

U-GAGE® T30UX Series with Analog Output



more sensors, more solutions

Ultrasonic Sensor with TEACH-Mode Configuration

For complete technical information about this product, including dimensions, accessories, and specifications, see www.bannerengineering.com and search 141958_web



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.

Figure 1. Features



Models

Models	Range and Frequency	Cable ¹	Supply Voltage	Analog Output	Response Time
T30UXUA	100 mm to 1 m (3.9 in to 39 in)	Standard 2 m (6.5 ft) cable	10 to 30V dc	0 to 10V dc	45 ms or 105 ms selectable
T30UXIA	224 kHz			4 to 20 mA	
T30UXUB	200 mm to 2 m (7.8 in to 78 in)			0 to 10V dc	92 ms or 222 ms selectable
T30UXIB	174 kHz			4 to 20 mA	
T30UXUC	300 mm to 3 m (11.8 in to 118 in)			0 to 10V dc	135 ms or 318 ms selectable
T30UXIC	114 kHz			4 to 20 mA	

Sensor Configuration

Two TEACH methods may be used to configure the sensor:

- Teach individual minimum and maximum limits, or
- Use Auto-Window feature to center a sensing window around the taught position.

The sensor may be configured either via its push button, or via a remote switch. Remote configuration also may be used to disable the push button, preventing unauthorized personnel from adjusting the configuration settings. To access this feature, connect the white wire of the sensor to 0V dc, with a remote configuration switch between the sensor and the voltage.

Configuration is accomplished by following the sequence of input pulses. The duration of each pulse (corresponding to a push button “click”), and the period between multiple pulses, are as “T”: **0.04 seconds < T < 0.8 seconds**





Remote line configuration requires a greater than 1 second pause between pulse sequences.

¹ Only standard 2 m (6.5 ft) cable models are listed. For 4-Pin Euro-Style integral QD, add suffix “Q8” to the model number (for example, T30UXUAQ8). For 150 mm (6 in) PUR pigtail cable with 4-Pin threaded Euro-Style QD, add suffix “QPMA” to the model number (for example, T30UXUAQPMA). For 9 m (30 ft) cable, add suffix “W/30” to the model number (for example, T30UXUA W/30). A model with a QD connector requires a mating cable.



Mode Setup - Response Speed

Analog sensor models can be set up for either "Fast" or "Slow" response time

	Push Button 0.04 sec. < "click" < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
Response Speed Configuration	Push and hold MODE push button for > 2 seconds 	Power LED: OFF Mode LED: Flashing Amber shows previously selected mode	Double-pulse the remote line 	Power LED: OFF Mode LED: Flashing Amber shows previously selected mode
Select Speed	"Click" the MODE push button to cycle to correct selection: Fast or Slow 	Power LED: OFF Mode LED: Amber flashes to indicate currently selected mode (120 second time out ²)	<ul style="list-style-type: none"> • Single-pulse for Slow • Double-pulse for Fast 	Power LED: ON Green Mode LED: ON Amber shows selected mode (Sensor returns to RUN mode)
Save and Activate Mode	Push and hold MODE push button for > 2 seconds 	Power LED: ON Green Mode LED: ON Amber for selected mode	No action required; sensor will return to Run Mode	None

Analog Output

The U-GAGE T30UX series sensor may be configured for either a positive or a negative output slope, based on which condition is taught first (see [Figure 2. Positive and Negative Output Slopes](#) on page 2). If the near limit is taught first, the slope will be positive; if the far limit is taught first, the slope will be negative. Banner's scalable analog output automatically distributes the output signal over the width of the programmed sensing window.

The U-GAGE T30UX also features a 2-second hold upon loss of the received signal, which is useful for harsh and unstable applications. In the event of signal loss for longer than 2 seconds, the analog output goes to 3.6 mA or 0V dc, which may be used to trigger an alarm.

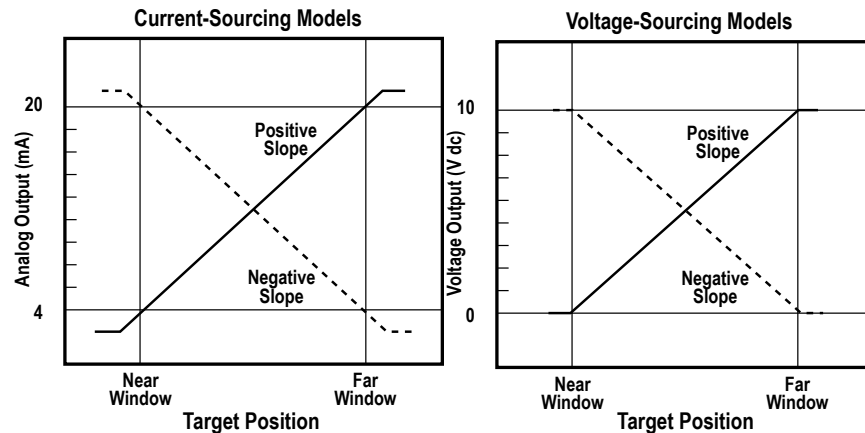







Figure 2. Positive and Negative Output Slopes

² The sensor will revert to previously saved configuration and return to RUN mode if TEACH is inactive for 120 seconds after the initial 2 second hold on push button

Teaching Minimum and Maximum Limits

General Notes on Teaching

- The sensor will return to RUN mode if the first TEACH condition is not registered within 120 seconds after the initial 2 second hold on the Analog push button.
- To exit TEACH mode without saving any changes, press and hold the Analog push button or remote line longer than 2 seconds (before teaching the second limit). The sensor will revert to the last saved limits.
- After the first limit is taught, the sensor will remain in TEACH mode until the TEACH sequence is finished or exited by a 2 second hold on the Analog push button or remote line.

	Push Button 0.04 sec. < "click" < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
TEACH Mode	Push and hold the Analog push button longer than 2 seconds 	Power LED: OFF Output LED: ON	No action required; sensor is ready for first limit teach	None
Teach First Limit	Position the target for the first limit (120 second time out)	Signal LED: Must be ON Red or Flashing Red ³	Position the target for the first limit	Signal LED: Must be ON Red or Flashing Red ³
	"Click" the Analog push button 	Teach Accepted Power LED: OFF Output LED: Flashing Teach Not Accepted Output LED: ON	Single-pulse the remote line 	Teach Accepted Power LED: OFF Output LED: Flashing Teach Not Accepted Power LED: ON
Teach Second Limit	Position the target for the second limit (no time out)	Signal LED: Must be ON Red or Flashing Red	Position the target for the second limit (no time out)	Signal LED: Must be ON Red or Flashing Red
	"Click" the Analog push button 	Teach Accepted Output LED: ON Power LED: ON Teach Not Accepted Output LED: Flashing Power LED: OFF	Single-pulse the remote line 	Teach Accepted Output LED: Turns ON Power LED: ON Teach Not Accepted Output LED: Flashing Power LED: OFF






³ Sensor will not Teach or indicate "Teach Not Accepted" when there is no signal present (Signal LED Red or Flashing Red)

Teaching Limits Using the Auto-Window Feature

Teaching the same limit twice automatically centers a 100 mm window on the taught position .

General Notes on Teaching

- The sensor will return to RUN mode if the TEACH condition is not registered within 120 seconds after the initial 2 second hold on the Analog push button.
- To exit TEACH mode without saving any changes, press and hold the Analog push button or remote line longer than 2 seconds (before teaching the second limit). The sensor will revert to the last saved limits.
- After the first limit is taught, the sensor will remain in TEACH mode until the TEACH sequence is finished or exited by a 2 second hold on the Analog push button or remote line.

	Push Button 0.04 sec. < "click" < 0.8 sec.		Remote Line 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
TEACH Mode	Push and hold the Analog push button longer than 2 seconds 	Power LED: OFF Output LED: ON	No action required; sensor is ready for first limit teach	None
Teach First Limit	Position the target for the center of window (120 second time out)	Signal LED: Must be ON Red or Flashing Red ⁴	Position the target for the center of window	Signal LED: Must be ON Red or Flashing Red ⁴
	"Click" the Analog push button 	Teach Accepted Power LED: OFF Output LED: Flashing Teach Not Accepted Output LED: ON	Single-pulse the remote line 	Teach Accepted Power LED: OFF Output LED: Flashing Teach Not Accepted Output LED: ON
Re-Teach Limit	Without moving the target, "click" the Analog push button again 	Teach Accepted Output LED: ON Power LED: ON Teach Not Accepted Output LED: Flashing Power LED: OFF	Without moving the target, single-pulse the remote line again 	Teach Accepted Output LED: ON Power LED: ON Teach Not Accepted Output LED: Flashing Power LED: OFF

⁴ Sensor will not Teach or indicate "Teach Not Accepted" when there is no signal present (Signal LED Red or Flashing Red)

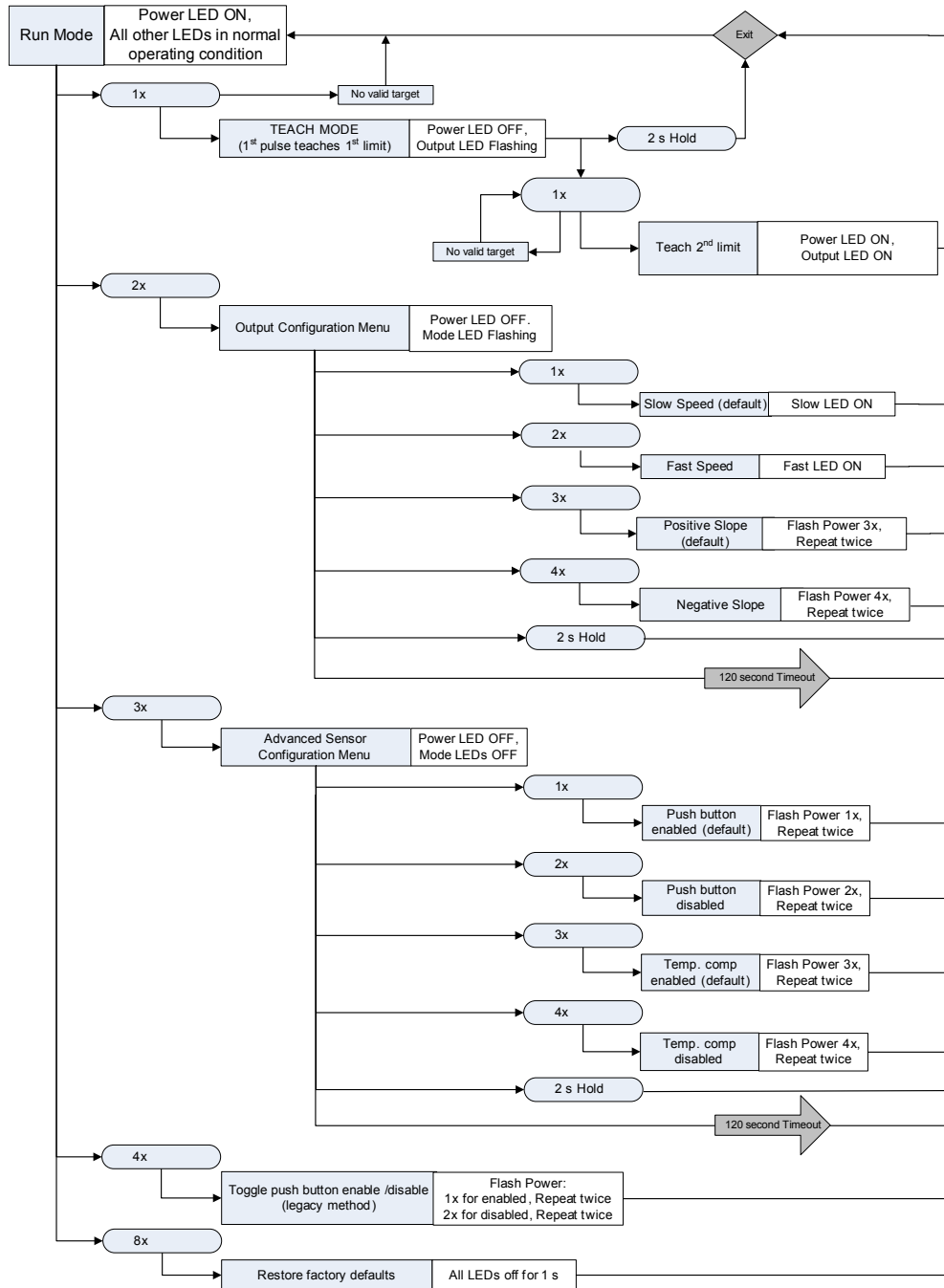
Remote Line TEACH

General Notes

- Run Mode is the sensor's normal operating condition
- The duration of each Pulse is defined as "T": $0.04 < T < 0.8 \text{ s}$



- A Hold will exit TEACH MODE and return to Run Mode with previously saved changes. The duration of a Hold is: $T > 2 \text{ s}$
- A Timeout will occur if a condition is not registered within 120 seconds, causing the sensor to return to Run Mode (during sensor configuration only)
- Sensor configuration user feedback shown on Green LED. See flowchart.
- The Red Signal LED will be ON whenever the target is in view.



Specifications

Sensing Range

- "A" suffix models: 100 mm to 1 m (3.9 in to 39 in)
- "B" suffix models: 200 mm to 2 m (7.8 in to 78 in)
- "C" suffix models: 300 mm to 3 m (11.8 in to 118 in)

Ultrasonic Frequency

- "A" suffix models: 224 kHz
- "B" suffix models: 174 kHz
- "C" suffix models: 114 kHz

Supply Voltage

10 to 30V dc (10% max. ripple) at 40 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Analog Output: 0 to 10V dc or 4 to 20 mA, depending on model

Output Rating

Analog Voltage Output: 2.5 kΩ min. load resistance; Minimum supply for a full 10V output is 12V dc (for supply voltages between 10 and 12, V out max. is at least V supply -2)

Analog Current Output: 1 kΩ max. at 24V input; max. load resistance = $(V_{cc}-4)/0.02\Omega$

For current output (4-20 mA) models, ideal results are achieved when the total load resistance

$R = [(V_{in} - 4)/0.020]\Omega$. Example, at $V_{in} = 24V$ dc, $R \approx 1\text{ k}\Omega$ (1 watt)

Output Protection Circuitry

Protected against short circuit conditions

Output Response Time

- "A" suffix models: 45 ms (fast); 105 ms (slow)
- "B" suffix models: 92 ms (fast); 222 ms (slow)
- "C" suffix models: 135 ms (fast); 318 ms (slow)

Delay at Power-up

500 ms

Temperature Effect

0.02% of distance/°C

Linearity

0.25% of distance

Resolution

- "A" suffix models: 0.1% of distance (0.5 mm min.)
- "B" suffix models: 0.1% of distance (1.0 mm min.)
- "C" suffix models: 0.1% of distance (1.5 mm min.)

Minimum Window Size

10 mm (0.4 in)

Adjustments

Sensing window limits: TEACH-Mode of near and far window limits may be set using the push button or remotely via TEACH input.

Response speed selection: Fast or Slow (see [Mode Setup - Response Speed](#) on page 2 or [Remote Line TEACH](#) on page 5)

Advanced configuration options: Analog output slope, push button enabled/disabled, temperature compensation enabled/disabled (see [Remote Line TEACH](#) on page 5)

Indicators

See [Figure 1. Features](#) on page 1

Loss of Signal Indication

0 to 10V dc models: Analog output goes to 0V

4 to 20 mA models: Analog output goes to 3.6 mA

Construction

Housing: PBT polyester

Push buttons: polyester

Transducer: epoxy /ceramic composite

Environmental Rating

Leakproof design, rated IP67 (NEMA 6)

Connections

2 m (6.5 ft) or 9 m (30 ft) shielded 4-conductor (with drain) PVC cable, 150 mm (6 in) PUR Euro-style pigtail (QPMA), or 4-pin integral Euro-style connector (Q8)

Operating Conditions

Temperature: -40 °C to +70 °C (-40 °F to +158 °F)

Humidity: 95% at +50 °C (non-condensing)

Vibration and Mechanical Shock

All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06 in, max acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave

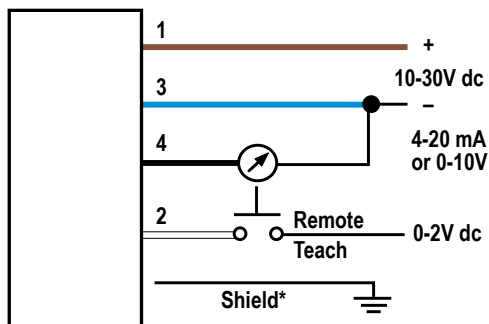
Application Note

The temperature warmup drift upon power-up is less than 1% of the sensing distance.

Certifications

CE Pending

Hookups



Wiring Key

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

Cable and QD hookups are functionally identical.

It is recommended that the shield wire be connected to earth ground. Shielded cordsets are recommended for all QD models.

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.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.