2002B

MAIN ASSEMBLY WITH SIGNAL CONDITIONERS
- P  PROCESS RECEIVER
- E  EXCITATION SUPPLY
- S  STRAIN / MICROVOLT

Operator’s Manual
Additional products from

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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.
# TABLE OF CONTENTS

1.0 GENERAL INFORMATION
   1.1 Model 2002B-P ................................................................. 1
   1.2 Model 2002B-E ................................................................. 1
   1.3 Model 2002B-S ................................................................. 1

2.0 SPECIFICATIONS
   2.1 Analog Input ................................................................. 2
   2.2 Accuracy at 25°C ............................................................. 3
   2.3 Noise Rejection .............................................................. 3
   2.4 Excitation Supply ............................................................ 3
   2.5 Analog-to-Digital Conversion .......................................... 4
   2.6 Digital Inputs ............................................................... 4
   2.7 Display ........................................................................ 4
   2.8 Power .......................................................................... 5
   2.9 Environmental .............................................................. 5
   2.10 Mechanical ................................................................. 5

3.0 MECHANICAL ASSEMBLY AND INSTALLATION ..................... 6
   3.1 Safety Considerations .................................................... 6
   3.2 Panel Mounting ............................................................. 7
# TABLE OF CONTENTS (cont.)

4.0 POWER & SIGNAL INPUT CONNECTIONS (TB1) .................................. 9
   4.1 Installing Option C1 ................................................................. 9
   4.2 Power Connections ................................................................. 10
   4.3 Signal Connections ................................................................. 10
   4.4 Main Board Connector Pin Assignments (J1) ............................... 11

5.0 MAIN BOARD CONFIGURATION ...................................................... 12
   5.1 Decimal Point Selection ............................................................ 12
   5.2 Model 2002B-P ........................................................................... 13
   5.3 Models 2002B-E and 2002B-S .................................................... 14

6.0 PLUG-IN CARD CONFIGURATION ................................................... 15
   6.1 Model 2002B-P ........................................................................... 15
   6.2 Model 2002B-E ........................................................................... 16
   6.3 Model 2002B-S ........................................................................... 17

7.0 CALIBRATION .................................................................................. 18

8.0 DRAWINGS ....................................................................................... 20

9.0 APPLICATION NOTES ....................................................................... 23
   9.1 Excitation Supply/Current Transmitter Interface ............................. 23
<table>
<thead>
<tr>
<th>Figure 3-1</th>
<th>DIN Case Dimensions</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 3-2</td>
<td>Exploded View</td>
<td>8</td>
</tr>
<tr>
<td>Figure 4-1</td>
<td>Changing Operating Voltage</td>
<td>9</td>
</tr>
<tr>
<td>Figure 4-2</td>
<td>Rear View of Case with Connectors</td>
<td>10</td>
</tr>
<tr>
<td>Figure 5-1</td>
<td>Display Board Jumper Locations</td>
<td>12</td>
</tr>
<tr>
<td>Figure 5-2</td>
<td>Main Board Jumper Locations</td>
<td>13</td>
</tr>
<tr>
<td>Figure 6-1</td>
<td>-P Card Jumper Locations</td>
<td>15</td>
</tr>
<tr>
<td>Figure 6-2</td>
<td>-E Card Jumper Locations</td>
<td>16</td>
</tr>
<tr>
<td>Figure 6-3</td>
<td>-S Card Jumper Locations</td>
<td>17</td>
</tr>
<tr>
<td>Figure 8-1</td>
<td>Main Board Assembly Diagram</td>
<td>20</td>
</tr>
<tr>
<td>Figure 8-2</td>
<td>Plug-in Card Assembly -E or -P Diagram</td>
<td>21</td>
</tr>
<tr>
<td>Figure 8-3</td>
<td>Plug-in Card Assembly -S Diagram</td>
<td>22</td>
</tr>
<tr>
<td>Figure 9-1</td>
<td>Two-wire Connection</td>
<td>23</td>
</tr>
<tr>
<td>Figure 9-2</td>
<td>Four-wire Connection</td>
<td>23</td>
</tr>
</tbody>
</table>
1.0 GENERAL INFORMATION

The 2002B series provides several versions of a low-cost, four and one-half digit panel meter for a wide range of applications that require accurate DC measurement with zero and span adjustments.

1.1 MODEL 2002B-P

The 2002B-P consists of a main assembly and a plug-in process receiver board.

Model 2002B-P is a process receiver with adjustments of 40,000 counts of zero and 20,000 counts of span for transmitter signals such as 4-20 mA, 1-5 V, and 0-10 V. The meter can be scaled to display readings directly in engineering units.

Model 2002B-P can also be used in ratiometric pot-follower applications, to determine such things as liquid level or valve setting from the position of a potentiometer wiper. The required external reference voltage can be derived from the meter's 4.7 V dc supply.

1.2 MODEL 2002B-E

The 2002B-E consists of a main assembly and a process receiver with excitation board.

In addition to all Model 2002B-P features, Model 2002B-E offers an electrically-floating supply for powering transmitters, active transducers, and bridges. Supply voltage is adjustable from 10 to 24 V dc up to a maximum output current of 50 mA. (See Section 9.1)

1.3 MODEL 2002B-S

The 2002B-S consists of a main assembly and a preamplifier with excitation board.

In addition to most 2002B-E features (with the exception that excitation maximum output current decreases from 30 mA at 10 V dc to 20 mA at 24 V dc), Model 2002B-S offers a high-impedance, precision preamplifier with programmable gains of 1, 3, 10, 30, and 100. Gains provide resolutions of 100, 30, 10, 3, and 1μV/count, respectively. Typical offset drift is only 0.3 μV/°C. The preamplifier is ideal for metal-foil, strain-gauge applications that require microvolt resolution.
2.0 SPECIFICATIONS

2.1 ANALOG INPUT

Models 2002B-P and 2002B-E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>2002B-P</th>
<th>2002B-E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>4-20 mA</td>
<td>1-5 V</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.8 µA</td>
<td>0.2 mV</td>
</tr>
<tr>
<td>Input resistance</td>
<td>130 Ω</td>
<td>1 MΩ</td>
</tr>
<tr>
<td>Bias current</td>
<td>50 pA</td>
<td>10 pA</td>
</tr>
<tr>
<td>Maximum input</td>
<td>55 mA</td>
<td>250 V</td>
</tr>
<tr>
<td>Configuration</td>
<td>250 V</td>
<td></td>
</tr>
<tr>
<td>Zero range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Span range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NMR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal (standard)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External (ratiometric)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential with respect to AC earth ground, bipolar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20,000 to +20,000 counts with multturn pots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 20,000 counts with multturn pots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 dB at 50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0 V dc ±5% with 12 kΩ source resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 - 2.0 V, 680 kΩ input resistance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 2002B-S

Range
- Most-sensitive scaling
- Least-sensitive scaling

Input resistance
Bias current
Maximum input
Configuration

Coarse preamplifier gains
Bridge balance adj.
Zero range
Span range
NMR

Reference:
- Internal (from excitation supply)
- External (opt)

±19.999 mV, 10 µV resolution
±2.5 V, 1 mV resolution (limited by CMV)
1 GΩ min without bridge balance
1 nA typ, 5 nA max
50 V
Differential with respect to AC earth ground, bipolar
1, 3, 10, 30, 100
±1.5 mV with 350 nΩ bridge
-20,000 to +20,000 counts with multturn pots
0 - 20,000 counts with multturn pots
80 dB at 50/60 Hz for 20 mV range; 66 dB at 50/60 Hz for 0.2 and 2.0 V ranges
1.0 V dc with 9.5 kΩ source resistance at 10 V dc excitation
1.0 V dc -50%/+100% with 680 kΩ input resistance
2.2 ACCURACY AT 25°C

Models 2002B-P, 2002B-E, and 2002B-S

Step response 1 second
Warmup to rated accuracy 10 minutes

Models 2002B-P and 2002B-E

Maximum error ±0.01% of span ±2 counts
Span tempco ±0.01% of span/°C
Zero tempco ±0.5 counts/°C

Model 2002B-S

<table>
<thead>
<tr>
<th>Reference</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum error</td>
<td>±0.01% S</td>
<td>±2 counts</td>
</tr>
<tr>
<td>Span tempco</td>
<td>±0.005% S/°C</td>
<td>±0.01% S/°C</td>
</tr>
<tr>
<td>Zero tempco</td>
<td>±0.5 μV/°C</td>
<td>±1.0 counts/°C</td>
</tr>
<tr>
<td>Bridge balance tempco</td>
<td>±0.5 μV/°C</td>
<td>±0.2 μV/°C</td>
</tr>
</tbody>
</table>

2.3 NOISE REJECTION

CMR, SIG GND to PWR GND 120 dB from DC to 60 Hz
CMV, SIG GND to PWR GND 1500 Vp per HV test;
354 Vp per IEC spacing

2.4 EXCITATION SUPPLY

Models 2002B-E and 2002B-S

Output voltage Adjustable from 10 to 24 V dc with multturn pot
Output current 50 mA max for -E; 30 mA max at 10 V
decreasing to 12 mA max at 24 V for -S
Load regulation* 0.15% typ, 0.5% max from zero to max load
Line regulation* 0.01% typ, 0.04% max for 10% change of AC
power voltage
Tempco* 0.02%/°C max
Ripple at 50/60 Hz 0.01%

* In Model 2002B-S, the meter’s internal reference (e.g., 1 V at 10 V excitation) is
derived from the excitation voltage for ratiometric operation which eliminates load and
line regulation errors and reduces other errors.
2.5 ANALOG-TO-DIGITAL CONVERSION

Technique
Input integration period
Read rate

Dual-slope, average-value
100 milliseconds
2.5/seconds

2.6 DIGITAL INPUTS
(Positive true referenced to DIG GND)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>&quot;0&quot; LEVEL VOLTS</th>
<th>&quot;1&quot; LEVEL VOLTS</th>
<th>SINK mA</th>
<th>SOURCE µA</th>
</tr>
</thead>
<tbody>
<tr>
<td>METER HOLD</td>
<td>0 to 1.0</td>
<td>2.5 to 5.0</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>LAMP TEST</td>
<td>0 to 0.6</td>
<td>2.0 to 5.0</td>
<td>1.3</td>
<td>20</td>
</tr>
<tr>
<td>DISPLAY BLANKING</td>
<td>0 to 0.6</td>
<td>2.0 to 5.0</td>
<td>1.3</td>
<td>20</td>
</tr>
</tbody>
</table>

2.7 DISPLAY

Type
Digit height
Symbols
Decimal Points
Overrange indication

7 segment, red LED
14.2 mm (0.56 in)
-1.8.8.8.8
4 positions programmed internally or at connector, source 0.3 mA from digit drive
4 least-significant digits flash

11192ML-01 4
2.8 POWER

Standard AC input voltage: 115 V ac ±15%
Optional AC input voltage: 230 V ac ±15%
AC frequency range: 47 to 400 Hz
Optional DC input voltage:
- 9-32 V dc, isolated to 300 V dc
- 26-56 V dc, isolated to 300 V dc

Power consumption, 2002B-P: 2.4 watts
Power consumption, 2002B-E or 2002B-S: 3.7 watts

Output voltages:
- +4.7 V dc ±5% at 10 mA max
- -4.7 V dc ±5% at 10 mA max

2.9 ENVIRONMENTAL

Operating temperature: 0 to 60°C
Storage temperature: -40 to +85°C
Humidity: 95% RH to 40°C (non-condensing)

2.10 MECHANICAL

Bezel: 96 x 48 x 8.0 mm
(3.78 x 1.89 x 0.31 inches)

Depth behind bezel with connector: 104.2 mm (4.10 inches)

Panel cutout: 92 x 45 mm (3.62 x 1.77 inches)

Weight: 425 g (15 ounces)

Case material: 94V-0 UL-rated polycarbonate

D1 connector (Optional): PCB edge connector with double row of 18 pins; 3.96 mm (0.156 inches) between pins

Screw Terminals: Barrier strip with #6 screw terminals for power and signal inputs
3.0 MECHANICAL ASSEMBLY AND INSTALLATION

3.1 SAFETY CONSIDERATIONS

This device is marked with the international Caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

Unpacking & Inspection
Unpack the instrument and inspect for obvious shipping damage. Do not attempt to operate the unit if damage is found.

Note
This instrument is a panel mount device protected in accordance with Class I of EN 61010 (115/230 AC power connections). Installation of this instrument should be done by Qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has no power-on switch. An external switch or circuit-breaker shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall not interrupt the Protective Conductor (Earth wire), and it shall meet the relevant requirements of IEC 947-1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the mains supply cord.

Furthermore, to provide protection against excessive energy being drawn from the mains supply in case of a fault in the equipment, an overcurrent protection device shall be installed.

- The Protective Conductor must be connected for safety reasons. Check that the power cable has the proper Earth wire, and it is properly connected. It is not safe to operate this unit without the Protective Conductor Terminal connected.

- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.

EMC Considerations
- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.
3.2 PANEL MOUNTING

NOTE: Dimensions are in millimeters ±0.25 mm and inches are in ( ) ±0.01 in.

SIDE VIEW

TERMINAL BLOCK COVER

SLIDE RETAINER

CASE

CLAMP RING

TOP VIEW

PANEL THICKNESS
6.4 (.25) max
0.8 (.03) min

45.0 +0.6/-0.0
(1.772 +.024/-0.000)

92.0 +0.8/-0.0
(3.622 +0.032/-0.000)

R 1.6 (.06) 4 PLCS

Figure 3-1 DIN Case Dimensions
Figure 3-2 Exploded View

1. Remove main board edge connector J1, if installed.
2. Loosen the two clamp screws on rear of case until slide clamps can be rotated. Push the two slide retainers toward the rear of the case, and remove them.
3. Working from the front of the panel, insert the meter into the panel cutout.
4. Insert slide retainers back onto the case, and push them up tightly against the rear of the panel.
5. Rotate slide clamps back into original position and tighten clamp screws just enough to hold the case in place. NEVER OVERTIGHTEN CLAMP SCREWS.
6. Install any connectors that have been removed.
4.0 POWER AND SIGNAL INPUT CONNECTIONS (TB1)

CAUTION: Incorrect power input can damage your panel meter.

4.1 INSTALLING OPTION C1 (230 V ac)

If this option is to be used, it must be installed prior to any power and signal connections. Option C1 is 230 V ac ±15%, 47-400 Hz operation. To change the meter in the field from 115 V ac operation, follow this procedure:

1. Refer to Figures 4-1 and 4-2. Remove power lines from the meter, then remove the meter from the case.

2. Remove jumpers W5 and W6 on the transformer.

3. Add jumper W4 on the printed circuit board. The meter is now wired for 230 V ac operation.

NOTE: To change the meter from 230 V ac to 115 V ac operation, reverse the above procedure.

Figure 4-1 Changing Operating Voltage
4.2 POWER CONNECTIONS

<table>
<thead>
<tr>
<th>TB1 Connection</th>
<th>AC Power Operation</th>
<th>Wire Color</th>
<th>DC Power Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002B-P 2002B-E 2002B-S</td>
<td>1 1 1</td>
<td>AC HI</td>
<td>Black, Brown</td>
</tr>
<tr>
<td></td>
<td>2 2 2</td>
<td>AC LO</td>
<td>White, Blue</td>
</tr>
<tr>
<td></td>
<td>3 3 3</td>
<td>AC GND</td>
<td>Green, Green/Yellow</td>
</tr>
</tbody>
</table>

4.3 SIGNAL INPUT CONNECTIONS

<table>
<thead>
<tr>
<th>TB1 Connection</th>
<th>Signal Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002B-P 2002B-E 2002B-S</td>
<td>- EXC</td>
</tr>
<tr>
<td>N/C 4 4</td>
<td>SIG LO</td>
</tr>
<tr>
<td>5 5 5</td>
<td>SIG HI</td>
</tr>
<tr>
<td>6 6 6</td>
<td>+ EXC</td>
</tr>
<tr>
<td>N/C 7 7</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4-2 Rear View of Case with Connectors
## 4.4 MAIN BOARD CONNECTOR PIN ASSIGNMENTS (J1)

(Left to right, looking at rear of case)

<table>
<thead>
<tr>
<th>CONNECTION</th>
<th>FUNCTION</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Spare (E9)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spare (E11)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Spare (E13)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Spare (E15)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>No connection</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1999.9 DP</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spare (E16)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>199.99 DP</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Spare (E17)</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>19.999 DP</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Spare (E20)</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>1.9999 DP</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Spare (E19)</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>DP Return</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Spare (E18)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Spare (E21)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>-4.7 V dc</td>
<td>Analog and Digital Power</td>
</tr>
<tr>
<td>N</td>
<td>Spare (E25)</td>
<td>Analog and Digital Power</td>
</tr>
<tr>
<td>12</td>
<td>+4.7 V dc</td>
<td>Excitation Voltage</td>
</tr>
<tr>
<td>P</td>
<td>-EXC</td>
<td>Reference Voltage</td>
</tr>
<tr>
<td>13</td>
<td>+REF</td>
<td>Lights All Display Segments</td>
</tr>
<tr>
<td>R</td>
<td>LAMP TEST</td>
<td>Excitation Voltage</td>
</tr>
<tr>
<td>14</td>
<td>+EXC</td>
<td>Digital Ground</td>
</tr>
<tr>
<td>S</td>
<td>DIG GND</td>
<td>Hold Last Display Reading</td>
</tr>
<tr>
<td>15</td>
<td>HOLD</td>
<td>Analog Ground</td>
</tr>
<tr>
<td>T</td>
<td>ANA GND</td>
<td>Signal Input</td>
</tr>
<tr>
<td>16</td>
<td>SIG LO</td>
<td>Blanks Four LSDs</td>
</tr>
<tr>
<td>U</td>
<td>BLANKING</td>
<td>Signal Input</td>
</tr>
<tr>
<td>17</td>
<td>SIG HI</td>
<td>100 kHz Out</td>
</tr>
<tr>
<td>V</td>
<td>OSC</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>ANA OUT</td>
<td></td>
</tr>
</tbody>
</table>
5.0 MAIN BOARD CONFIGURATION

The following procedures are used to select the various configurations of the main board for use as a 2002B-P, 2002B-E, or 2002B-S in conjunction with a plug-in signal conditioning card.

5.1 DECIMAL POINT SELECTION

![Display Board Jumper Locations](image)

Figure 5-1 Display Board Jumper Locations

The 2002B has four decimal point locations which can be displayed. They may be programmed by installing push-on jumpers on S1 of the display board or by connecting pins on the optional rear connector, J1.

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated in the chart below.

<table>
<thead>
<tr>
<th>Decimal point</th>
<th>S1</th>
<th>Alternate decimal point selection using main board connector J1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9999 DP</td>
<td>A</td>
<td>Connect K to L</td>
</tr>
<tr>
<td>19.999 DP</td>
<td>B</td>
<td>Connect J to L</td>
</tr>
<tr>
<td>199.99 DP</td>
<td>C</td>
<td>Connect H to L</td>
</tr>
<tr>
<td>1999.9 DP</td>
<td>D</td>
<td>Connect F to L</td>
</tr>
</tbody>
</table>
Figure 5-2  Main Board Jumper Locations

The 2002B-P main board is generally configured to use the internal absolute reference rather than an external ratiometric one. The three input ranges for this are listed in the chart below.

<table>
<thead>
<tr>
<th>Input Ranges</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-20 mA</td>
<td>A</td>
<td>A,F,C</td>
<td>B</td>
</tr>
<tr>
<td>1-5 V dc</td>
<td>B</td>
<td>A,F,D</td>
<td>B</td>
</tr>
<tr>
<td>0-10 V dc</td>
<td>C</td>
<td>A,F,D</td>
<td>B</td>
</tr>
</tbody>
</table>
The 2002B-E main board may be configured to use one of three input ranges.

<table>
<thead>
<tr>
<th>Input Ranges</th>
<th>S2</th>
<th>S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-20 mA</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>1-5 V dc</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>0-10 V dc</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

The 2002B-E and 2002B-S may also be configured to use one of three reference sources:

**Internal Absolute Reference**

This reference mode uses the meter’s own internal reference to perform the analog-to-digital conversion. Use this mode when measuring an absolute voltage or current where you do not require measurement of the input signal to be relative to (ratiometric with) another signal such as an external transducer excitation supply.

**Internal Ratiometric Reference**

This reference mode will use the meter’s own excitation supply voltage as a reference in performing the analog-to-digital conversion. Use this reference with a load cell or applications where it is desired to have the measurement of the input signal relative to (ratiometric with) the meter’s internal excitation supply.
External Ratiometric Reference

This reference mode will use a signal which you will provide on the rear connector (J1-13) as a reference in performing the analog-to-digital conversion. Use this reference with a load cell or applications where it is desired to have the measurement of the input signal relative to (ratiometric with) some external signal.

<table>
<thead>
<tr>
<th>Reference Voltage Source</th>
<th>S3</th>
<th>S4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Absolute (as shipped)</td>
<td>A,F</td>
<td>B</td>
</tr>
<tr>
<td>Internal Ratiometric</td>
<td>B,E</td>
<td>A</td>
</tr>
<tr>
<td>External Ratiometric</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTE: If your application requires the use of an external ratiometric reference, remove all push-on jumpers from S4. This reference signal must then be provided at the rear connector on J1-13.

6.0 PLUG-IN CARD CONFIGURATION

6.1 Model 2002B-P

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

![Diagram of the -P Card Jumper Locations](image)

The 2002B-P plug-in card should have push-on jumpers installed on positions S1-A and S1-C.
6.2 Model 2002B-E

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

![Diagram of S1, A, B, C, D jumpers]

Figure 6-2 -E Card Jumper Locations

The 2002B-E plug-in card should be configured according to the type of reference for which the main board was configured.

<table>
<thead>
<tr>
<th>Reference Voltage Source</th>
<th>S1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Absolute</td>
<td>A,C</td>
</tr>
<tr>
<td>Internal Ratiometric</td>
<td>B,D</td>
</tr>
<tr>
<td>External Ratiometric</td>
<td>A,C</td>
</tr>
</tbody>
</table>

* Zero Offset is derived from this reference.
6.3 Model 2002B-S

Remove all push-on jumpers not used in the desired configuration. Install appropriate jumpers as indicated.

![Diagram showing jumper locations](image)

**Figure 6-3  -S Card Jumper Locations**

The 2002B-S plug-in card should be configured according to the type of reference for which the main board was configured.

<table>
<thead>
<tr>
<th>* Reference Voltage Source</th>
<th>S1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Absolute (as shipped)</td>
<td>A,C</td>
</tr>
<tr>
<td>Internal Ratiometric</td>
<td>B,D</td>
</tr>
<tr>
<td>External Ratiometric</td>
<td>A,C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gain Ranges</th>
<th>μV/Count</th>
<th>S1</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>0 to 100</td>
<td>G</td>
</tr>
<tr>
<td>X3</td>
<td>0 to 30</td>
<td>F</td>
</tr>
<tr>
<td>X10</td>
<td>0 to 10</td>
<td>E</td>
</tr>
<tr>
<td>X30</td>
<td>0 to 3</td>
<td>H</td>
</tr>
<tr>
<td>X100</td>
<td>0 to 1</td>
<td>-</td>
</tr>
</tbody>
</table>

* Zero Offset is derived from this reference.
7.0 CALIBRATION

Using the upper and lower signals as well as the upper and lower display readings required by your application, calculate the slope factor (S):

Upper Input (UI) _______  Upper Display (UD) _______
Lower Input (LI) _______  Lower Display (LD) _______

\[ S = \frac{UD - LD}{UI - LI} \]

Then calculate the Top Calibration Point (TCP):

\[ TCP = S \times UI \]

Example: If you wanted an input of 4 to 20 mA to produce display readings of 1000 to 10000:

\[ UI = 20 \quad UD = 10000 \]
\[ LI = 4 \quad LD = 1000 \]

\[ S = \frac{10000 - 1000}{20 - 4} = 562.5 \]

\[ TCP = 562.5 \times 20 = 11250 \]
After determining LI, UI, LD, UD, S, and TCP for your application, you will be ready to commence with the following procedure. Refer to Figure 3-1 to locate the calibration potentiometers.

1. If you are using a 2002B-E or a 2002B-S, adjust Excitation Voltage (R14) as required for your application.

2. Center the position of the Fine Span (R32) and Fine Zero (R36) by turning them 20 turns clockwise and then about 8 to 10 turns counter-clockwise.

3. Apply an input of zero volts or milliamperes (depending on your configuration). Adjust Coarse Zero (R16) until the meter displays 0000.

4. Apply the Upper Input signal and adjust the Coarse Span (R17) until the meter displays the TCP reading.

5. Apply the Lower Input signal and adjust the Coarse Zero (R16) until the meter displays the Lower Display reading.

6. Apply the Upper Input signal and adjust Fine Span (R32) until the meter displays the Upper Display reading.

7. Apply the Lower Input signal and adjust Fine Zero (R36) until the meter displays the Lower Display reading.

NOTE: If you are using a 2002B-S, a bridge balance adjustment (R15) is available to null any errors which may exist in your load cell bridge. A resistor may be installed at R5 on the plug-in board if R15 does not provide enough adjustment.
Figure 8-1  Main Board Assembly Diagram
Figure 8-3  Plug-in Card Assembly -S Diagram
9.0 APPLICATION NOTES

9.1 Excitation Supply/Current Transmitter Interface

The following block diagrams show the proper hookup for interfacing an electrically-floating excitation supply with either a 2-wire or a 4-wire current transmitter (4-20 mA loop-powered).

![Two-wire Connection](image1)

**Figure 9-1 Two-wire Connection**

![Four-wire Connection](image2)

**Figure 9-2 Four-wire Connection**

* For 3-wire hookup, connect -EXC to SIG LO.

**NOTE:** For proper operation the unit must be configured for an internal absolute reference. (See Section 5.3)
NEWPORT 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.

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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.

FOR NON-WARRANTY REPAIRS, consult NEWPORT for current repair charges. Have the following information available BEFORE contacting NEWPORT:
1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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