L-GAGE® LTF Time of Flight Laser Distance Sensor with IO-Link

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Quick Start Guide

*Laser distance sensor with dual discrete (switched) outputs and IO-Link.*

This guide is designed to help you set up and install the LTF Time of Flight Laser Distance Sensor. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at *www.bannerengineering.com*. Search for p/n *195393* to view the manual. Use of this document assumes familiarity with pertinent industry standards and practices.

⚠️ **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.

Features and Indicators
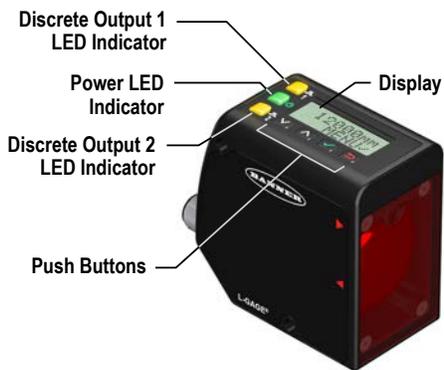
Figure 1. Features

Three LED indicators provide ongoing indication of the sensing status.

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 Indicators

Solid Amber = Discrete Output is On
Off = Discrete Output is Off

Display

Figure 2. Display shown in Run Mode

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

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 ˅ˈ 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.

↩️ **Escape Button**

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.

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.

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.

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Avoid exposure - laser light emitted from this aperture

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
Acc to IEC 60825-1:2007.
Wavelength 635-680nm; 1.0mW max. Output
Complies with 21 CFR 1040.10 and 1040.11
except for deviations pursuant to
Laser Notice No. 50, dated June 24, 2007.

*Figure 3. FDA (CDRH) warning label (Class 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.

Mount the Sensor

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

## Wiring Diagrams
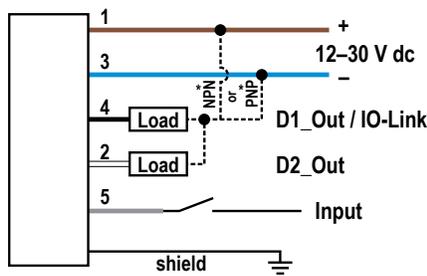
Figure 4. IO-Link Models
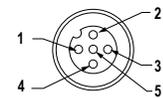
Sensor Programming

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 page 3, *Sensor Menu (MENU)* on page 4, and the instruction manual (p/n 195393) for more information on the options available from each menu. For TEACH options, follow the TEACH instructions in the instruction manual.

In addition to programming the sensor, use the remote input to disable the buttons for security, preventing unauthorized or accidental programming changes. See the instruction manual for more information.
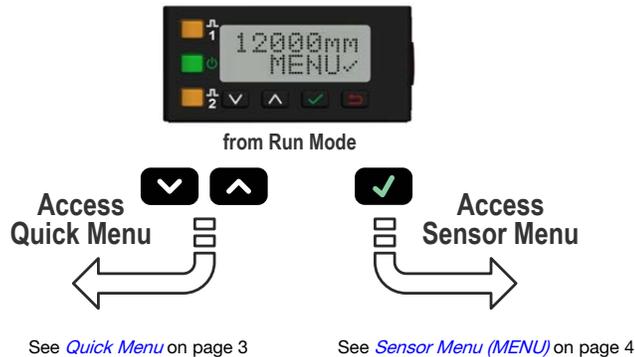
Figure 5. Accessing the Menus

Quick Menu

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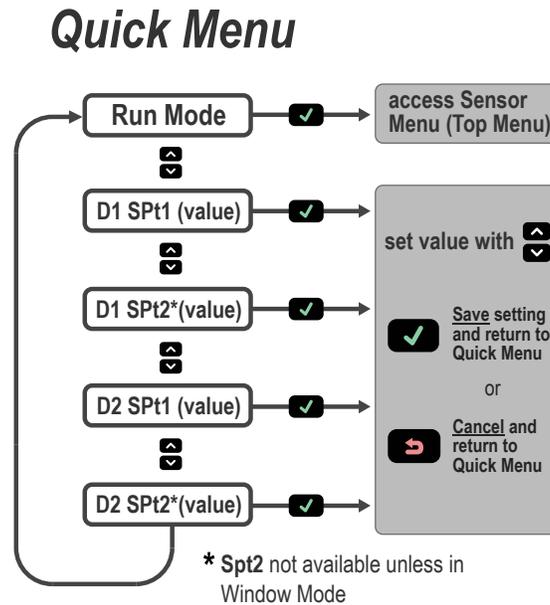

Figure 6. Quick Menu Map (Window Mode)

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.

Top Menu *Sub Menus*

Run Mode

Enter ✓ Top Menu

Enter Quick Menu Loop
(see Quick Menu diagram)

✓ ▶
Select Menu Item
or
Press to Save Setting

◀ ↩
Go Back to Parent Menu
or
Press and Hold to Go Back
to Run Mode

MENU D1_OUT

D1_OUT Tch2Pt	Tch2Pt TchSPt1	TchSPt1 50mm
	Tch2Pt TchSPt2	TchSPt2 12000mm
D1_OUT TchMid	TchMid WndSize	WndSize +00020mm
	TchMid TchMdPt	TchMdPt 6000mm
	TchMid Offset	Offset 0mm
D1_OUT AdjSPt1	AdjSPt1 +00050mm	
D1_OUT AdjSPt2	AdjSPt2 +12000mm	
D1_OUT Mode	Mode Alarm	
	Mode Health	
	Mode Swtch ⌐	
	Mode Swtch ⌐	
	Mode Wnd ⌐⌐ *	
	Mode Wnd ⌐⌐	

(in SPt mode only)
D1_OUT SPtRef	SPtRef Object
	SPtRef Backgrnd
	SPtRef Custom

(in SPtRef Custom mode only)
| D1_OUT Offset | Offset 0 mm |

D1_OUT Hyst	Hyst Auto	
D1_OUT Timer	Timer OffDly	OffDly 0 ms
	Timer Off1Sho	Off1Sho 0 ms
	Timer OnDly	OnDly 0 ms
	Timer On1Sho	On1Sho 0 ms
D1_OUT Polarity	Polarity PNP *	
	Polarity NPN	

MENU D2_OUT

D2_OUT Tch2Pt	Tch2Pt TchSPt1	TchSPt1 50mm
	Tch2Pt TchSPt2	TchSPt2 12000mm
D2_OUT TchMid	TchMid WndSize	WndSize +00020mm
	TchMid TchMdPt	TchMdPt 6000mm
	TchMid Offset	Offset 0 mm
D2_OUT AdjSPt1	AdjSPt1 +00050mm	
D2_OUT AdjSPt2	AdjSPt2 +12000mm	
D2_OUT Mode	Mode Alarm	
	Mode Health	
	Mode Swtch ⌐	
	Mode Swtch ⌐	
	Mode Wnd ⌐⌐ *	
	Mode Wnd ⌐⌐	
	Mode PFM ⌐⌐	

(in SPt mode only)
D2_OUT SPtRef	SPtRef Object
	SPtRef Backgrnd
	SPtRef Custom

(in SPtRef Custom mode only)
| D2_OUT Offset | Offset 0 mm |

D2_OUT Hyst	Hyst Auto	
D2_OUT Timer	Timer OffDly	OffDly 0 ms
	Timer Off1Sho	Off1Sho 0 ms
	Timer OnDly	OnDly 0 ms
	Timer On1Sho	On1Sho 0 ms
D2_OUT Polarity	Polarity PNP *	
	Polarity NPN	

* Default Setting

Top Menu *Sub Menus*

MENU INPUT

INPUT Type	Type Teach
	Type LasrEnbl
	Type SyncMstr
	Type SyncSlve
	Type Disabled *

| INPUT Active | Active Low * |
| | Active High |

MENU MEASURE

MEASURE Speed	Fast
	Standard
	Medium *
	Slow

MENU DISPLAY

DISPLAY Units	Units mm *
	Units in
DISPLAY Zero	Zero Near *
	Zero Far
DISPLAY Shift	Shift Off *
	Shift SetZero
	Shift AutoSet
DISPLAY View	View Normal *
	View Invert
DISPLAY Sleep	Sleep Disabled *
	Sleep 1min
	Sleep 5min
	Sleep 15min
	Sleep 60min

MENU INFO

INFO Model	Model LTF12K
INFO P/N	P/N 801130
INFO S/N	S/N F..S..P..
INFO Version	Version 1.0.0

MENU RESET

| RESET No |
| RESET Yes |

Figure 7. Sensor Menu Map

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
User configurable to dual discrete NPN or dual discrete PNP; the NPN/PNP polarity menus change both outputs

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

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

IO-Link Interface
Supports Smart Sensor Profile: Yes
Baud Rate: 38400 bps
Process Data Widths: 32 bits
IODD files: Provides all programming options of the display, plus additional functionality. See p/n *199517* for IO-Link reference information.

Repeatability
See Performance Curves

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 60 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

CE

UL c US Industrial Control Equipment LISTED 3TJJ

Sensing Beam
Visible red, 660 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
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

Reflectance	LTF12		LTF24		
	±10 mm	±20 mm	±25 mm	±50 mm	±100 mm
6% Black Card	5 m	7 m	7 m	9 m	11 m
18% Gray Card	8 m	11 m	11 m	14 m	18 m
90% White Card	12 m	-	24 m	-	-

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

**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*.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Repeatability Performance

LTF12 Models
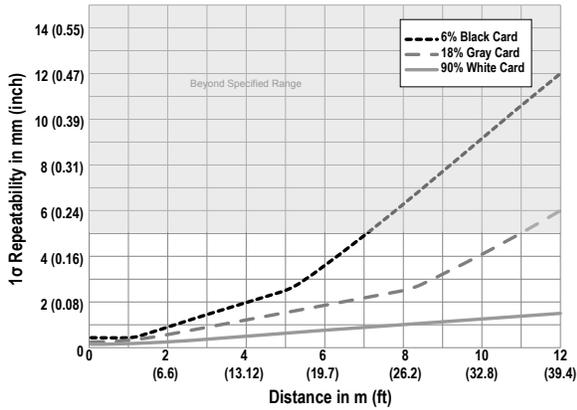
Figure 8. Speed: Slow (256 ms)
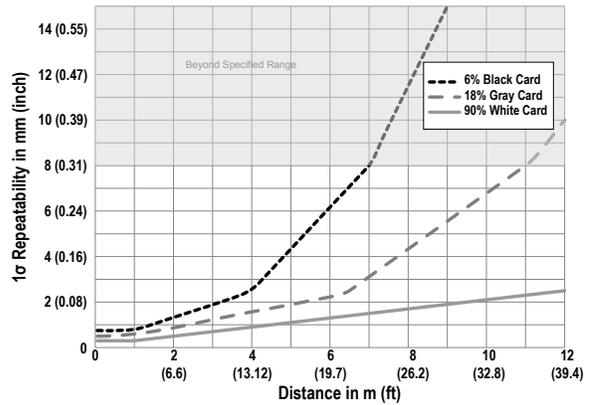
Figure 9. Speed: Medium (32 ms)
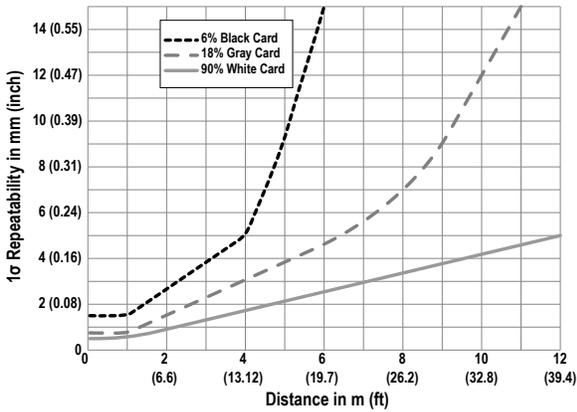
Figure 10. Speed: Standard (8 ms)
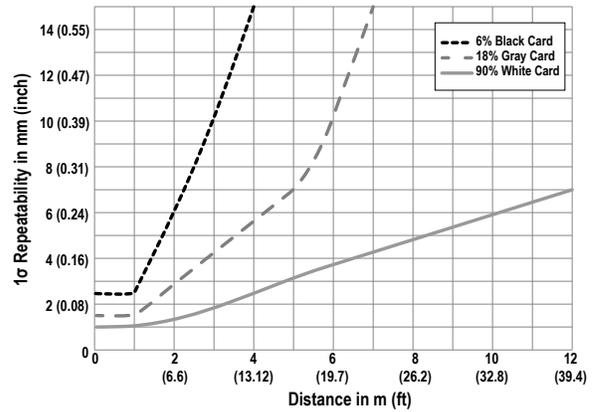
Figure 11. Speed: Fast (1.5 ms)

LTF24 Models
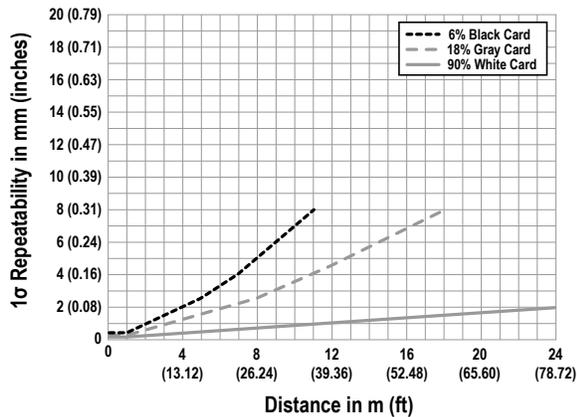
Figure 12. Speed: Slow (256 ms)
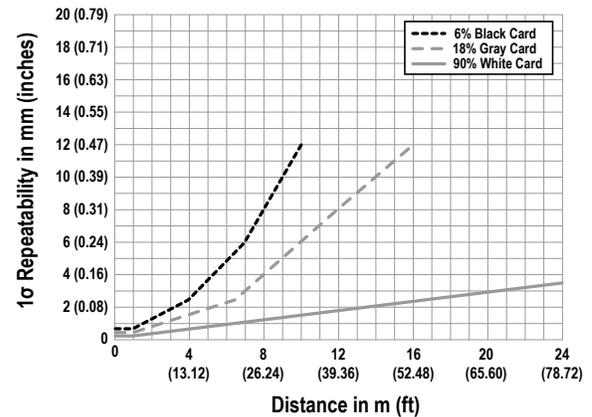
Figure 13. Speed: Medium (32 ms)

LTF24 Models
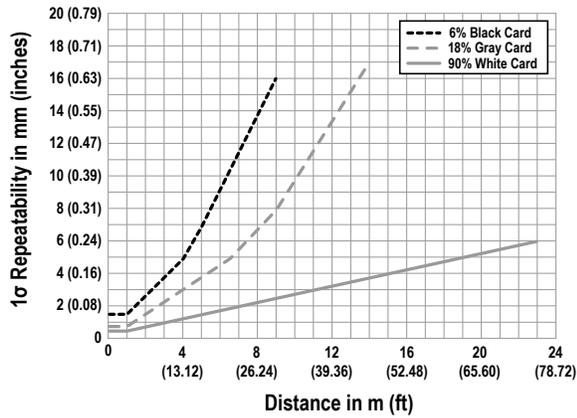
Figure 14. Speed: Standard (8 ms)
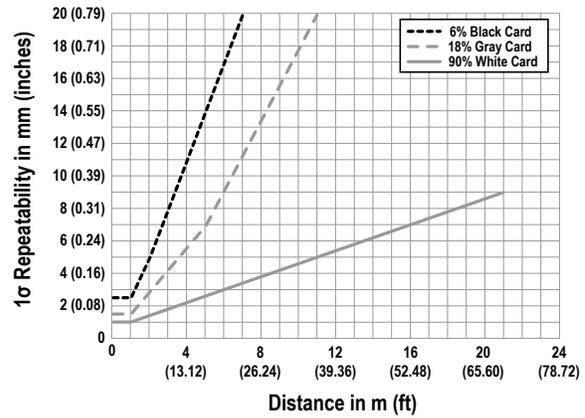
Figure 15. Speed: Fast (1.5 ms)

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