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1 Product Description
Laser distance sensor with both analog and discrete (switched) outputs

- High performance time of flight measurement
- Extended ranges up to 24 m
- Reliably detects challenging targets
- Fast set up with intuitive interface

**WARNING: Not To Be Used for Personnel Protection**

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

1.1 Models

<table>
<thead>
<tr>
<th>Family</th>
<th>Range</th>
<th>Output</th>
<th>Laser Class</th>
<th>Sensing Mode</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTF</td>
<td>12</td>
<td>I</td>
<td>C2</td>
<td>LD</td>
<td>Q</td>
</tr>
<tr>
<td></td>
<td>12 = 12 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 = 24 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = 4 to 20 mA analog and (1) NPN/PNP discrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U = 0 to 10 V analog and (1) NPN/PNP discrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Some model combinations may not be available.

1.2 Overview

The LTF Time of Flight Laser Distance Sensor is designed for precise, long-distance measurements. A 2-line LCD shows the real-time distance measurement, in either millimeters or inches, and the analog output measurement, in milliamps or volts, when the sensor is in Run mode.

See Factory Defaults for a list of sensor default settings.

Models with current or voltage analog outputs are available. This manual provides the display information and the navigation paths for the current models with the voltage model text in parentheses if it is different.
1.2.1 Features and Indicators

Three LED indicators provide ongoing indication of the sensing status.

**Analog Output LED Indicator**
- Solid Amber = Displayed distance is within the taught analog output window
- Off = Displayed distance is outside the taught analog output window

**Power LED Indicator**
- Solid Green = Normal operation, power On and laser On
- Flashing Green (1 Hz) = Power On and laser Off (laser enable mode)

**Discrete Output LED Indicator**
- Solid Amber = Discrete Output is On
- Off = Discrete Output is Off

1.2.2 Display

The display is a 2-line, 8-character LCD. The main screen is the Run mode screen, which shows the real-time distance measurement and the analog output measurement.

1.2.3 Buttons

Use the sensor buttons **Down**, **Up**, **Enter**, and **Escape** to program the sensor and to access sensor information.

**Down and Up Buttons**

Press **Down** and **Up** to:
- Access the Quick Menu from Run mode
- Navigate the menu systems
- Change programming settings
- Change individual digit values in distance based settings

When navigating the menu systems, the menu items loop.

**Enter Button**

Press **Enter** to:
- Access the Sensor Menu from Run mode
- Access the submenus
- Move right one digit in distance based settings
- Save changes

In the Sensor Menu, a check mark ✓ in the lower right corner of the display indicates that pressing **Enter** accesses a submenu.

Press **Enter** to save changes. New values flash rapidly and the sensor returns to the parent menu.
Press **Escape** to:
- Leave the current menu and return to the parent menu
- Return to Run mode from the Quick Menu

**Important:** Pressing **Escape** discards any unsaved programming changes.

In the Sensor Menu, a return arrow ↩️ in the upper left corner of the display indicates that pressing **Escape** returns to the parent menu.
Press and hold **Escape** for 2 seconds to return to Run mode from any menu or remote teach.

### 1.3 Laser Description and Safety Information

**CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer.

### 1.3 Class 2 Laser Models

**CAUTION:** Never stare directly into the sensor lens. Laser light can damage your eyes. Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.

**For Safe Laser Use - Class 2 Lasers**
- Do not stare at the laser.
- Do not point the laser at a person’s eye.
- Mount open laser beam paths either above or below eye level, where practical.
- Terminate the beam emitted by the laser product at the end of its useful path.

Reference IEC 60825-1:2007, Section 8.2.

**Class 2 Lasers**
Class 2 lasers are lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

**Class 2 Laser Safety Notes**
Low-power lasers are, by definition, incapable of causing eye injury within the duration of a blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 to 700 nm). Therefore, an ocular hazard may exist only if individuals overcome their natural aversion to bright light and stare directly into the laser beam.
2 Sensor Installation

**Note:** Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow the window clear using filtered, compressed air, then clean as necessary using 70% isopropyl alcohol and cotton swabs or water and a soft cloth.

2.1 Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

2.2 Wiring Diagrams

```
12-30V dc

D_Out
A_Out
Input

4-20 mA

* User-configurable PNP/NPN setting

Figure 4. Analog Current Model
```

```
12-30V dc

D_Out
A_Out
Input

0-10V

* User-configurable PNP/NPN setting

Figure 5. Analog Voltage Model
```

**Key**

1 = Brown  
2 = White  
3 = Blue  
4 = Black  
5 = Gray

2.3 Connecting to RSD1

The following diagram depicts the connection of the LTF to the optional RSD1 accessory.

```
Figure 6. LTF to RSD1
```

Use these cordsets to connect the RSD1 to the LTF sensor or to other devices, such as PLC inputs, IO-Link masters, or control systems.
### 5-Pin Male Threaded and 5-Pin Female Quick Disconnect M12/Euro-Style Cordset with Shield—Double Ended

<table>
<thead>
<tr>
<th>Model</th>
<th>Length &quot;L1&quot;</th>
<th>Style</th>
<th>Pinout (Male)</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDEC3-503SS</td>
<td>0.31 m (1 ft)</td>
<td>Female Straight/Male Straight</td>
<td>1 4 5 3 2</td>
<td>2 1 3 4 5</td>
</tr>
<tr>
<td>MQDEC3-506SS</td>
<td>1.83 m (6 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MQDEC3-515SS</td>
<td>4.58</td>
<td></td>
<td>1 4 5 3 2</td>
<td>2 1 3 4 5</td>
</tr>
<tr>
<td>MQDEC3-530SS</td>
<td>9.20</td>
<td></td>
<td>1 4 5 3 2</td>
<td>2 1 3 4 5</td>
</tr>
</tbody>
</table>

### 5-Pin Threaded M12/Euro-Style Cordsets with Shield—Single Ended

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Style</th>
<th>Dimensions</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDEC2-506</td>
<td>1.83 m (6 ft)</td>
<td>Straight</td>
<td>M12 x 1  ø 14.5</td>
<td></td>
</tr>
<tr>
<td>MQDEC2-515</td>
<td>4.57 m (15 ft)</td>
<td></td>
<td>32 Typ. [1.28&quot;]</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>MQDEC2-530</td>
<td>9.14 m (30 ft)</td>
<td></td>
<td>30 Typ. [1.18&quot;]</td>
<td>2 = White</td>
</tr>
<tr>
<td>MQDEC2-550</td>
<td>15.2 m (50 ft)</td>
<td></td>
<td></td>
<td>3 = Blue</td>
</tr>
<tr>
<td>MQDEC2-506RA</td>
<td>1.83 m (6 ft)</td>
<td>Right-Angle</td>
<td>M12 x 1  ø 14.5</td>
<td></td>
</tr>
<tr>
<td>MQDEC2-515RA</td>
<td>4.57 m (15 ft)</td>
<td></td>
<td>32 Typ. [1.28&quot;]</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>MQDEC2-530RA</td>
<td>9.14 m (30 ft)</td>
<td></td>
<td>30 Typ. [1.18&quot;]</td>
<td>2 = White</td>
</tr>
<tr>
<td>MQDEC2-550RA</td>
<td>15.2 m (50 ft)</td>
<td></td>
<td></td>
<td>3 = Blue</td>
</tr>
</tbody>
</table>

---

L-GAGE® LTF Time of Flight Laser Distance Sensor

www.bannerengineering.com - Tel: + 1 888 373 6767
3 Sensor Programming

Program the sensor using the buttons on the sensor or the remote input (limited programming options).

From Run mode, use the buttons to access the Quick Menu and the Sensor Menu. See Quick Menu on p. 9 and Sensor Menu (MENU) on p. 10 for more information on the options available from each menu. For TEACH options, follow the TEACH instructions.

In addition to programming the sensor, use the remote input to disable the buttons for security, preventing unauthorized or accidental programming changes. See Remote Input on p. 10 for more information.

3.1 Quick Menu

The sensor includes a Quick Menu with easy access to view and change the analog and discrete output switch points.

Access the Quick Menu by pressing Down or Up from Run mode. When in the Quick Menu, the current distance measurement displays on the first line and the menu name and the analog value alternate on the second line of the display.

Press Enter to access the switch points. Press Down and Up to change each digit. Press Enter to move right one digit. After reviewing each digit, press Enter again to save the new value and return to the Quick Menu. Press Cancel to ignore any changes made if only some digits have been changed.

Figure 7. Accessing the Menus

Quick Menu

Run Mode

- Set value with
- Save setting and return to Quick Menu or Cancel and return to Quick Menu

Access Sensor Menu (Top Menu)

4mA Pt (value)

20mA Pt (value)

SPt1 Pt (value)

SPt2 Pt (value)*

* In Setpoint Mode, SPt1 Pt is replaced by SPt and SPt2 Pt is not available.

Figure 8. Quick Menu Map (Window Mode)
3.2 Sensor Menu (MENU)

Access the Sensor Menu by pressing Enter from Run mode. The Sensor Menu is also accessible from the Quick Menu: navigate to MENU and press Enter. The Sensor Menu includes several submenus that provide access to view and change sensor settings and to view sensor information.

**Sensor Menu**

![Sensor Menu Basic Map](image)

(See Sensor Menu Full Map for the complete map)

- **MENU A_OUT**: Access analog output settings
- **MENU D_OUT**: Access discrete output settings
- **MENU INPUT**: Select input line settings (remote TEACH, trigger mode, etc.)
- **MENU MEASURE**: Select response speed and trigger measurement
- **MENU DISPLAY**: Select display units, zero reference, shift, and orientation
- **MENU INFO**: View sensor information
- **MENU RESET**: Reset to factory defaults

Figure 9. Sensor Menu Basic Map

See Sensor Menu Full Map and the Menu sections of this manual for more information.

3.3 Remote Input

Use the remote input to program the sensor remotely. The remote input is disabled by default. Activate remote input using the buttons to navigate to the Input Type menu option.

The remote input provides limited programming options and is Active Low by default. For Active Low, connect the gray input wire to ground (0 V dc), with a remote switch connected between the wire and ground. To use the Active High function, configure the sensor for Active High using the buttons on the sensor, then connect the gray input wire to V+ (12 to 30 V dc). Pulse the remote input according to the diagram and the instructions provided in this manual.

The length of the individual programming pulses is equal to the value \( T \): \( 0.04 \text{ seconds} \leq T \leq 0.8 \text{ seconds} \).

Exit remote programming modes by holding the remote input low for > 2 seconds, or waiting for the automatic 60-second timeout, or by pressing and holding Escape for 2 seconds. The sensor returns to Run mode without saving any new settings.
NOTE: Follow procedure for the TEACH/SET method (highlighted in black box) chosen in the TEACH Selection menu. Timeout is 60 seconds.

**Remote Teach:**
- **Remote TEACH**
  - Enter Remote TEACH
  - **RMT TCH** with measurement value
  - **Teaching.. (4mA)**
    - Tch4mA with measurement value, then to Tch20mA
  - **Teaching.. (20mA)**
    - Tch20mA with measurement value, then back to Run mode
  - **Teaching.. (SPt1)**
    - TchSPt1 with measurement value, then to TchSPt2
  - **Teaching.. (SPt2)**
    - TchSPt2 with measurement value, then back to Run mode
  - **Teaching.. (TchA&D1)**
    - Tch4mA and TchSPt1 with measurement value, then to TchA&D2
  - **Teaching.. (TchA&D2)**
    - Tch20mA and TchSPt2 with measurement value, then back to Run mode
  - **Teaching.. (Tch12mA)**
    - Tch12mA with measurement value, then back to Run mode
  - **Teaching.. (TchMdPt)**
    - TchMdPt (teaches SPt in Switch Mode) with measurement value, then back to Run mode
  - **Teaching.. (TchA&D)**
    - Tch12mA and TchMdPt (teaches SPt in Switch Mode) with measurement value, then back to Run mode

**Remote Setup:**
- **Remote SETUP**
  - Enter Remote Setup
  - **REMOTE SETUP**
  - **Slope**
    - Slope value (positive or negative)
    - **Select Slope Positive**, then back to Run mode
    - **Select Slope Negative**, then back to Run mode
  - **Sensor Mode**
    - Mode with current value
    - **Set Mode to Alarm**, then back to Run mode
    - **Set Mode to Health**, then back to Run mode
    - **Set Mode to Switch**, then back to Run mode
    - **Set Mode to Window**, then back to Run mode
  - **Window Size**
    -WndSize with value
    - **Set Window Size to X1**, then back to Run mode
    - **Set Window Size to X2**, then back to Run mode
    - **Set Window Size to X3**, then back to Run mode
    - **Set Window Size to X4**, then back to Run mode
    - **Set Window Size to X5**, then back to Run mode
    - **Set Window Size to X6**, then back to Run mode
    - Refer to the Window size table for the acceptable values.
  - **Sensor Lock / Unlock**
    - Locks or Unlocks Sensor
    - **Unlock Sensor**
    - **Lock Sensor**
  - **Reset to Default Settings**
    - Resets Sensor to Factory Default Settings

**Figure 10. Remote Input Map**

Timing between Pulse groups > 1 second

Timing between Pulse groups > 1 second

**Remote Setup:**
- **REMOTE SETUP**
  - Enter Remote Setup
  - **REMOTE SETUP**
  - **Sensor Mode**
    - Mode with current value
    - **Set Mode to Alarm**, then back to Run mode
    - **Set Mode to Health**, then back to Run mode
    - **Set Mode to Switch**, then back to Run mode
    - **Set Mode to Window**, then back to Run mode
  - **Window Size**
    -WndSize with value
    - **Set Window Size to X1**, then back to Run mode
    - **Set Window Size to X2**, then back to Run mode
    - **Set Window Size to X3**, then back to Run mode
    - **Set Window Size to X4**, then back to Run mode
    - **Set Window Size to X5**, then back to Run mode
    - **Set Window Size to X6**, then back to Run mode
    - Refer to the Window size table for the acceptable values.
  - **Sensor Lock / Unlock**
    - Locks or Unlocks Sensor
    - **Unlock Sensor**
    - **Lock Sensor**
  - **Reset to Default Settings**
    - Resets Sensor to Factory Default Settings

**Figure 10. Remote Input Map**

- **Setup Window Size to X1**, then back to Run mode
- **Setup Window Size to X2**, then back to Run mode
- **Setup Window Size to X3**, then back to Run mode
- **Setup Window Size to X4**, then back to Run mode
- **Setup Window Size to X5**, then back to Run mode
- **Setup Window Size to X6**, then back to Run mode

Refer to the Window size table for the acceptable values.
Table 1: Remote TEACH Window Sizes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Remote TEACH Window Size (mm)</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>X3</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>X4</td>
<td>500</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>X5</td>
<td>2000</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>X6</td>
<td>11950</td>
<td>23950</td>
<td></td>
</tr>
</tbody>
</table>

3.4 Locking and Unlocking the Sensor

Use the lock and unlock feature to prevent unauthorized or accidental programming changes. A lock symbol ☐ displays in the upper left corner of the display to indicate when the sensor is locked. When locked, the menus are available to view settings, but the values cannot be changed. The remote input is also disabled, except for the unlock function.

**Button Instructions**

To lock or unlock the sensor using the buttons, press and hold **Down** 🔽 and **Escape** ⏺ simultaneously for 3 seconds.

**Remote Input Instructions**

1. Access the setup mode.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double-pulse the remote input.</td>
<td>&quot;REMOTE SETUP&quot; displays.</td>
</tr>
</tbody>
</table>

2. Access the lock/unlock function.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four-pulse the remote input.</td>
<td>&quot;LOCK&quot; and the current status (unlocked or locked) display.</td>
</tr>
</tbody>
</table>

3. Lock or unlock the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlock: Single-pulse the remote line.</td>
<td>&quot;Unlocked&quot; flashes and the sensor returns to Run mode. The sensor is unlocked.</td>
</tr>
<tr>
<td>Lock: Double-pulse the remote input.</td>
<td>&quot;Locked&quot; flashes and the sensor returns to Run mode. The sensor is locked and the lock symbol displays in the upper left corner.</td>
</tr>
</tbody>
</table>

3.5 Analog Output Menu (A_OUT)

Use the Analog Output menu to view or change:

- 4 mA (0 V) setpoint
- 20 mA (10 V) setpoint
- 12 mA (5 V) window
- Slope
- Loss of signal behavior
3.5.1 TEACH 4 mA (0 V) and TEACH 20 mA (10 V)

The Tch4mA (Tch0V) and Tch20mA (Tch10V) options use targets to set the 4 mA (0 V) and 20 mA (10 V) to the desired setpoints. When using the buttons, only one value needs to be set if the second value is valid. When using the remote input, both values must be set.

Navigate: MENU > A_OUT > Tch2Pt > Tch4mA (Tch0V) or navigate: MENU > A_OUT > Tch2Pt > Tch20mA (Tch10V)

Remote Input: Available

Button Instructions

1. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target. The target must be within the sensor’s measurement range.</td>
<td>The target’s analog output measurement and distance measurement values display.</td>
</tr>
</tbody>
</table>

2. Access the TEACH mode and TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigate: MENU &gt; A_OUT &gt; Tch2Pt &gt; Tch4mA (Tch0V) OR Navigate: MENU &gt; A_OUT &gt; Tch2Pt &gt; Tch20mA (Tch10V)</td>
<td>The selected TEACH mode and “Teaching” display while the sensor is being taught. TEACH Accepted The new value is shown on the second line of the display and flashes before it is saved and the sensor returns to the parent menu. TEACH Not Accepted “FAIL” and a warning message display, and the sensor returns to the parent menu.</td>
</tr>
</tbody>
</table>

3. Repeat steps 1 to 2 for the other setpoint, if desired.

Remote Input Instructions

Teaches both the 4 mA (0 V) and 20 mA (10 V) setpoints.

1. Access the TEACH mode.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>‘RMT TCH’ and the current measurement value display.</td>
</tr>
</tbody>
</table>

2. Present the target.
3. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the 4 mA (0 V) target.</td>
<td>‘RMT TCH’ and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>Tch4mA (Tch0V) Teaching displays while the sensor is being taught.</td>
</tr>
</tbody>
</table>

**TEACH Accepted**

The new value displays on the second line of the display, flashes, and then Tch20mA (Tch10V) and the current measurement value display.

**TEACH Not Accepted**

“FAIL” flashes, the sensor returns to step 2, and ‘RMT TCH’ displays.

4. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the 20 mA (10 V) target.</td>
<td>‘Tch20mA (Tch10V)’ and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

5. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>Tch20mA (Tch10V) Teaching displays while the sensor is being taught.</td>
</tr>
</tbody>
</table>

**TEACH Accepted**

The new value displays on the second line of the display, flashes, and the sensor returns to Run mode.

**TEACH Not Accepted**

“FAIL” flashes, the sensor returns to step 2, and ‘RMT TCH’ displays.

### 3.5.2 Midpoint TEACH

![Figure 12. Window and Midpoint Example](image)

The Midpoint TEACH uses both the window size and the 12 mA (5 V) setpoint to determine the actual measurement window. For example, a window of 200 mm with a 12 mA (5 V) setpoint of 600 mm places the measurement window from 500 mm to 700 mm.

To use the Midpoint TEACH:

1. Set the window size.
2. Set the measurement window using TEACH 12 mA (5 V) on p. 15.

The Analog Output Midpoint TEACH and the Discrete Output Midpoint TEACH are independent settings (see Midpoint TEACH on p. 21).

#### Window Size

The A_OUT > TchMid > WndSize option sets the window size that the Midpoint TEACH uses to set the 4 mA (0 V) and 20 mA (10 V) setpoints.

The taught surface must be inside the defined sensing range, and at least one setpoint (with offset applied, if any) must be located within the sensing range.
The Analog Output window size is a different setting than the Discrete Output window size when defined using the push buttons.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Size Minimum</td>
<td>10 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Window Size Maximum</td>
<td>11950 mm</td>
<td>23950 mm</td>
</tr>
<tr>
<td>Range</td>
<td>50 mm to 12000 mm</td>
<td>50 mm to 24000 mm</td>
</tr>
<tr>
<td>Default Window Size</td>
<td>2000 mm</td>
<td>2000 mm</td>
</tr>
</tbody>
</table>

Navigate: MENU > A_OUT > TchMid > WndSize
Remote Input: Available

1. Access the Window Size mode.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Navigate: MENU &gt; A_OUT &gt; TchMid &gt; WndSize</td>
<td>&quot;WndSize&quot; and the current window size value display.</td>
</tr>
<tr>
<td>Remote Input</td>
<td>a. Double-pulse the remote input to enter setup mode.</td>
<td>a. &quot;REMOTE SETUP&quot; displays.</td>
</tr>
<tr>
<td></td>
<td>b. Three-pulse the remote input to enter window size mode.</td>
<td>b. &quot;WndSize&quot; and the current window size value display.</td>
</tr>
</tbody>
</table>

2. Set the window size.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>a. Use the Up and Down buttons to set the desired window size—the value changes in increments of 2.</td>
<td>a. &quot;WndSize&quot; and the new value display.</td>
</tr>
<tr>
<td></td>
<td>b. Press Enter to save the new value.</td>
<td>b. The new value flashes and the sensor returns to &quot;TchMid WndSize&quot;.</td>
</tr>
<tr>
<td>Remote Input</td>
<td>Pulse the remote input 1 to 6 times to select the desired window size.</td>
<td>The new value flashes and the sensor returns to Run mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Window Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LTF12</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
</tr>
<tr>
<td>5</td>
<td>2000</td>
</tr>
<tr>
<td>6</td>
<td>11950</td>
</tr>
</tbody>
</table>

TEACH 12 mA (5 V)
The Tch12mA (Tch5V) option sets the midpoint that determines the actual measurement window.

Navigate: MENU > A_OUT > TchMid > Tch12mA (Tch5V)
Remote Input: Available

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**Button Instructions**

1. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target.</td>
<td>The target’s analog output measurement and distance measurement values display.</td>
</tr>
</tbody>
</table>

2. Access the TEACH 12 mA (5 V) mode and TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigate: MENU &gt; A_OUT &gt; TchMid &gt; Tch12mA (Tch5V)</td>
<td>“Tch12mA (Tch5V) Teaching” displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td>TEACH Accepted</td>
</tr>
<tr>
<td></td>
<td>The new value is shown on the second line of the display and flashes before it is saved and the sensor returns to “TchMid Tch12mA (Tch5V)”.</td>
</tr>
<tr>
<td></td>
<td>TEACH Not Accepted</td>
</tr>
<tr>
<td></td>
<td>“FAIL” and a warning message display and the sensor returns to “Tch Mid Tch12mA (Tch5V)”</td>
</tr>
</tbody>
</table>
Remote Input: Not available
Default: 50 mm

3.5.4 Adjust 20 mA (10 V)
The Adj20mA (Adj10V) option manually adjusts the distance at which the Analog Output is 20 mA (10 V). The value is adjustable between the sensor’s range. It is required to at least maintain the minimum window size.

Navigate: MENU > A_OUT > Adj20mA (Adj10V)
Remote Input: Not available
Default: 12000 mm for LTF12, 24000 mm for LTF24

3.5.5 Slope
The Slope option sets the slope as positive or negative. This swaps the 4 mA and 20 mA (0 V and 10 V) values.

Navigate: MENU > A_OUT > Slope
Remote Input: Available
Default: Positive

The analog current output tracks slightly beyond each window limit (from 3.8 mA to 20.2 mA)

Figure 13. Slope—Current-Sourcing Models

The analog voltage output tracks slightly beyond the upper window limit (up to 10.2 V)

Figure 14. Slope—Voltage-Sourcing Models

1. Access the slope setting.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Navigate: MENU &gt; A_OUT &gt; Slope</td>
<td>“Slope” and the current setting display.</td>
</tr>
<tr>
<td>Remote Input</td>
<td>a. Double-pulse the remote input to enter setup mode.</td>
<td>a. “REMOTE SETUP” displays.</td>
</tr>
<tr>
<td></td>
<td>b. Single-pulse the remote input to access A_OUT Slope.</td>
<td>b. “Slope” and the current setting display.</td>
</tr>
</tbody>
</table>

2. Set the slope.
### 3.5.6 Loss of Signal

The LossSig option sets the Analog Output value used by the sensor during a loss of signal. When a signal is restored, measurement resumes.

**Navigate:** Menu > A_Out > LossSig  
**Remote Input:** Not available  
**Default:** 3.5 mA (0 V)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 mA (0 V)</td>
<td>The Analog Output switches to this value 2 seconds after a loss of signal. When advanced measurements are enabled, the Analog Output is updated to this value immediately upon the release of the trigger input. For Voltage models, this is 0 V. (Default)</td>
</tr>
<tr>
<td>20.5 mA (10.5 V)</td>
<td>The Analog Output switches to this value 2 seconds after a loss of signal. When advanced measurements are enabled, the Analog Output is updated to this value immediately upon the release of the trigger input. For Voltage models, this is 10.5 V.</td>
</tr>
<tr>
<td>Hold</td>
<td>The Analog Output holds the last value indefinitely during a loss of signal. When advanced measurements are enabled, the last value is held across the triggered measurement periods.</td>
</tr>
</tbody>
</table>

The Range advanced measurement behavior is affected by the Loss of Signal option. For additional information on advanced measurements, see Trigger on p. 30. The Range advanced measurement tracks a maximum and a minimum during the measurement period, and calculates the range as follows:

\[
\text{Range} = \text{maximum distance} - \text{minimum distance}
\]

If the maximum and/or minimum measurements are outside of the taught setpoints, the Loss of Signal option determines how the range is calculated.

<table>
<thead>
<tr>
<th>Option</th>
<th>Sensor Behavior in Range Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 mA (0 V)</td>
<td>If the maximum or minimum measurement is outside of the taught setpoints, the sensor outputs 3.5 mA (0 V) to indicate an out of range measurement.</td>
</tr>
<tr>
<td>20.5 mA (10.5 V)</td>
<td>If the maximum or minimum measurement is outside of the taught setpoints, the sensor outputs 20.5 mA (10.5 V) to indicate an out of range measurement.</td>
</tr>
<tr>
<td>Hold</td>
<td>The sensor limits the maximum and minimum measurements so that they cannot exceed the taught setpoints.</td>
</tr>
</tbody>
</table>

### 3.6 Discrete Output Menu (D_OUT)

Use this menu to view or change:
- Setpoints
- Midpoint
- Mode
3.6.1 Two-Point TEACH

The TchSPt1 and TchSPt2 options teach the desired switch points. When using the buttons, the switch points can be taught independently. Both values must be taught when using the remote input.

**Note:** When in Switch mode, use TEACH Switch Point on p. 23.

**Navigate:** MENU > D_OUT > Tch2Pt > TchSPt1 and navigate: MENU > D_OUT > Tch2Pt > TchSPt2

**Remote Input:** Available

**Button Instructions**

1. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target. The target must be within the sensor’s range.</td>
<td>The target’s analog output measurement and distance measurement value display.</td>
</tr>
</tbody>
</table>

2. Access the TEACH mode and TEACH the sensor.
### Remote Input Instructions

1. **Access the TEACH mode.**

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>&quot;RMT TCH&quot; and the current switch point value displays.</td>
</tr>
</tbody>
</table>

2. **Present the target.**

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the switch point one target.</td>
<td>&quot;RMT TCH&quot; and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

3. **TEACH the sensor.**

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double-pulse the remote input.</td>
<td>&quot;TchSPt1 Teaching&quot; displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>The new value displays on the second line of the display, flashes, and the sensor goes to &quot;TchSPt2&quot; and the current measurement value.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>&quot;FAIL&quot; flashes, the sensor returns to step 2, and &quot;RMT TCH&quot; displays.</td>
</tr>
</tbody>
</table>

4. **Present the target.**

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the switch point two target.</td>
<td>&quot;TchSPt2&quot; and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

5. **TEACH the sensor.**

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>&quot;TchSPt2 Teaching&quot; displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>The new value displays on the second line of the display, flashes, and the sensor returns to Run mode.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>&quot;FAIL&quot; flashes, the sensor returns to step 2, and &quot;RMT TCH&quot; displays.</td>
</tr>
</tbody>
</table>
3.6.2 Midpoint TEACH

The Midpoint TEACH uses both the window size and the TEACH midpoint to determine the actual measurement window. For example, a window of 200 mm with a midpoint of 600 mm places the measurement window from 500 mm to 700 mm.

To use Midpoint TEACH:
1. Set the window size.
2. Set the measurement window using TEACH Midpoint on p. 22.

The Discrete Output Midpoint TEACH and the Analog Output Midpoint TEACH are independent settings.

Window Size

The D_OUT > TchMid > WndSize option sets the window size that the Midpoint TEACH uses to set the setpoint one and setpoint two thresholds.

The taught surface must be inside the defined sensing range, and at least one setpoint (with offset applied, if any) must be located within the sensing range.

The Discrete Output window size is a different setting than the Analog Output window size when defined using the push buttons.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Size Minimum</td>
<td>10 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Window Size Maximum</td>
<td>11950 mm</td>
<td>23950 mm</td>
</tr>
<tr>
<td>Range</td>
<td>50 mm to 12000 mm</td>
<td>50 mm to 24000 mm</td>
</tr>
<tr>
<td>Default Window Size</td>
<td>20 mm</td>
<td>20 mm</td>
</tr>
</tbody>
</table>

Navigate: MENU > D_OUT > TchMid > WndSize

Remote Input: Available

1. Access the setup mode.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Input</td>
<td>a. Double-pulse the remote input to enter setup mode.</td>
<td>a. &quot;REMOTE SETUP&quot; displays.</td>
</tr>
<tr>
<td></td>
<td>b. Three-pulse the remote input to enter window size mode.</td>
<td>b. &quot;WndSize&quot; and the current value display.</td>
</tr>
</tbody>
</table>

2. Set the window size.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>a. Use Down and Up to set the desired window size—the value changes in increments of 2.</td>
<td>a. &quot;WndSize&quot; and the new value display.</td>
</tr>
<tr>
<td></td>
<td>b. Press Enter to save the new value.</td>
<td>b. The new value flashes and returns to &quot;TchMid WndSize&quot;.</td>
</tr>
</tbody>
</table>
Remote Input (Sets A_OUT and D_OUT window Size)

Pulse the remote input 1 to 6 times to select the desired window size.

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Window Size</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LTF12</td>
<td>LTF24</td>
</tr>
<tr>
<td>1</td>
<td>10 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>2</td>
<td>20 mm</td>
<td>20 mm</td>
</tr>
<tr>
<td>3</td>
<td>100 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>4</td>
<td>500 mm</td>
<td>500 mm</td>
</tr>
<tr>
<td>5</td>
<td>2000 mm</td>
<td>2000 mm</td>
</tr>
<tr>
<td>6</td>
<td>11950 mm</td>
<td>23950 mm</td>
</tr>
</tbody>
</table>

The new value flashes and the sensor returns to Run mode.

**TEACH Midpoint**

The TchMdPt option sets the midpoint that determines the actual measurement window.

Navigate: MENU > D_OUT > TchMid > TchMdPt

Remote Input: Available

**Button Instructions**

1. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target.</td>
<td>The target’s analog output measurement and distance measurement value display.</td>
</tr>
</tbody>
</table>

2. Access the TEACH midpoint mode and TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigate: MENU &gt; D_OUT &gt; TchMid &gt; TchMdPt</td>
<td>“TchMdPt Teaching” displays while the sensor is being taught.</td>
</tr>
</tbody>
</table>

**TEACH Accepted**

The new value is shown on the second line of the display and flashes before it is saved and the sensor returns to “TchMid TchMdPt”.

**TEACH Not Accepted**

“FAIL” and a warning message display, and the sensor returns to “TchMid TchMdPt”.

**Remote Input Instructions**

1. Access the TEACH mode.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>“RMT TCH” and the current measurement value display.</td>
</tr>
</tbody>
</table>

2. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target.</td>
<td>“RMT TCH” and the target's measurement value display.</td>
</tr>
</tbody>
</table>

3. TEACH the sensor.
Window TEACH Offset

Use the D_OUT > TchMid > Offset menu to set an offset from the taught distance used during a Midpoint TEACH. By default, the value is 0 mm because the window is centered around the taught distance. A positive offset value always shifts the window towards the sensor.

3.6.3 Adjust Switch Point One

The AdjSPt1 option manually adjusts the value of the switch point one threshold for the Discrete Output when the sensor is in Window mode. The value is adjustable within the sensor’s range. It is required to be maintain the minimum window size between switch points. This menu is not available when the sensor is in Switch, Alarm, or Health mode.

Navigate: MENU > D_OUT > AdjSPt1
Remote Input: Not available
Default: 50 mm

3.6.4 Adjust Switch Point Two

The AdjSPt2 option manually adjusts the value of the switch point two threshold for the Discrete Output when the sensor is in Window mode. The value is adjustable with the sensor’s range. It is required to be maintain the minimum window size between switch points. This menu is not available when the sensor is in Switch, Alarm, or Health mode.

Navigate: MENU > D_OUT > AdjSPt2
Remote Input: Not available
Default: 12000 mm for LTF12; 24000 mm for LTF24

3.6.5 TEACH Switch Point

The TchSPt option teaches the distance at which the switch point threshold is placed when the Discrete Output is in Switch mode. This menu is not available when the sensor is in Window, Alarm, or Health mode.

Navigate: MENU > D_OUT > TchSPt
Remote Input: Available

Button Instructions

1. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the target. The target must be within the sensor’s range.</td>
<td>The target’s analog output measurement and distance measurement value display.</td>
</tr>
</tbody>
</table>

2. Access the switch point TEACH mode and TEACH the sensor.
Remote Input Instructions

1. Verify the sensor is in Switch mode.
2. Access the TEACH mode.
3. Present the target.
4. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigate: MENU &gt; D_OUT &gt; TchSPt</strong></td>
<td>“TchSPt Teaching” displays while the sensor is being taught.</td>
</tr>
<tr>
<td>** TEACH Accepted**</td>
<td>The new value is shown on the second line of the display and flashes before it is saved and the sensor returns to “D_OUT TchSPt”.</td>
</tr>
<tr>
<td>** TEACH Not Accepted**</td>
<td>“FAIL” flashes, the sensor returns to step 3, and “RMT TCH” displays.</td>
</tr>
</tbody>
</table>

3.6.6 Adjust Switch Point

The AdjSPt option manually adjusts the value of the switch point threshold for the discrete output when the sensor is in Switch mode. The value is adjustable within the sensor’s range. This menu is not available when the sensor is in Window, Alarm, or Health mode.

**Navigate:** MENU > D_OUT > AdjSPt

**Remote Input:** Not available

**Default:** 50 mm

3.6.7 Mode

The Mode option sets the output to the desired mode.

**Navigate:** MENU > D_OUT > Mode

**Remote Input:** Available

**Default:** Wnd

The following table describes the sensor modes.
### Mode Description

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td><strong>Alarm Mode</strong>: The Discrete Output is Off while a target is detected by the sensor at any distance. When a loss of signal occurs, the Discrete Output is On. This mode has no associated thresholds.</td>
</tr>
<tr>
<td>Health</td>
<td><strong>Health Mode</strong>: The Discrete Output is On while a target is detected by the sensor at any distance. When a loss of signal occurs, the Discrete Output is Off. This mode has no associated thresholds.</td>
</tr>
<tr>
<td>Swtch</td>
<td><strong>Switch Mode</strong>: The Discrete Output is On while a target is detected nearer than the switch point threshold. When a target is detected farther than the switch point threshold or the signal is lost, the Discrete Output is Off.</td>
</tr>
<tr>
<td>Wnd</td>
<td><strong>Window Mode</strong>: The Discrete Output is On while a target is detected between the SPt1 and SPt2 thresholds. (Default) When a target is detected outside the SPt1 and SPt2 thresholds or the signal is lost, the Discrete Output is Off.</td>
</tr>
</tbody>
</table>

### Remote Input Instructions

1. Access the setup mode.

   **Action**
   
   Double-pulse the remote input.
   
   **Result**
   
   "REMOTE SETUP" displays.

2. View the current mode.

   **Action**
   
   Double-pulse the remote input.
   
   **Result**
   
   The current mode displays.

3. Program the sensor.

   **Action**
   
   Pulse the remote input 1 to 6 times to select the desired mode.
   
   **Pulses** | **Mode**
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>![ Pulse 1 ]</td>
</tr>
<tr>
<td>2</td>
<td>![ Pulse 2 ]</td>
</tr>
<tr>
<td>3</td>
<td>![ Pulse 3 ]</td>
</tr>
<tr>
<td>4</td>
<td>![ Pulse 4 ]</td>
</tr>
<tr>
<td>5</td>
<td>![ Pulse 5 ]</td>
</tr>
<tr>
<td>6</td>
<td>![ Pulse 6 ]</td>
</tr>
</tbody>
</table>

   **Result**
   
   The selected mode flashes and the sensor returns to Run mode.
3.6.8 Switch Point Reference (SPtRef)

The SPtRef menu only displays for a discrete output when it is set to switch mode. This setting cannot be changed with remote teach.

- **Object** (default). Object mode automatically optimizes the switching threshold just past the taught distance, farther away from the sensor’s face.
- **Background.** Background mode automatically optimizes the switching threshold just in front of the taught distance, closer to the sensor’s face.
- **Custom.** Custom mode allows the user to define the location of the switching threshold relative to a taught distance using the Offset menu that appears only after selecting Custom Switch Point Reference.

In **Object** or **Background**, the distance between the taught surface and the switching threshold varies depending on measurement stability. Use object mode when teaching an object if a change in state is required when the object is no longer present. Use background mode when teaching background so that the output state changes when a new object is in front of the background.

**Navigate:** MENU > D_OUT > SPtRef

**Remote Input:** Not available

**Default:** Object

3.6.9 Switch Point TEACH Offset

Use this menu to set an offset from the taught distance after a switch point TEACH, if SPtRef is set to Custom. By default, the value is 0 mm. A positive offset value always shifts the threshold towards the sensor.

**Navigate:** MENU > D_OUT > TchMd > Offset

**Remote Input:** Not available

**Default:** 0 mm

3.6.10 Switch Point Hysteresis

With the default setting of AUTO, the hysteresis value applied at each threshold is automatically calculated and set based on target, distance and measurement repeatability, with a 10 mm minimum setting.

By default, the hysteresis is applied away from the sensor. Changing the SPt Ref setting from Object to Background changes the direction of the hysteresis.

![Figure 17. How hysteresis affects the sensor output based on the discrete output switchpoint mode and the setpoint reference mode](image)

L-GAGE® LTF Time of Flight Laser Distance Sensor

www.bannerengineering.com - Tel: + 1 888 373 6767
Press the up button (▲) to manually select a constant hysteresis value between 2 mm and 11950 mm for the LTF12 and between 2 mm and 23950 mm for the LTF24 models.

**Navigate:** MENU > D_OUT > Hyst  
**Remote Input:** Not available  
**Default:** Auto

### 3.6.11 Timer

The Timer option sets the delays and timers. On/Off Delays and On/Off One-Shot timers can be programmed between 1 to 9999 ms (a value of 0 disables the delay/timer). Figure 20 on p. 27 defines how the delays/timers affect the output behavior.

**Navigate:** MENU > D_OUT > Timer  
**Remote Input:** not available  
**Default:** 0 ms for all timers

Some combinations of delays/timers are not allowed. The programming menu automatically disables invalid combinations of delays/timers. The following table shows the allowable combinations of delays/timers.
### 3.6.12 Polarity

The Polarity option sets the discrete output polarity to either PNP (current sourcing) or NPN (current sinking). The physical wiring of the sensor and the sensor polarity setting must match.

**Navigate:** MENU > D_OUT > Polarity  
**Remote Input:** Not available  
**Default:** PNP

### 3.7 Input Menu (INPUT)

Use this menu to view or change the:
- Multi-function input type  
- Active state of the remote input

![Input Menu Map](image)

#### 3.7.1 Input Type

The Type option sets the input type.

**Navigate:** MENU > INPUT > Type  
**Remote Input:** Not available  
**Default:** Disabled

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teach</td>
<td>The remote input is used to TEACH and program the sensor.</td>
</tr>
<tr>
<td>LasrEnbl</td>
<td>The remote input is used to control when the laser emitter is On/Off.</td>
</tr>
<tr>
<td>Trigger</td>
<td>The remote input is used to trigger advanced measurements To enable advanced measurements, the Input Type option must be set to Trigger (see Trigger on p. 30).</td>
</tr>
<tr>
<td>SyncMstr</td>
<td>The remote input is used as the Master Sync output to an attached Slave sensor (see Sync Master/Slave on p. 36).</td>
</tr>
<tr>
<td>SyncSlve</td>
<td>The remote input is used as the Slave Sync input from an attached Master sensor (see Sync Master/Slave on p. 36).</td>
</tr>
<tr>
<td>Disabled</td>
<td>The remote input is disabled. (Default)</td>
</tr>
</tbody>
</table>
3.7.2 Input Active

The Active option sets the active state of the remote input. Use the Active options to change the active input to Low or High.

**Navigate:** MENU > INPUT > Active

**Remote Input:** Not available

**Default:** Low

<table>
<thead>
<tr>
<th>Input Active</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>The remote input detects low (0 V) inputs and high-to-low transitions. (Default)</td>
</tr>
<tr>
<td>High</td>
<td>The remote input detects high (V+) inputs and low-to-high transitions.</td>
</tr>
</tbody>
</table>

3.8 Measure Menu (MEASURE)

Use this menu to view or change the:
- Speed
- Trigger

![Measure Menu Map](image)

### 3.8.1 Speed

The Speed option sets the speed at which the measurement is calculated. This process uses averaging in the digital processing of the signal to calculate the measurement. A slower speed increases the response time of the sensor but improves the repeatability. Refer to the repeatability specifications for each speed.

**Navigate:** MENU > MEASURE > Speed

**Remote Input:** Not available

**Default:** Medium

<table>
<thead>
<tr>
<th>Speed</th>
<th>Response Time *</th>
<th>Lateral Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>1.5 ms</td>
<td>5.5 ms</td>
</tr>
<tr>
<td>Standard</td>
<td>8 ms</td>
<td>16 ms</td>
</tr>
<tr>
<td>Medium</td>
<td>32 ms</td>
<td>48 ms</td>
</tr>
<tr>
<td>Slow</td>
<td>256 ms</td>
<td>288 ms</td>
</tr>
</tbody>
</table>

* Response time triples when using Master/Slave mode.
3.8.2 Trigger

The Trigger option sets the advanced measurement that is calculated when a trigger event is detected on the remote input. The analog output updates with the new advanced measurement on each trigger event. To use these Trigger options, the sensor Input Type option must be set to Trigger; see Input Type on p. 28.

Navigate: MENU > MEASURE > Trigger

Remote Input: Not available

Default: Sample

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>The current distance at the time of the trigger event. (Default) The Analog Output tracks the sample values during the measuring period.</td>
</tr>
<tr>
<td>Average</td>
<td>The averaged distance since the last trigger event.</td>
</tr>
<tr>
<td>Maximum (Max)</td>
<td>The maximum distance since the last trigger event.</td>
</tr>
<tr>
<td>Minimum (Min)</td>
<td>The minimum distance since the last trigger event.</td>
</tr>
<tr>
<td>Range</td>
<td>The difference between the maximum and minimum distance since the last trigger event. For additional information on the Range measurement behavior when the maximum or minimum distance is outside of the taught setpoints, see Loss of Signal on p. 18.</td>
</tr>
<tr>
<td>TrackMax</td>
<td>The maximum distance since the last trigger event. The Analog Output tracks new maximum values during the measurement period.</td>
</tr>
<tr>
<td>TrackMin</td>
<td>The minimum distance since the last trigger event. The Analog Output tracks new minimum values during the measurement period.</td>
</tr>
</tbody>
</table>

![Figure 24. Sample](image1)

![Figure 25. Average](image2)
Figure 26. Maximum and Minimum

Figure 27. Range

Figure 28. Track Maximum and Track Minimum
3.9 Display Menu (DISPLAY)

Use this menu to view or change the:

- Display units
- Display orientation
- Sleep mode settings

Figure 29. Display Menu Map

3.9.1 Units

The Units option sets the displayed units to millimeters (mm) or inches (in).

Navigate: MENU > DISPLAY > Units
Remote Input: Not available
Default: mm

3.9.2 Zero and Shift

Use the Display Zero menu to select the zero reference location. The default is 0 = the face of the sensor.

- Near 0 = the face of the sensor; the measurement increases further from the sensor
- Far 0 = maximum range; the measurement increases closer to the sensor

Use the Display Shift menu to select whether the sensor shifts the zero reference location based on the last TEACH process. The default is Off (0).

- Off 0 = the face of the sensor or the maximum range, depending on the zero setting
- SetZero—Sets the current distance as its new zero reference location. This process is independent of teaching analog or discrete set points.
- AutoSet—Shifts the zero reference location at the taught distance during any analog or discrete setting teach.

This figure illustrates three examples of how changes to the zero and shift settings affect what distance readout is shown on the display when in 2-pt TEACH mode. Changes to the zero setting affect the direction in which the distance increases. Turning the shift setting on sets the taught location as the reference point for any distance measurement.
3.9.3 View

The View option sets the display orientation of the sensor. Invert the display for applications where the device is mounted upside down. This rotates the display 180°. The Down and Up buttons do not change when the display is inverted.

Navigate: MENU > DISPLAY > View
Remote Input: Not available
Default: Normal
3.9.4 Sleep

The Sleep option sets when the display is put to sleep. Four timing options are available: 1, 5, 15, or 60 minutes. Sleep mode is disabled by default. Sleep occurs in Run mode and any menu. To wake the sensor and return to the last viewed mode or menu, press any button.

Navigate: MENU > DISPLAY > Sleep
Remote Input: Not available
Default: Disabled

3.10 Information Menu (INFO)

Use this menu to view model, part number (P/N), serial number (S/N), and firmware version (Version) information. Select one of these options to view specific information for your sensor. This information is read-only.

Navigate: MENU > INFO
Remote Input: Not available

3.11 Reset Menu (RESET)

Use this menu to restore the sensor to the factory default settings.

Navigate: MENU > RESET. Select Yes to apply the factory defaults; select No to return to the Reset option without changing any sensor settings.
Remote Input: Eight-pulse the remote input
### 3.12 Factory Default Settings

<table>
<thead>
<tr>
<th>Analog Output Settings</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust 4 mA (0 V)</td>
<td>50 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>Adjust 20 mA (10 V)</td>
<td>12000 mm</td>
<td>24000 mm</td>
</tr>
<tr>
<td>Loss of Signal</td>
<td>3.5 mA (0 V)</td>
<td>3.5 mA (0 V)</td>
</tr>
<tr>
<td>Slope</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Window Size</td>
<td>2000 mm</td>
<td>2000 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Settings</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Active</td>
<td>Low</td>
</tr>
<tr>
<td>Input Type</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measure Settings</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Medium</td>
</tr>
<tr>
<td>Trigger</td>
<td>Sample</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discrete Output Settings</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust Switch Point One</td>
<td>50 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>Adjust Switch Point Two</td>
<td>12000 mm</td>
<td>24000 mm</td>
</tr>
<tr>
<td>Mode</td>
<td>Wnd</td>
<td>Wnd</td>
</tr>
<tr>
<td>Polarity</td>
<td>PNP</td>
<td>PNP</td>
</tr>
<tr>
<td>Timer</td>
<td>0 ms for all timers</td>
<td>0 ms for all timers</td>
</tr>
<tr>
<td>Window Size</td>
<td>20 mm</td>
<td>20 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display Settings</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>Disabled</td>
</tr>
<tr>
<td>Units</td>
<td>mm</td>
</tr>
<tr>
<td>Zero</td>
<td>Near</td>
</tr>
<tr>
<td>Shift</td>
<td>Off</td>
</tr>
<tr>
<td>View</td>
<td>Normal</td>
</tr>
</tbody>
</table>
4 Sync Master/Slave

Two LTF sensors may be used together in a single sensing application. To eliminate crosstalk between the two sensors, configure one sensor to be the master and one to be the slave. In this mode, the sensors alternate taking measurements and the response speed triples.

1. Configure the first sensor as the master; navigate: MENU > INPUT > Type > SyncMstr.
2. Configure the second sensor as the slave; navigate: MENU > INPUT > Type > SyncSlve.
3. Connect the gray (input) wires of the two sensors together.
5 Additional Remote TEACH Procedures

5.1 TEACH Analog Output and Discrete Output Switch Points Together

Use the following procedure to teach identical Analog Output and Discrete Output switch points at the same time using the remote input. This feature is not available using the buttons.

1. Access the TEACH mode.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>&quot;RMT TCH&quot; and the current measurement value display.</td>
</tr>
</tbody>
</table>

2. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the switch point one target.</td>
<td>&quot;RMT TCH&quot; and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

3. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-pulse the remote input.</td>
<td>&quot;TchA&amp;D1 Teaching&quot; displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>The new value displays on the second line of the display, flashes, and then &quot;TchA&amp;D2&quot; and the current measurement value display.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>&quot;FAIL&quot; flashes, the sensor returns to step 2, and &quot;RMT TCH&quot; displays.</td>
</tr>
</tbody>
</table>

4. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the switch point two target.</td>
<td>&quot;TchA&amp;D2&quot; and the target’s measurement value display.</td>
</tr>
</tbody>
</table>

5. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>&quot;TchA&amp;D2 Teaching&quot; displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>The new value displays on the second line of the display, flashes, and then returns to Run mode.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>&quot;FAIL&quot; flashes, the sensor returns to step 2, and &quot;RMT TCH&quot; displays.</td>
</tr>
</tbody>
</table>

5.2 TEACH Analog Output and Discrete Output Midpoints Together

Use the following procedure to teach an identical Analog Output 12 mA (5 V) point and Discrete Output midpoint (switch point) at the same time using the remote input. This feature is not available using the buttons. Note that if the window sizes and/or offsets were set independently (using the buttons), the windows taught using the following procedure could be different.
When the Discrete Output is set to Switch Mode, the SPt TEACH is executed with SPtRef=Custom and Offset=0 mm.

1. Access the TEACH mode.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pulse the remote input.</td>
<td>&quot;RMT TCH&quot; and the current measurement value display.</td>
</tr>
</tbody>
</table>

2. Present the target.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present the midpoint (switch point) target.</td>
<td>&quot;RMT TCH&quot; and the target's measurement value display.</td>
</tr>
</tbody>
</table>

3. TEACH the sensor.

<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six-pulse the remote input.</td>
<td>&quot;TchA&amp;D Teaching&quot; displays while the sensor is being taught.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>The new value displays on the second line of the display, flashes, and the sensor returns to Run mode.</td>
</tr>
<tr>
<td></td>
<td><strong>TEACH Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td>&quot;FAIL&quot; flashes, the sensor returns to step 2, and &quot;RMT TCH&quot; displays.</td>
</tr>
</tbody>
</table>
6 Specifications

Supply Voltage
12 to 30 V DC

Power and Current Consumption (Exclusive of Load)
Normal Run Mode: < 2.1 W
Current consumption < 85 mA at 24 V DC

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Construction
Die-cast zinc housing; acrylic window

Maximum Torque
2.6 N·m (23.0 in-lbs)

Output Configuration
Analog output: 4 to 20 mA or 0 to 10 V, depending on model
Discrete output rating: Discrete NPN/PNP is user-configurable

Output Ratings
Discrete Output: 100 mA maximum (protected against continuous overload and short circuit)
OFF-state leakage current (PNP): < 10 μA at 30 V
OFF-state leakage current (NPN): < 200 μA at 30 V
Output saturation voltage (PNP outputs): < 3 V at 100 mA
Output saturation voltage (NPN outputs): < 1.6 V at 100 mA
Analog current output (LTF...I Models): 1 kΩ maximum at 24 V; maximum load resistance = [(Vcc-4.5)/0.02 Ω]
Analog voltage output (LTF...U Models): 2.5 kΩ minimum load resistance

Remote Input
Allowable Input Voltage Range: 0 to Vcc
Active Low (internal weak pullup—sinking current):
High State > 4.3 V at 740 μA maximum
Low State < 1.3 V at 800 μA maximum

Active High (internal weak pulldown—sourcing current):
High State > 4.3 V at 1.7 mA maximum
Low State < 1.3 V at 1.6 mA maximum

Response Time
Fast: 1.5 ms
Standard: 8 ms
Medium: 32 ms
Slow: 256 ms

Repeatability
See Performance Curves

Sensing Beam
Visible red, 860 nm

Sensing Range -- LTF12
90% White Target: 50 mm to 12000 mm
18% Gray Target: 50 mm to 11000 mm
6% Black Target: 50 mm to 7000 mm

Sensing Range -- LTF24
90% White Target: 50 mm to 24000 mm
18% Gray Target: 50 mm to 18000 mm
6% Black Target: 50 mm to 11000 mm

Ambient Light Immunity
> 40000 lux

Delay at Power Up
2 seconds

Measurement Output Rate
0.5 ms

Minimum Window Size, Analog and Discrete
10 mm

BoreSighting
40 mm radius at 12000 mm
80 mm radius at 24000 mm

Temperature Effect
50 mm to 12000 mm: ±0.25 mm/°C (typical)
>12000 mm: ±0.5 mm/°C (typical)

Linearity/Accuracy

<table>
<thead>
<tr>
<th>Reflection</th>
<th>LTF12</th>
<th>LTF24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±10 mm</td>
<td>±20 mm</td>
</tr>
<tr>
<td>6% Black Card</td>
<td>5 m</td>
<td>7 m</td>
</tr>
<tr>
<td>18% Gray Card</td>
<td>8 m</td>
<td>11 m</td>
</tr>
<tr>
<td>90% White Card</td>
<td>12 m</td>
<td>-</td>
</tr>
</tbody>
</table>

Resolution
LTF12: < 0.3 mm to 3 mm
LTF24: < 0.3 mm to 4 mm
Resolution measured as twice repeatability with white target at slow response speed at 20 °C. See repeatability curves for more detail.

Beam Spot Size
6.5 mm at 50 mm
10 mm at 7500 mm
12.5 mm at 12000 mm
35 mm at 24000 mm
Beam spot size is calculated as 1.6 times the D4σ measured diameter
Storage Conditions
–30 °C to +65 °C (–22 °F to +149 °F)

Operating Conditions
–20 °C to +55 °C (–4 °F to +131°F)
90% at +55 °C maximum relative humidity (non-condensing)

Environmental Rating
IEC IP67; NEMA 6

Shock
MIL-STD-202G, Method 213B, Condition I (100G 6x along X, Y, and Z axes, 18 shocks), with device operating

Vibration
MIL-STD-202G, Method 201A (Vibration: 10 Hz to 55 Hz, 0.06 inch (1.52 mm) double amplitude, 2 hours each along X, Y and Z axes), with device operating

Application Note
For optimum performance, allow 15 minutes for the sensor to warm up

Certifications

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table. Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply. Supply wiring leads < 24 AWG shall not be spliced. For additional product support, go to www.bannerengineering.com.

<table>
<thead>
<tr>
<th>Supply Wiring (AWG)</th>
<th>Required Overcurrent Protection (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>5.0</td>
</tr>
<tr>
<td>22</td>
<td>3.0</td>
</tr>
<tr>
<td>24</td>
<td>2.0</td>
</tr>
<tr>
<td>26</td>
<td>1.0</td>
</tr>
<tr>
<td>28</td>
<td>0.8</td>
</tr>
<tr>
<td>30</td>
<td>0.5</td>
</tr>
</tbody>
</table>

6.1 Repeatability Performance

LTF12 Models

Figure 35. Speed: Slow (256 ms)

Figure 36. Speed: Medium (32 ms)

Figure 37. Speed: Standard (8 ms)

Figure 38. Speed: Fast (1.5 ms)
Figure 39. Speed: Slow (256 ms)

Figure 40. Speed: Medium (32 ms)

Figure 41. Speed: Standard (8 ms)

Figure 42. Speed: Fast (1.5 ms)

6.2 Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.
# 7 Troubleshooting

<table>
<thead>
<tr>
<th>Message/Indicator</th>
<th>Description</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail/Out of Range</td>
<td>The TEACH failed, the target is out of range. The target might have moved out of range after the TEACH process began.</td>
<td>TEACH the target within the measurement range.</td>
</tr>
<tr>
<td>Fail/OfSt Out of Range</td>
<td>The TEACH failed. The target is in range but the offset value caused the setpoint(s) to be out of range.</td>
<td>Adjust the offset value or target distance to keep the setpoint(s) within the measurement range.</td>
</tr>
<tr>
<td>MIN Wnd xx mm (xx in)</td>
<td>The adjusted or taught window size is too small; the minimum window size is displayed.</td>
<td>The sensor automatically adjusts the window size to maintain the minimum window size and completes the adjust or TEACH operation.</td>
</tr>
<tr>
<td>xxxxx &lt; NEAR</td>
<td>The threshold (xxxx) is less than the minimum sensing range. xxxx could be 4mA Pt (0V Pt), 20mA Pt (10V Pt) or SPt1.</td>
<td>The desired window size is maintained, but the usable portion of the window is restricted to be within the defined sensing range.</td>
</tr>
<tr>
<td>xxxxx &gt; FAR</td>
<td>The threshold (xxxx) is greater than the maximum sensing range. xxxx could be 4mA Pt (0V Pt), 20mA Pt (10V Pt) or SPt2.</td>
<td>The desired window size is maintained, but the usable portion of the window is restricted to be within the defined sensing range.</td>
</tr>
<tr>
<td>OutRnge</td>
<td>The target is out of range, too dark, or the sensor is not measuring.</td>
<td>Move the target within the measurement range.</td>
</tr>
<tr>
<td>&lt; NEAR</td>
<td>During RUN mode the target is detected, but is inside the NEAR measuring range.</td>
<td>The sensor can reliably detect targets up to the face of the sensor, and the Discrete Output state is valid. The Analog Output cannot be used to measure distances inside the NEAR measuring range.</td>
</tr>
<tr>
<td>Power LED is flashing green</td>
<td>The sensor input is set to laser enable and the input is not active.</td>
<td>See Input Type on p. 28.</td>
</tr>
<tr>
<td>All LEDs are flashing</td>
<td>The laser shuts off, the Power LED flashes green, the Output LEDs flash amber at 1 Hz, and the display is blank. The sensor has experienced a fault.</td>
<td>Contact Banner Engineering to resolve.</td>
</tr>
<tr>
<td>Type Sync Slave</td>
<td>The slave mode sensor does not see the master’s pulse.</td>
<td>Make sure that the master mode sensor is configured and functioning properly. Check the input wire connection between the master and slave.</td>
</tr>
</tbody>
</table>
8 Sensor Menu Full Map

Top Menu

- Run Mode
  - Enter Quick Menu Loop (see Quick Menu diagram)

Sub Menus

- MENU A_OUT
  - A_OUT Adj4mA
  - A_OUT Adj20mA
  - A_OUT Slope
  - A_OUT Slope Pos
  - A_OUT Slope Neg
  - A_OUT Lead/Tr
  - LossSig 3.5 mA
  - LossSig 20.5 mA

- MENU D_OUT
  - D_OUT Adj4mA
  - D_OUT Adj20mA
  - D_OUT Mode
    - Mode A
    - Mode B
    - Mode C
    - Mode D
    - Mode E

- MENU INPUT
  - INPUT Type
    - Type TEK
    - Type LASE
    - Type PNP
    - Type NPN
  - INPUT Active
    - Active Low
    - Active High

- MENU MEASURE
  - MEASURE Speed
    - Speed Fast
    - Speed Standard
    - Speed Slow
  - MEASURE Trigger
    - Trigger Sample
    - Trigger Average
    - Trigger Max
    - Trigger Min
    - Trigger Range
    - Trigger Track Max
    - Trigger Track Min

- MENU DISPLAY
  - DISPLAY Sleep
    - Sleep 1min
    - Sleep Disabled
    - Sleep 5min
    - Sleep 15min
    - Sleep 60min
  - DISPLAY Units
    - Units in
    - Units mm
  - DISPLAY View
    - View Invert
    - View Normal

- MENU INFO
  - INFO Model
    - INFO Model LTF12I
  - INFO P/N
    - P/N 94849
  - INFO S/N

- MENU RESET
  - RESET No
  - RESET Yes

* Default Setting
9 Accessories

9.1 Cordsets

All measurements are listed in millimeters, unless noted otherwise.

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Style</th>
<th>Dimensions</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDEC2-506</td>
<td>1.83 m</td>
<td>Straight</td>
<td>44 Typ.</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>MQDEC2-515</td>
<td>4.57 m</td>
<td>Straight</td>
<td>32 Typ.</td>
<td>2 = White</td>
</tr>
<tr>
<td>MQDEC2-530</td>
<td>9.14 m</td>
<td>Straight</td>
<td>30 Typ.</td>
<td>3 = Blue</td>
</tr>
<tr>
<td>MQDEC2-550</td>
<td>15.2 m</td>
<td>Straight</td>
<td>27 Typ.</td>
<td>4 = Black</td>
</tr>
<tr>
<td>MQDEC2-506RA</td>
<td>1.83 m</td>
<td>Right-Angle</td>
<td>32 Typ.</td>
<td>5 = Gray</td>
</tr>
<tr>
<td>MQDEC2-515RA</td>
<td>4.57 m</td>
<td>Right-Angle</td>
<td>30 Typ.</td>
<td></td>
</tr>
<tr>
<td>MQDEC2-530RA</td>
<td>9.14 m</td>
<td>Right-Angle</td>
<td>27 Typ.</td>
<td></td>
</tr>
<tr>
<td>MQDEC2-550RA</td>
<td>15.2 m</td>
<td>Right-Angle</td>
<td>27 Typ.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Style</th>
<th>Pinout (Male)</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDEC3-503SS</td>
<td>0.31 m</td>
<td>Female Straight/Male Straight</td>
<td>1 = Brown</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>MQDEC3-506SS</td>
<td>1.83 m</td>
<td>Female Straight/Male Straight</td>
<td>2 = White</td>
<td>2 = White</td>
</tr>
<tr>
<td>MQDEC3-515SS</td>
<td>4.58</td>
<td>Female Straight/Male Straight</td>
<td>3 = Blue</td>
<td>3 = Blue</td>
</tr>
<tr>
<td>MQDEC3-530SS</td>
<td>9.20</td>
<td>Female Straight/Male Straight</td>
<td>4 = Black</td>
<td>4 = Black</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 = Gray</td>
<td>5 = Gray</td>
</tr>
</tbody>
</table>
9.2 Brackets

All measurements are listed in millimeters, unless noted otherwise.

**SMBLTFFA**
- Swivel plate bracket
- 5 mm stainless steel

**SMBLTFL**
- Right-angle bracket
- 12 gauge stainless steel

**SMBLTFU**
- Enclosed bracket
- 16 gauge stainless steel

**SMBAMSLTFP**
- AMS mounting pattern
- 12 gauge stainless steel

- Includes the mounting plate and two protective windows
- 90 plus degree rotation
- Window frames are black anodized aluminum; mounting plate is stainless steel
- The mounting plate, SMBAMSLTFP, can be ordered separately
- The replacement window, RWAMSLTF, can be ordered separately

9.3 RSD1 Remote Display

Use the optional RSD1 for remote monitoring and configuring compatible devices.

Refer to the RSD1 instruction manual (p/n 199621) or quick start guide (p/n 199622) for more information. See Accessories on p. 44 for the required cordsets.
### RSD1 Remote Display

<table>
<thead>
<tr>
<th>Model</th>
<th>Output A and B</th>
<th>Dimensions</th>
<th>Male</th>
<th>Wiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSD1QP</td>
<td>Configurable</td>
<td>![Dimensions Diagram]</td>
<td>![Male Wiring Diagram]</td>
<td></td>
</tr>
</tbody>
</table>

1 = Brown  
2 = White  
3 = Blue  
4 = Black  
5 = Gray
10 Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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