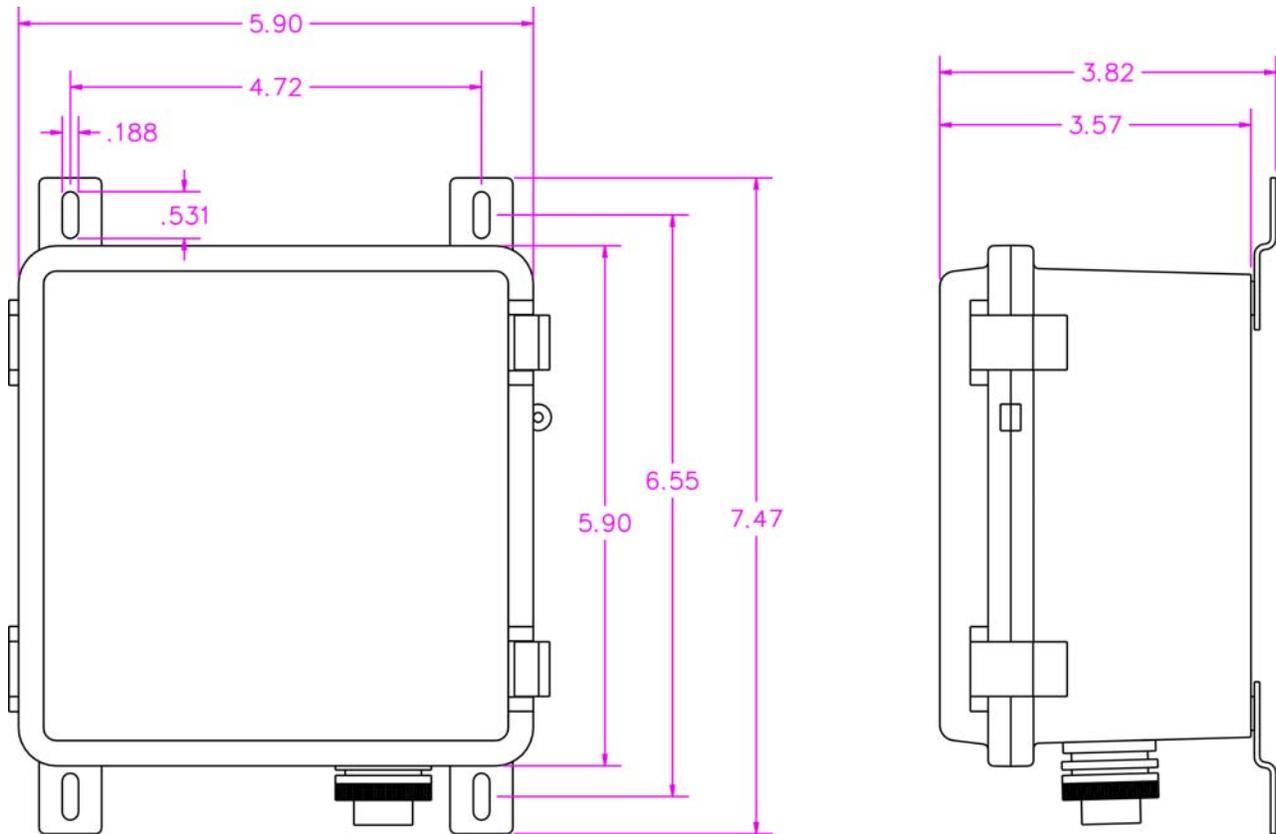
Prior to installation it is recommended that you verify proper instrument operation by testing the MS2001L with the calibration probe.

- 1) Use the supplied power cord to connect the MS2001L instrument to an AC outlet.
- 2) Connect the calibration probe directly to the probe connector.
- 3) Set the Alloy Switch to “Steel”.
- 4) Turn the instrument “on”.
- 5) After 1 minute the LCD display should show a reading of  $5.00 \pm 0.10$  mpy. If the instrument does not display the correct value, allow several minutes for the electronics to warm up. If after several minutes the instrument still does not display the correct value, contact Metal Samples for further assistance.

## IV. Installation

To install the MS2001L follow these steps.

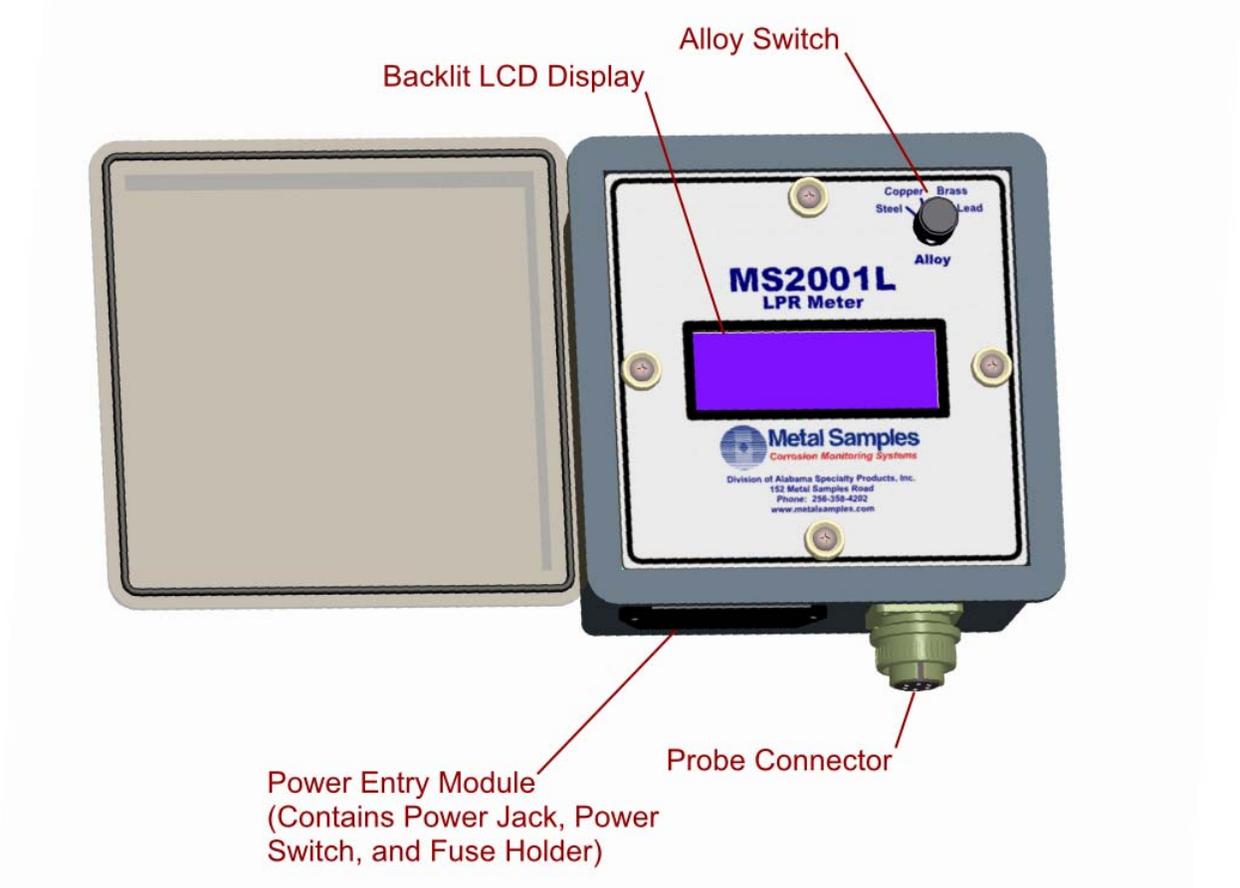
- 1) Assemble the mounting brackets onto the enclosure using the provided screws.
- 2) Mount the MS2001L in close proximity to the monitoring point. Mounting dimensions are shown in Figure 1.



**Figure 1 - MS2001L Mounting Dimensions (in Inches)**

- 3) Use the supplied power cord to connect the MS2001L instrument to an AC outlet.
- 4) Use the supplied probe cable to connect the MS2001L instrument to the LPR probe (which should already be fitted into the system, with electrodes installed.)

Figure 2 shows the location of the Probe Connector and Power Entry Module, along with the LCD Display and Alloy Switch.



**Figure 2 - MS2001L Overview**

## V. Operation

The MS2001L is designed to work with four alloys commonly found in water systems: steel, copper, brass, and lead. Prior to operation, the Alloy Switch should be set to the alloy being tested (the alloy of the electrodes in use.) This will set the necessary alloy constant for the corrosion rate calculation.

After setting the Alloy Switch, turn the power switch to the “on” position. The LCD display should illuminate and you should see the initial screen that reads “Metal Samples Company” and displays the software revision number.

After one minute the display should show the corrosion rate on the first line of the LCD display. After 30 more seconds, the display should show the ZRA value on the second line of the display. The bottom line of the LCD display shows a bar graph of the corrosion rate. This is illustrated below in Figure 3.



**Figure 3 - Typical Measurement Display**

The MS2001L will give a continuous display of the Corrosion Rate and ZRA measurements as long as the power remains “on”. The displayed values will update every 1.5 minutes (a complete Corrosion Rate and ZRA measurement cycle.)

## VI. Troubleshooting

If the instrument does not power up, check the following items:

1. Is the instrument plugged into a working outlet?
2. Is the power switch in the "on" position?
3. If the instrument is plugged into a working outlet and the power switch is "on", but the LCD display is not on, the fuse is most likely blown.

### Procedure for Replacing the Fuse

- 1) Unplug the instrument from the outlet.
- 2) Turn the power switch to the "off" position.
- 3) Carefully open the fuse cover (located in the Power Entry Module show in Figure 2.)
- 4) Remove the fuse by slowly pulling the fuse out of the holder.
- 5) Inspect the fuse to see if the fuse element is blown or broken. If you cannot tell by visual inspection, use an ohm-meter to check the fuse.
- 6) If the fuse is blown, carefully install a new fuse of the same value.

You may now plug the instrument into a working outlet and turn the power switch to the "on" position. The LCD display should illuminate and the instrument should resume normal operation. If it does not, please contact Metal Samples for further assistance.

If the instrument does not measure as expected during operation, disconnect the instrument from the probe and connect the Calibration Probe. Set the Alloy Switch to "Steel" and let the instrument complete a new measurement cycle (1.5 minutes.) The instrument should display  $5.00 \text{ mpy} \pm 0.10 \text{ mpy}$ . If it does not, please contact Metal Samples for further assistance.

## **VII. Warranty**

Metal Samples will correct, either by repair or replacement, any defect of material or workmanship which occurs within ninety (90) days after startup or six (6) months from the date of shipment to the original purchaser, whichever comes first, provided that an inspection by Metal Samples discloses that such a defect developed under normal and proper use.