508B
CURRENT LOOP INDICATOR
Operator's Manual

NEWPORT Electronics, Inc.

MADE IN THE U.S.A.
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Frequency Meters
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Printers
Process Meters
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Transmitters
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Thermistors
Wire
Rate Meters
Timers
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It is the policy of NEWPORT to comply with all worldwide safety and EMC/EMI regulations that apply. NEWPORT is constantly pursuing certification of its products to the European New Approach Directives. NEWPORT will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but NEWPORT Electronics, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.
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1.0 DESCRIPTION

1.1 DEFINITION/APPLICATION

Model 508B is a signal powered, two-wire current-loop indicator that accepts 1-5 mA, 4–20 mA, or 10-50 mA process signals and digitally display (±2000 active counts) the process variable in either percent or in engineering units for such parameters as pressure, flow, temperature, and level.

1.2 FEATURES

In-field Programmability

Input ranges (1-5 mA, 4-20 mA, or 10-50 mA) are selected by push-on jumpers. Three decimal points and a dummy right-hand zero may also be selected by push-on jumpers. Zero and span may be fine tuned with precision, 25-turn potentiometers. Positive slope response may be changed to negative slope response (e.g., +6000 to −18000) by simply changing two other push-on jumpers.
Signal Powered

Model 508B obtains operating power directly from the current loop, requiring a drop of less than 2.5 V or 2.5 mW at 1 mA.

Electrical Isolation/Overrange Protection

The 508B is electrically isolated from its case and is immune to most sources of electrical noise encountered in process-control environments. In the event of input overrange currents, the 508B can tolerate 250 mA in the forward direction and 1000 mA reverse.

Vibration/Shock/Water Resistance

Low mass and multi-point circuit board support give excellent vibration and shock resistance. Sturdy, die-cast construction, polyurethane paint, and full fluorosilicone gasketing ensure a virtually waterproof case. Circuit boards are conformally coated for added humidity protection.

Mounting Versatility

The 508B-1 may be mounted in a control room on either American or European relay tracks with snaptrack adaptors. The unit can be wall mounted using an available bulkhead adaptor or mounted in an explosion-proof enclosure for wiring compatibility with other equipment in hazardous environments. Both the 508B-2 and the 508B-3 may be connected directly to a conduit with a "T" junction box.

2.0 SPECIFICATIONS

2.1 INPUT

Current: 1-5 mA, 4-20 mA, or 10-50 mA (jumper selectable)
Voltage drop: 2.5 V max forward; up to 50 mA
Protection: 250 mA forward at 3 V or 6 V with IS option; 1000 mA reverse at 2.5 V
Zero range: –2510 to +2000 counts; jumper selectable in 4 overlapping coarse ranges with a 25-turn potentiometer for continuous adjustment within the following selected ranges: –2510 to –1420; –1580 to –420; –470 to +850; and +760 to +2000.
Span range: 0 to 2000 counts, continuously adjustable with 25-turn potentiometer
Normal mode rejection: 46 dB min at 50/60 Hz
Common mode rejection: 120 db typical, dc to 60 Hz
Common mode voltage: 700 V peak from dc to 60 Hz (meter to case)
RFI susceptibility: Less than ±0.5% of span at a distance of one meter from a 2-watt, hand-held transceiver (approximately equivalent to 10 V/m field strength) at frequencies of 27 MHz or 440 MHz

NOTE: Proper lead dress and shielding required.
2.2 ACCURACY

Accuracy: Within ±0.1% Span ±1 Count at +25°C
Zero Tempco: ±0.1 Count/K typ., ±0.2 Count/K max.
Span Tempco: ±0.005% Span/K typ., ±0.015% Span/K max.

2.3 DISPLAY

Type: 7-segment LCD, 8.9 mm (0.350 in) high
Color: Black digits on white background
Symbols: –1.8.8.80
Polarity: Minus sign
Overrange: Three least significant digits blanked
Extra digit: Dummy right-hand zero is jumper selectable
Decimal points: Three positions, jumper selectable
Lifetime: More than 30,000 hours to 2:1 contrast ratio
Temperature derating: 2:1 lifetime reduction for each 10°C above 60°C
Humidity derating: 2:1 lifetime reduction for each 10%RH above 60%RH

2.4 CONVERSION

Technique: Dual-slope, average-value with autozero correction
Polarity: Determined automatically at the end of signal integration period
Signal integration period: 100 mS typ.
Reading rate: 2.5/sec

2.5 ENVIRONMENTAL

Temperature: -40 TO +85°C
Humidity: To 95% at 40°C
Vibration: 1.52 mm (.06 in) double amplitude, 10-80 Hz cycled
Shock: 55 g, half-sine, 9-13 msec duration
Water resistance: Watertight to a proof pressure of 35 kPa (5 psi)
Mounting position: Any
2.6 MECHANICAL

Weight: 400 g (14 oz)
Diameter: 74 mm (2.9 in)
Height: 48 mm (1.9 in) including barrier
Electrical connections: Standard: 3-position barrier strip with #6 screw wire clamps
Optional: Two #18 stranded wires, 305 mm (12 in) long

3.0 MECHANICAL ASSEMBLY AND INSTALLATION

3.1 SAFETY CONSIDERATIONS

To ensure safe operation follow the guidelines below:

VISUAL INSPECTION: Do not attempt to operate the instrument if damage is found.

This instrument will meet the requirements of certain FM safety certifications for hazardous environments. In order to meet these requirements the appropriate intrinsic safety barrier must be included in the installation to limit the voltage and current that may be introduced in the hazardous environment.

EXERCISE CAUTION: Due to certain current loop installations, high common mode voltages may be present on the loop circuits. Become familiar with the possible hazards that your circuit may present before installing this meter or, to be safe, remove all sources of power to the circuit while installing.

RAIN OR MOISTURE: Do not expose the instrument to condensing moisture.

3.2 INTRINSIC SAFETY PARAMETERS FOR FM (FACTORY MUTUAL)

Certificate No. 5X2A0.AX
V max=12.5 V,
I max=250 mA
Intrinsically Safe for Class I, II and III, Division 1, Groups A,B,C,D,E,F and G hazardous locations.
Ci=8.6 µF
Li=0 mH
3.3 MECHANICAL INSTALLATION

Rear view: Standard, integral mounting plate

Figure 3-1 Basic Mounting Configurations

508B-1

12.7 mm or 1/2 inch conduit

508B-2 and 508B-3
The 508B is packaged in a small, rugged, die-cast, zinc-alloy case designed to fit 3" I.D. or larger housings, requiring less than 2” of height.

Three basic 508B configurations (508B-1, 508B-2, and 508B-3) provide mounting versatility.

The 508B-1 provides for surface, track, or explosion-proof housing mounting and is connected with a 3-terminal, #6 screw barrier strip (beneath the display window).

The 508B-2 is equipped with a 1/2" EMT conduit fitting on the case side beneath the display. The fitting has two 0.3 millimeter long, #18 stranded insulated wires passing through a neoprene moisture plug for hookup to junction boxes with standard wire nuts.

The 508B-3 is equipped with a 1/2" NPT conduit fitting on the case side beneath the display. The fitting has two 0.3 mm long, #18 stranded insulated wires passing through a neoprene moisture plug for hookup to junction boxes with standard wire nuts.

3.4 STANDARD MOUNTING

Tapped holes on the back of the 508B case provide for custom mounting to a flat surface; integral flanges on the back of the case provide for standard 8TK2 relay track mounting. For flat surface mounting, use #6 hardware. For 8TK2 relay track mounting, simply push onto track.

The following optional adaptors provide additional mounting options:

1. Adapter plate for surface mount with two #8 front-entry screws through keyhole slots or for push-mount into TR2/2TK relay track. (Option MAT1)

2. Rail clamp for push mount onto DIN EN 50 022 relay track. (Option MDT1)

3. Spring retainers for mounting in 76.4 to 88.9 mm (3 to 3.5 in) inside diameter explosion-proof housings. (Option MXS1)

4. Wire brackets for mounting the 508B above a transmitter in a single housing. (Option MXS2)
Figure 3-2 Surface and TR2/2TK Relay Track Mounting (Option MAT1)

1. Position plate for desired application.
2. Use #6 hardware to mount plate to the back of the case.

Figure 3-3 DIN Track Mounting (Option MDT1)

1. Position plate for desired track direction.
2. Use #6 flathead screws to mount plate to the back of the case.
1. Position spring retainers across the back of the case.
2. Use wire protector feet (4 provided with Option MXS1) to hold spring retainers in place.
3. Press case assembly into explosion-proof housing.
Figure 3-5. External Explosion-Proof Housing Mounting (Option MXS2)

1. Install brackets using #6 screws and flat washers.
2. Mount 508B above transmitter as shown in Figure 3-6.
3. Press wires to pass into housing.

Figure 3-6. External Explosion-Proof Housing Mounting (Option EPW2)
4.0 SIGNAL INPUT CONNECTIONS

WARNING: Input currents in excess of protective limits can damage your meter

4.1 508B-1

The 508B-1 has a 3-terminal barrier strip on the front of the case below the display window. The signal inputs are marked with a "+" or a "–" symbol. The third terminal (case ground) is marked with a "/ / / " symbol. Use of a shielded cable, properly dressed, is recommended.

4.2 508B-2 and 508B-3

Both the 508B-2 and 508B-3 come equipped with a male conduit fitting on the side of the case. The 508B-2 fitting is 1/2" EMT; the 508B-3 fitting is 1/2" NPT. Each conduit fitting is plugged with a rubber stopper. Two 0.3 millimeter long, #18 stranded insulated wires are passed through each stopper. The two wires are white and black. The black wire is the "+" signal input; the white wire is the "–" signal input. Either unit can be hooked up using standard wire nuts.

Figure 4-1 508B-1 Signal Connections

<table>
<thead>
<tr>
<th>Screw-Terminal Pin Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Figure 4-2 508B-2 & 508B-3 Signal Connections

<table>
<thead>
<tr>
<th>Terminal Wire Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK WIRE    + SIGNAL INPUT</td>
</tr>
<tr>
<td>WHITE WIRE    – SIGNAL INPUT</td>
</tr>
</tbody>
</table>
5.0 CONFIGURATION AND CALIBRATION

The factory setup (FS) option procedure is to configure the 508B for a specific application. Customers may specify any two current inputs and their corresponding digital readings. For optional configuration procedures, see Section 5.3.

The unit may be configured using the push-on jumpers already positioned on the pin-forest. Pin-forest designations are illustrated in Figure 5-4.

5.1 GLOSSARY

The following terms and their definitions appear throughout the following procedures:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP1</td>
<td>Decimal point 1.999</td>
</tr>
<tr>
<td>DP2</td>
<td>Decimal point 19.99</td>
</tr>
<tr>
<td>DP3</td>
<td>Decimal point 199.9</td>
</tr>
<tr>
<td>DRHZ</td>
<td>Dummy right-hand zero</td>
</tr>
<tr>
<td>G</td>
<td>Gain expressed in counts per mA</td>
</tr>
<tr>
<td>I1</td>
<td>Lowest input current in mA</td>
</tr>
<tr>
<td>I2</td>
<td>Highest input current in mA</td>
</tr>
<tr>
<td>N1</td>
<td>Reading in displayed counts at input current I1</td>
</tr>
<tr>
<td>N2</td>
<td>Reading in displayed counts at input current I2</td>
</tr>
<tr>
<td>RN</td>
<td>Required range number for zero range selection</td>
</tr>
<tr>
<td>RSS</td>
<td>Reverse span slope</td>
</tr>
<tr>
<td>ZR1</td>
<td>Zero range (-2510 to -1420)</td>
</tr>
<tr>
<td>ZR2</td>
<td>Zero range (-1580 to -420)</td>
</tr>
<tr>
<td>ZR3</td>
<td>Zero range (-470 to +850)</td>
</tr>
<tr>
<td>ZR4</td>
<td>Zero range (+760 to +2000)</td>
</tr>
</tbody>
</table>
5.2 CALCULATION

NOTE: An alternate FS calculation procedure is given in Section 5.3

1. Base all calculations on one of three ranges: 1 mA to 5 mA, 4 mA to 20 mA, or 10 mA to 50 mA. Write results of calculations in blanks provided below each procedural step.

2. Determine the lowest input current, I1, specified by the customer:
   \[ I1 = \underline{_______} \text{mA} \]

3. Determine the highest input current, I2, specified by the customer:
   \[ I2 = \underline{_______} \text{mA} \]

4. Determine the reading, N1, at input current, I1, specified by the customer:
   \[ N1 = \underline{_______} \text{counts} \]

5. Determine the reading, N2, at input current, I2, specified by the customer:
   \[ N2 = \underline{_______} \text{counts} \]

6. Calculate the gain (G1):
   \[ G = \frac{(N2 - N1)}{(I2 - I1)} = \frac{(-)}{(-)} \text{ counts per mA} \]

7. Calculate the required range number:
   \[ RN = N1 - (I1 \times G) = \underline{_______} \]

NOTE: If G is greater than 500, it is out of the operating range for the standard unit.

8. Select the zero range, ZR, that includes the required range number, RN, from the following ranges:
   - ZR1 = -2510 to -1420
   - ZR2 = -1580 to -420
   - ZR3 = -470 to +850
   - ZR4 = +760 to +2000

9. Proceed to FS Procedure Implementation, Section 5.4.
5.3 ALTERNATE FS CALCULATION

1. (Line 1) Low signal input (mA) = _______________________
2. (Line 2) High signal input (mA) = _______________________
3. (Line 3) Low signal input reading (counts) = _______________________
4. (Line 4) High signal input reading (counts) = _______________________
5. (Line 5) Line 2 - Line 1 = _______________________
6. (Line 6) Line 4 - Line 3 = _______________________
7. (Line 7) Line 6 divided by Line 5 = _______________________
8. (Line 8) Line 7 x Line 1 = _______________________
9. (Line 9) Line 3 - Line 8 = _______________________

10. Select a zero range from one of the following, where the number on Line 9 falls between the high and low numbers of that ZR range:
    
    ZR1 = -2510 to -1420
    ZR2 = -1580 to -420
    ZR3 = -470 to +850
    ZR4 = +760 to +2000

11. Proceed to FS Procedure Implementation, Section 5.4.

5.4 FS PROCEDURE IMPLEMENTATION

Pin-forest designations are illustrated in Figure 5-4 Jumper Locations. Range and display selection are listed in Table 5-1 Configuration Chart.

1. If the current range chosen in either Section 5.2 Step 1 or Section 5.3 Steps 1 and 2 equals either 4 mA to 20 mA or 10 mA to 50 mA, install a push-on jumper as indicated in Table 5-1.

2. If N1 (5.2 Step 3 or 5.3 Step 3) is more positive than N2 (5.2 Step 5 or 5.3 Step 4), reverse the span slope (RSS) by installing two push-on jumpers as indicated in Table 5-1.

3. Select the zero range required (ZR1, ZR2, ZR3, or ZR4), and install a push-on jumper as indicated in Table 5-1.

4. If a dummy right-hand zero (DRHZ) is required, install a push-on jumper as indicated in Table 5-1.

5. If a decimal point is required (DP1, DP2, DP3), install a push-on jumper as indicated in Table 5-1.
5.5 COMPONENT ACCESS/UNIT CALIBRATION

Tools and Equipment

#2 Phillips screwdriver
Jewelers' slotted screwdriver
Precision milliampere power source
or
10 V power supply, 4 1/2 digit DMM with milliampere range and 10 kOhm rheostat

Figure 5-1. 508B-2 and 508B-3 Case Access
Figure 5-2. Calibration Setup

1. Remove 4 Phillips-head screws from the top of the 508B case, and lift main unit from case. (See Figure 5-1)

2. Select the desired jumper configuration and install push-on jumpers in locations indicated in the Table 5-1 Configuration Chart. (See Figure 5-4)

3. Pull off two sealing plugs that cover 508B span and zero potentiometer screw heads.

4. Set up 508B in calibration configuration. (See Figure 5-2)

NOTE: Store unused jumpers in a vertical position on unused upper pins closest to the display board.
5. Calibrate unit as follows:
   A. Alternately apply input currents I1 and I2, and adjust span pot (S) until span reading equals \(N_2 - N_1\) counts.
   B. Apply input current, I1, and adjust the zero pot (Z) until a reading equal to N1 is displayed.

6. Remove 508B from calibration setup.

7. Replace two sealing plugs over 508B span and zero potentiometer screw heads.

8. Apply labels as described in Section 5.6. (See Figure 5-3).

9. Replace 508B main unit in case.

10. Replace 4 Phillips-head screws that hold the 508B unit to the case.

5.6 LABELS

Figure 5-3. Label Placement

1. Add new label directly over existing label. Add correct values of I1, I2, N1, and N2.
2. Install one label on the outside of the housing as shown above.
3. Install one label on the wire shield as shown above.
Table 5-1. Configuration Chart

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Push-On Jumpers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 mA</td>
<td>NONE</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>J*</td>
</tr>
<tr>
<td>10-50 mA</td>
<td>A</td>
</tr>
<tr>
<td>Normal span slope</td>
<td>G,a*</td>
</tr>
<tr>
<td>Reverse span slope</td>
<td>F,Z</td>
</tr>
<tr>
<td>Zero range -2510 to -1420 (ZR1)</td>
<td>I</td>
</tr>
<tr>
<td>Zero range -1580 to -420 (ZR2)</td>
<td>T</td>
</tr>
<tr>
<td>Zero range -470 to +850 (ZR3)</td>
<td>NONE</td>
</tr>
<tr>
<td>Zero range +760 to +2000 (ZR4)</td>
<td>c</td>
</tr>
<tr>
<td>Dummy right-hand zero (DRHZ)</td>
<td>D</td>
</tr>
<tr>
<td>Decimal Point 1.999 (DP1)</td>
<td>W</td>
</tr>
<tr>
<td>Decimal Point 19.99 (DP2)</td>
<td>V</td>
</tr>
<tr>
<td>Decimal Point 199.9 (DP3)</td>
<td>L*</td>
</tr>
</tbody>
</table>

* Default Setting

NOTE: The factory-calibrated configuration shows 00.0 to 100.0 for a 4 to 20 mA input.
6.0 INTRINSIC SAFETY CONSIDERATIONS

NOTES:

1. Apparatus which is unspecified except that it must not be supplied from nor contain under normal or abnormal conditions a source of potential with respect to Earth in excess of 250V R.M.S. or 250V D.C.

2. The following output parameters apply; Vmax=12.5V, Imax=250mA, Ci=6.2µF, Li=0.

3. The Interconnecting Cable may be a twin pair, or a pair contained in a Type A or Type B multicore cable (as defined in EN50039 clause 5.3) provided that the peak voltage of any circuit contained within the multicore does not exceed 60 Volts.

4. The capacitance or inductance or inductance to resistance (4R) ratio of the Interconnecting Cable must not exceed the values specified for the barrier in use.

5. The electrical circuit in the Hazardous Area must be capable of withstanding without breakdown an A.C. test voltage of 500V R.M.S. to Earth or frame for one minute.

Figure 6-1 Block Diagram for 508B Usage for Factory Mutual
NEW PORT ELECTRONICS, INC. warrants this unit to be free of defects in materials and workmanship for a period of one (1) year from date of purchase. In addition to NEWPORT’s standard warranty period, NEWPORT ELECTRONICS will extend the warranty period for one (1) additional year if the warranty card enclosed with each instrument is returned to NEWPORT.

If the unit should malfunction, it must be returned to the factory for evaluation. NEWPORT’s Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by NEWPORT, if the unit is found to be defective it will be repaired or replaced at no charge. NEWPORT's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of NEWPORT’s control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the NEWPORT Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO NEWPORT, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM NEWPORT’S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting NEWPORT:
1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

NEWPORT’s policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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