

# L-GAGE® LTF Time of Flight Laser Distance Sensor



## Quick Start Guide

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

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](http://www.bannerengineering.com). Search for p/n 194135 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

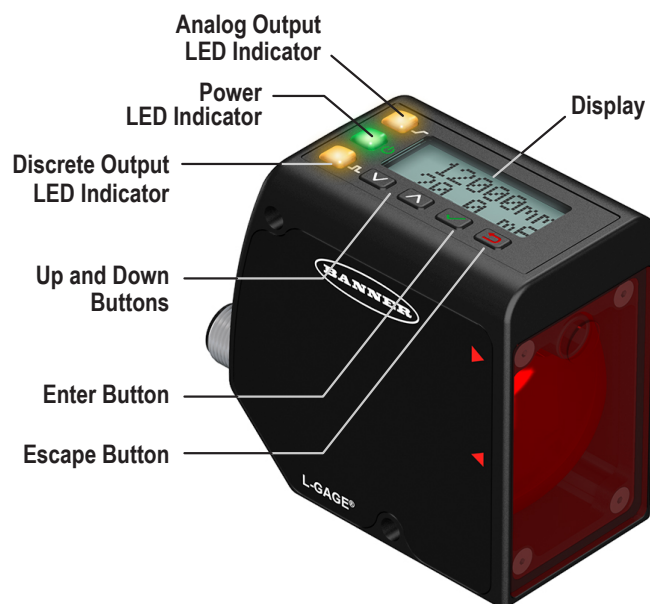


Figure 1. Features

Three LED indicators provide ongoing indication of the sensing status.

### 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

## 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.



Figure 2. FDA (CDRH) warning label (Class 2)

## Sensor Installation

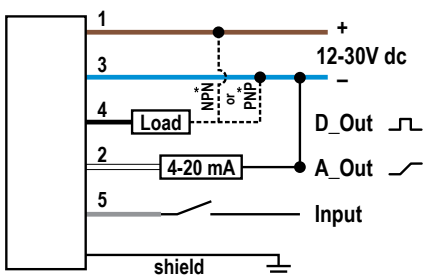


NOTE: Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow the window clear using filtered, compressed air, then clean as necessary using 70% isopropyl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

## Sensor Mounting

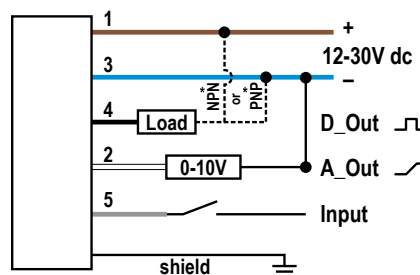
1. If a bracket is needed, mount the sensor onto the bracket.
2. Mount the sensor (or the sensor and the bracket) to the machine or equipment at the desired location. Do not tighten at this time.
3. Check the sensor alignment.
4. Tighten the screws to secure the sensor (or the sensor and the bracket)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

## Wiring Diagrams



\* User-configurable PNP/NPN setting

Figure 3. Analog Current Model



\* User-configurable PNP/NPN setting

Figure 4. Analog Voltage Model

#### Key

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

## Display



Figure 5. 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 and the analog output 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 ✓ 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.

## 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 4, [Sensor Menu \(MENU\)](#) on page 4, and the instruction manual (p/n 194135) 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.

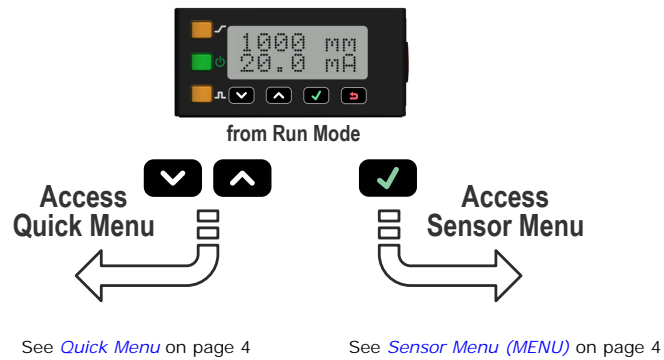


Figure 6. Accessing the Menus

## 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.

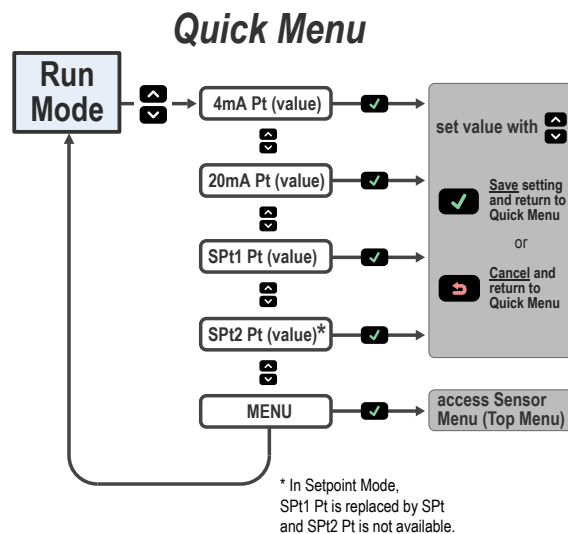


Figure 7. Quick Menu Map (Window Mode)

## 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.

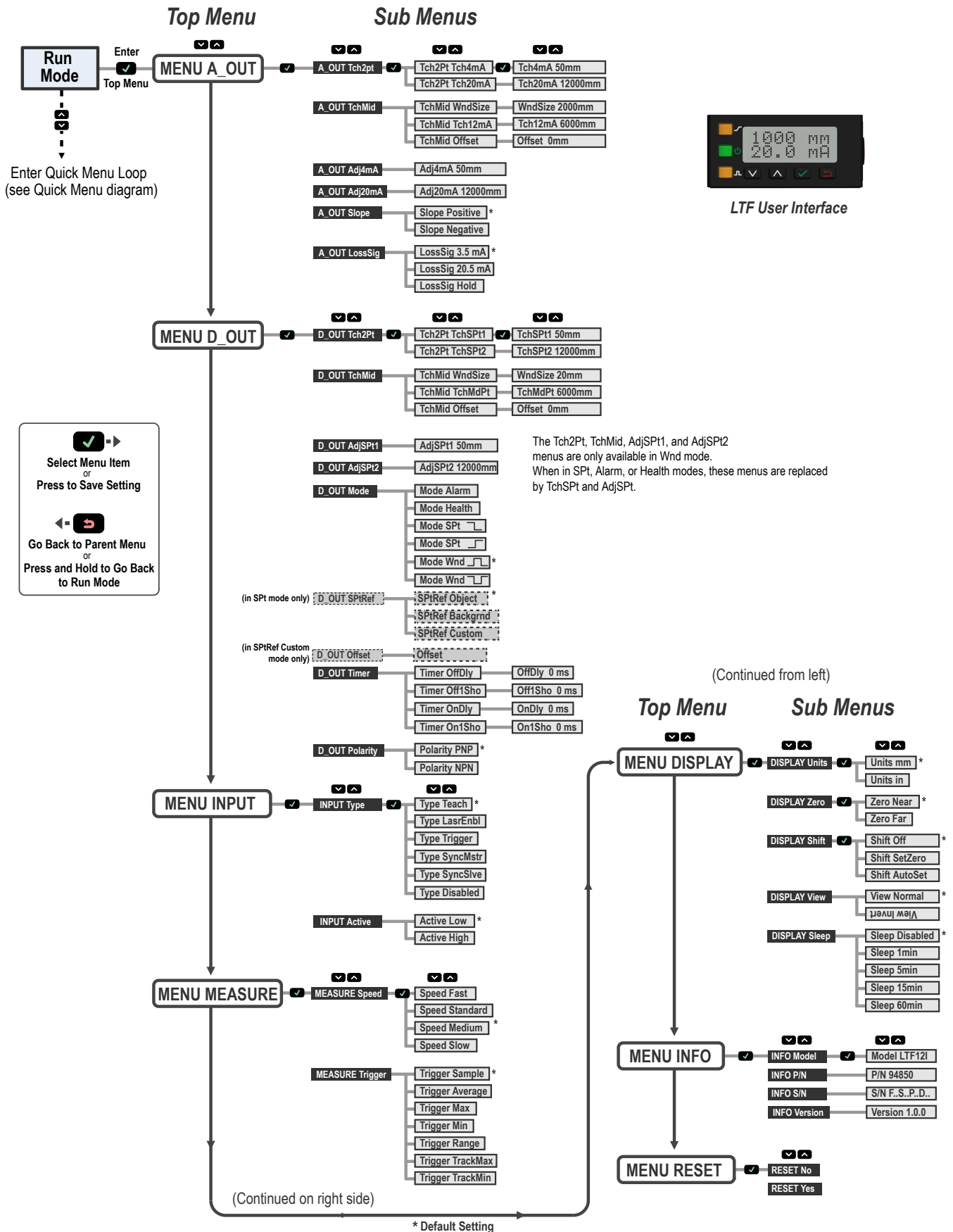


Figure 8. Sensor Menu Map

## 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

### 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  $\mu$ A at 30 V

OFF-state leakage current (NPN): < 200  $\mu$ A 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 k $\Omega$  maximum at 24 V;

maximum load resistance =  $[(V_{cc}-4.5)/0.02 \Omega]$

Analog voltage output (LTF...U Models): 2.5 k $\Omega$  minimum load resistance

### Remote Input

Allowable Input Voltage Range: 0 to V<sub>cc</sub>

Active Low (internal weak pullup—sinking current):

High State > 4.3 V at 740  $\mu$ A maximum

Low State < 1.3 V at 800  $\mu$ A 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

### 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

### Vibration and Mechanical Shock

All models meet Mil. Std. 202G requirements method 201A. Also meets 60947-5-2.

### Application Note

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

### Certifications



UL Pending

### Sensing Beam

Visible red, 660 nm

### Sensing Range

90% White Target: 50 mm (1.97 in) to 12000 mm (472.44 in)

18% Gray Target: 50 mm (1.97 in) to 11000 mm (433 in)

6% Black Target: 50 mm (1.97 in) to 7000 mm (275.5 in)

### Construction

Die-cast zinc housing; acrylic window

### Maximum Torque

2.6 N·m (23.0 in-lbs)

### 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

### Temperature Effect

$\pm 0.25$  mm/°C (typical)

### Linearity/Accuracy

Reflectance	$\pm 10$ mm	$\pm 20$ mm
6% Black Card	5 m	7 m
18% Gray Card	8 m	11 m
90% White Card	12 m	-

### Repeatability

See Performance Curves

### Resolution

< 0.3 to 3 mm<sup>1</sup>

### Beam Spot Size

6.5 mm at 50 mm

10 mm at 7500 mm

12.5 mm at 12000 mm

Beam spot size is calculated as 1.6 times the D4 $\sigma$  measured value

### 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 <http://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

<sup>1</sup> Resolution measured as twice repeatability with white target at slow response speed at 20 °C. See repeatability curves for more detail.

## Repeatability Performance

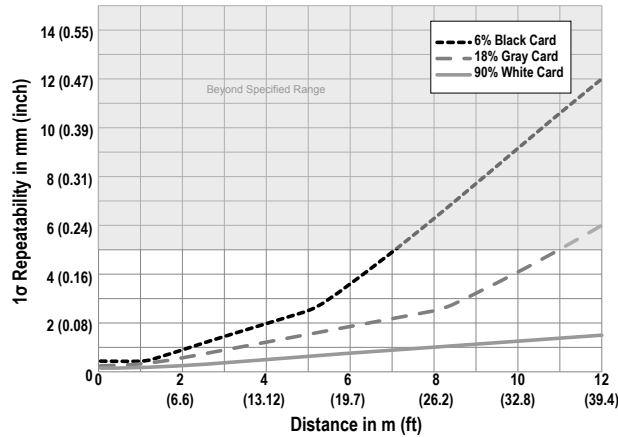


Figure 9. Speed: Slow (256 ms)

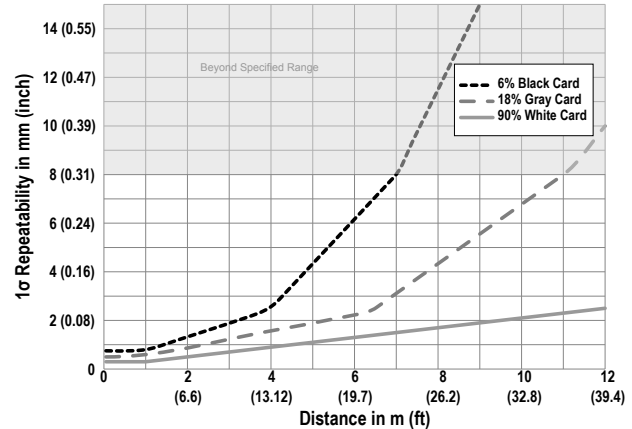


Figure 10. Speed: Medium (32 ms)

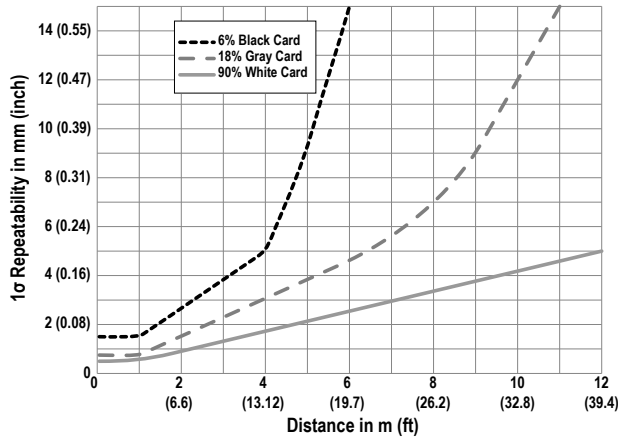


Figure 11. Speed: Standard (8 ms)

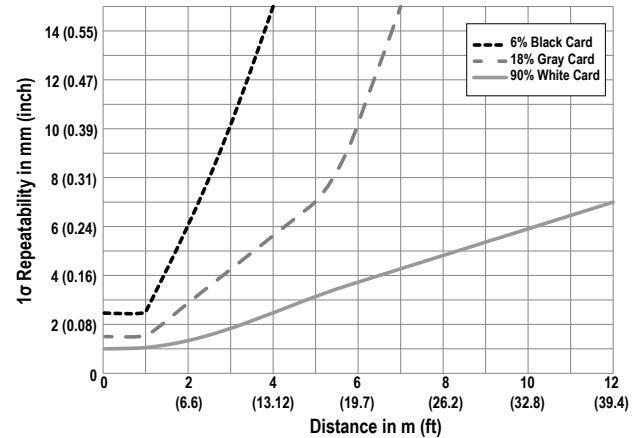


Figure 12. Speed: Fast (1.5 ms)

\* 1 Sigma repeatability

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