

Data Sheets & Instructions for Popular Ultrasonic Sensors



QS18U Series
Compact High-Speed



U-GAGE S18U Series
Barrel Style with Right Angle



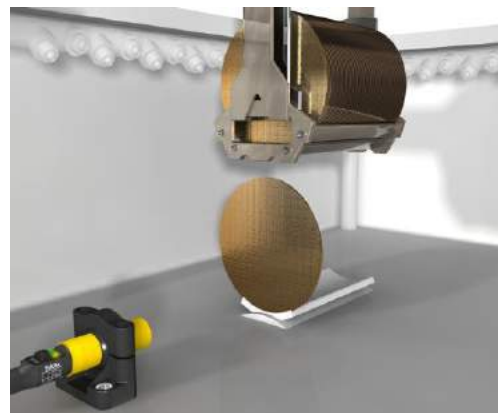
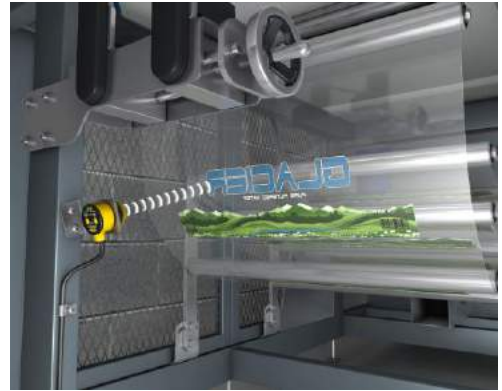
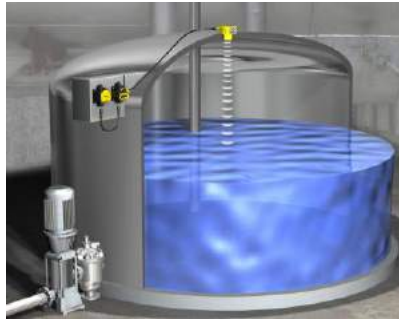
U-GAGE T18U Series
Thrubeam Type



U-GAGE T30 Series
Digital & Analog Types

U-GAGE T30U Series
Pump-In/Pump-Out Type

Got a application? Got a question? Call the Experts at Ramco



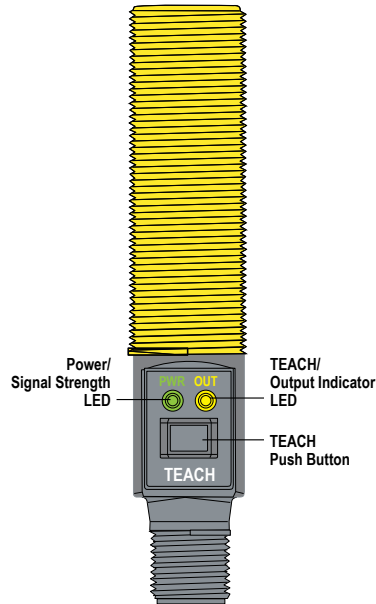
Ramco Innovations www.ramcoi.com Toll Free 800-328-6236

U-GAGE™ S18U Series Sensors with Discrete Output



Datasheet

18 mm Ultrasonic Sensors with TEACH-mode programming



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Short dead zone
- One NPN and one PNP output
- Two bi-colored status LEDs
- Rugged encapsulated design for harsh environments
- Choose 2 meter or 9 meter unterminated cable, or 5-pin Euro-style QD connector
- Wide operating range of -20°C to $+60^{\circ}\text{C}$ (-4°F to $+140^{\circ}\text{F}$)
- Choose either straight or right-angle housing
- Temperature compensation
- Configurable for normally open or normally closed operation
- Fast response time (5 milliseconds)



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.

Models

Model Number	Sensing Range	Cable ¹	Supply Voltage	Output	Housing Configuration
S18UBA	30 mm to 300 mm (1.2 in to 11.8 in)	5-wire, 2 m (6.5 ft) cable	10 V dc to 30 V dc	Bipolar NPN/PNP	Straight
S18UBAQ		5-pin Euro style QD			
S18UBAR		5-wire, 2 m (6.5 ft) cable			Right-Angle
S18UBARQ		5-pin Euro style QD			



NOTE: Information about discrete models is available at <http://www.bannerengineering.com>.

Configuration Instructions

Status Indicators

Power On/Off LED State	Indicates
Off	The power is off
On red	The target is weak or is outside of the sensing range
On green	The sensor is operating normally, target is good

¹

- 9 m cables are available by adding suffix "W/30" to the model number of any cabled sensor (for example, S18UBA W/30).
- A model with a QD connector requires a mating cable.



Output/Teach LED State	Indicates
Off	The target is outside of the window limits (normally open operation)
On yellow	The target is within the window limits (normally open operation)
On red	The sensor is in TEACH mode and is waiting for the first limit
Flashing red	The sensor is in TEACH mode and is waiting for the second limit

Sensor Programming

Use one of two TEACH methods to program the sensor:

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

The sensor may be programmed either via its push button, or via a remote switch. Remote programming also may be used to disable the push button, preventing unauthorized personnel from adjusting the programming settings. To access this feature, connect the gray wire of the sensor to 0 V dc to 2 V dc, with a remote programming switch between the sensor and the voltage.



NOTE: The impedance of the Remote Teach input is 12 kΩ.

Programming 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 defined as "T": 0.04 seconds < T < 0.8 seconds.

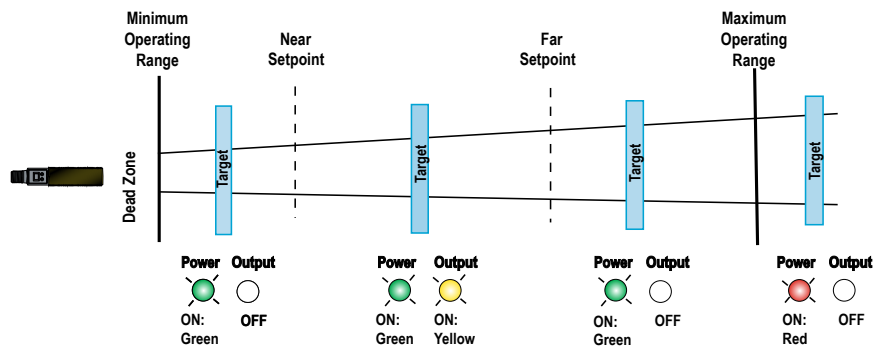


Figure 1. TEACH Interface

Teach Minimum and Maximum Limits



NOTE:

- The sensor returns to Run mode if the first Teach condition is not registered within 120 seconds
- After the first limit is taught, the sensor remains in Program mode until the Teach sequence is finished
- To exit Program mode without saving any changes, press and hold the programming push button > 2 seconds (before teaching the second limit). The sensor reverts to the last saved limits

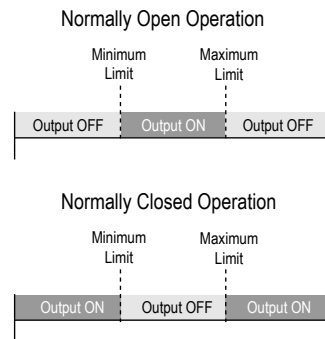



Figure 2. Teaching independent minimum and maximum limits


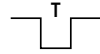
1. Enter Programming mode.

For Application/Technical Support Contact Ramco Innovations



U-GAGE™ S18U Series Sensors with Discrete Output

Method	Action	Result
Push Button ²	Press and hold the TEACH button 	Output LED: On red Power LED: On green (good signal) or On red (no signal)
Remote Input ³	No action required; the sensor is ready for the first limit	

2. Present the target for the first limit. The Power LED must be On green.
3. Teach the first limit.

Method	Action	Result
Push Button	Press the TEACH button one time. 	Teach Accepted Output LED: Flashes Red
Remote Input	Single-pulse the remote line. 	Teach Not Accepted Output LED: On Red

4. Present the target for the second limit. The Power LED must be On green.
5. Teach the second limit.

Method	Action	Result
Push Button	Press the TEACH button one time. 	Teach Accepted Output LED: Yellow or OFF
Remote Input	Single-pulse the remote line. 	Teach Not Accepted Output LED: Flashes Red

Teaching Limits Using the Auto-Window Feature

Teaching the same limit twice for the same output automatically centers a 10 mm window on the taught position.



NOTE:

- The sensor returns to Run mode if the first Teach condition is not registered within 120 seconds
- After the first limit is taught, the sensor remains in Program mode until the Teach sequence is finished
- To exit Program mode without saving any changes, press and hold the programming push button > 2 seconds (before teaching the second limit). The sensor reverts to the last saved limits

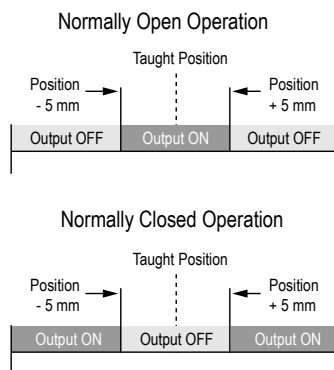


Figure 3. Using the Auto-Window feature for programming each output

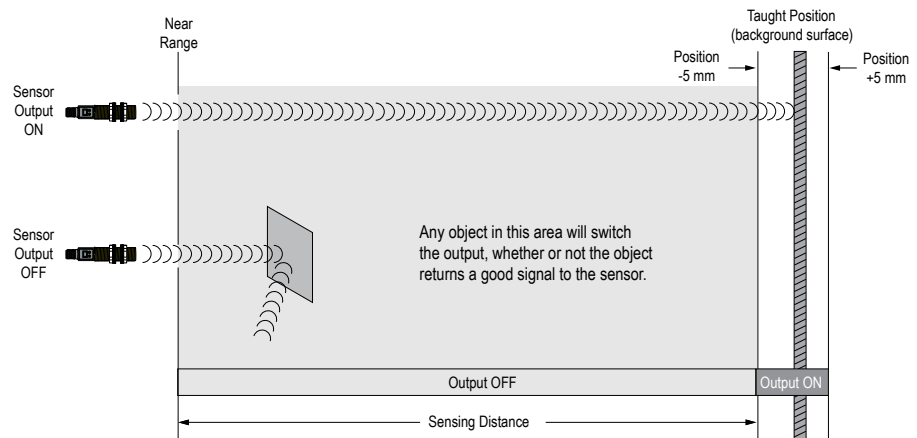



Figure 4. An application for the Auto-Window feature (retroreflective mode)



1. Enter Programming mode.

² 0.04 s < "click" < 0.8 s



³ 0.04 s < T < 0.8 s

Method	Action	Result
Push Button ⁴	Press and hold the TEACH button 	Output LED: On red Power LED: On green (good signal) or On red (no signal)
Remote Input ⁵	No action required; the sensor is ready for the first limit	

- Position the target for the center of the window. The Power LED must be On green.
- Teach the limit.

Method	Action	Result
Push Button	Press the TEACH button one time. 	Teach Accepted Output LED: Flashing Red
Remote Input	Single-pulse the remote line. 	Teach Not Accepted Output LED: ON Red

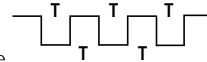
- Teach the limit a second time.

Method	Action	Result
Push Button	Without moving the target, press the TEACH button one time. 	Teach Accepted Output LED: Yellow or OFF
Remote Input	Without moving the target, single-pulse the remote line. 	Teach Not Accepted Output LED: Flashing Red

Normally Open/Normally Closed Operation Select

The sensor can be configured for either normally open or normally closed operation via the remote teach wire (gray). A series of three pulses on the line will toggle between normally open and normally closed operation. Normally open is defined as the output energizing when the target is present. Normally closed is defined as the output energizing when the target is absent. See [Figure 2](#) on page 2 and [Figure 3](#) on page 3.

To toggle between normally open or normally closed operation, triple-pulse the remote line. Either Normally Open or Normally Closed operation is selected, depending on previous condition.

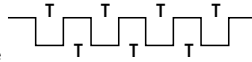


the remote line. Either Normally Open or

Lock the Buttons

Enable or disable the buttons to prevent unauthorized adjustment of the program settings.

To lock or unlock the buttons, four-pulse the remote line. The buttons are enabled or disabled, depending on the previous condition.



the remote line. The buttons are enabled or disabled, depending on the

Installation

Principles of Operation

Ultrasonic sensors emit one or multiple pulses of ultrasonic energy, which travel through the air at the speed of sound. A portion of this energy reflects off the target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor. The distance to the object is then calculated using the following formula: $D = ct \div 2$

D = distance from the sensor to the target

c = speed of sound in air

t = transit time for the ultrasonic pulse

To improve accuracy, an ultrasonic sensor may average the results of several pulses before outputting a new value.

Temperature Effects

The speed of sound is dependent upon the composition, pressure and temperature of the gas in which it is traveling. For most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature may fluctuate.

In air, the speed of sound varies with temperature according to the following approximation:

In metric units: $C_{m/s} = 20 \sqrt{273 + T_C}$

In English units: $C_{ft/s} = 49 \sqrt{460 + T_F}$

⁴ 0.04 s < "click" < 0.8 s

⁵ 0.04 s < T < 0.8 s

$C_{m/s}$ = speed of sound in meters per second

T_C = temperature in °C

$C_{ft/s}$ = speed of sound in feet per second

T_F = temperature in °F

Temperature Compensation

Changes in air temperature affect the speed of sound, which in turn affects the distance reading measured by the sensor. An increase in air temperature shifts both sensing window limits closer to the sensor. Conversely, a decrease in air temperature shifts both limits farther away from the sensor. This shift is approximately 3.5% of the limit distance for a 20° C change in temperature.

The S18U series ultrasonic sensors are temperature compensated. This reduces the error due to temperature by about 90%. The sensor will maintain its window limits to within 1.8% over the -20° to +60° C (-4° to +140° F) range.



NOTE:

- Exposure to direct sunlight can affect the sensor's ability to accurately compensate for changes in temperature.
- If the sensor is measuring across a temperature gradient, the compensation will be less effective.
- The temperature warmup drift upon power-up is less than 1.7% of the sensing distance. After 10 minutes, the apparent distance will be within 0.3% of the actual position. After 25 minutes, the sensing position will be stable.

Wiring Diagrams

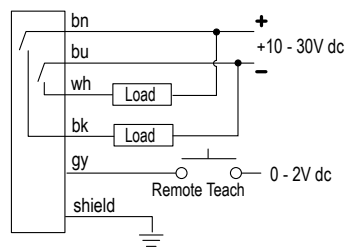


Figure 5. Cabled Models

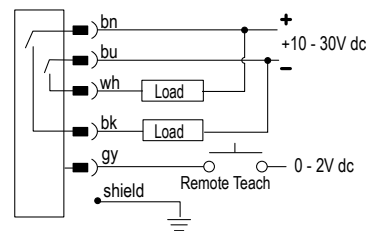


Figure 6. QD Models



NOTE: It is recommended that the shield wire be connected to earth ground or DC common.

Specifications

Sensing Range
30 to 300 mm (1.2 in to 11.8 in)

Supply Voltage
10 V dc to 30 V dc (10% maximum ripple); 65 mA max. (exclusive of load), 40 mA typical @ 25V input

Ultrasonic Frequency
300 kHz, rep. rate 2.5 ms

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
SPST solid-state switch conducts when target is sensed within sensing window; one NPN (current sinking) and one PNP (current sourcing) output in each model.

Output Protection
Protected against short circuit conditions

Delay at Power-Up
300 milliseconds

Temperature Effect
0.02% of distance/ °C

Connections
2 m (6.5 ft) or 9 m (30 ft) shielded 5-conductor (with drain) PVC jacketed attached cable or 5-pin Euro-style quick-disconnect

Output Ratings
100 mA maximum
OFF-state leakage current: < 5 microamps
NPN saturation: < 200 mV @ 10 mA and < 600 mV @ 100 mA
PNP saturation: < 1.2 V @ 10 mA and < 1.6 V @ 100 mA

Remote TEACH Input
Impedance: 12 kΩ

Construction
Threaded Barrel: Thermoplastic polyester
Push Button: Santoprene
Push Button Housing: ABS/PC
Lightpipes: Acrylic

Minimum Window Size
5 mm

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

Indicators
Range Indicator (Red/Green)

Green—Target is within sensing range
Red—Target is outside sensing range
OFF—Sensing power is OFF

Teach/Output Indicator (Amber/Red)

Yellow—Target is within taught limits
OFF—Target is outside taught window limits
Red—Sensor is in TEACH mode

Repeatability
0.5 mm

Output Response Time
5 milliseconds

Hysteresis
0.7 mm

Operating Conditions

Temperature: -20 °C to +60 °C (-4 °F to +140 °F)

Temperature Warmup Drift

Less than 1.7% of sensing distance upon power-up (see Temperature Compensation)

Environmental Rating

Leakproof design is rated IEC IP67; NEMA 6P

Vibration and Mechanical Shock

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

Application Notes

Objects passing inside the specified near limit may produce a false response.

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.

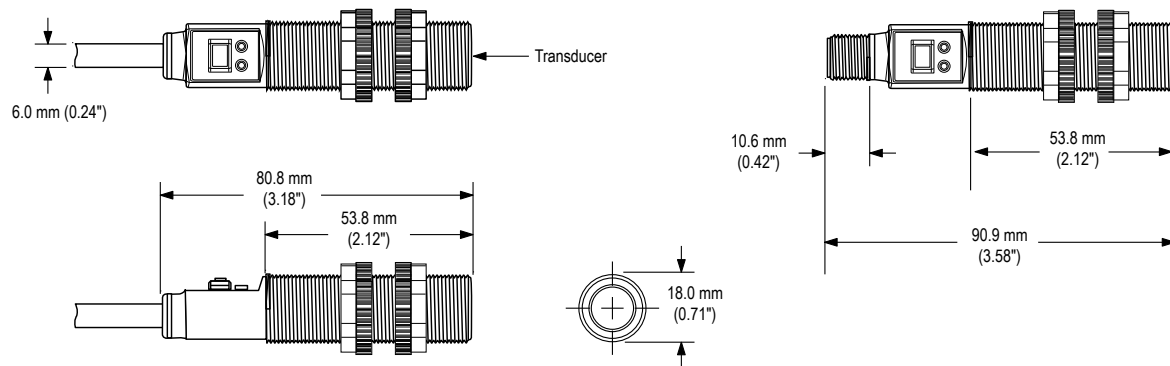
Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to <http://www.bannerengineering.com>.

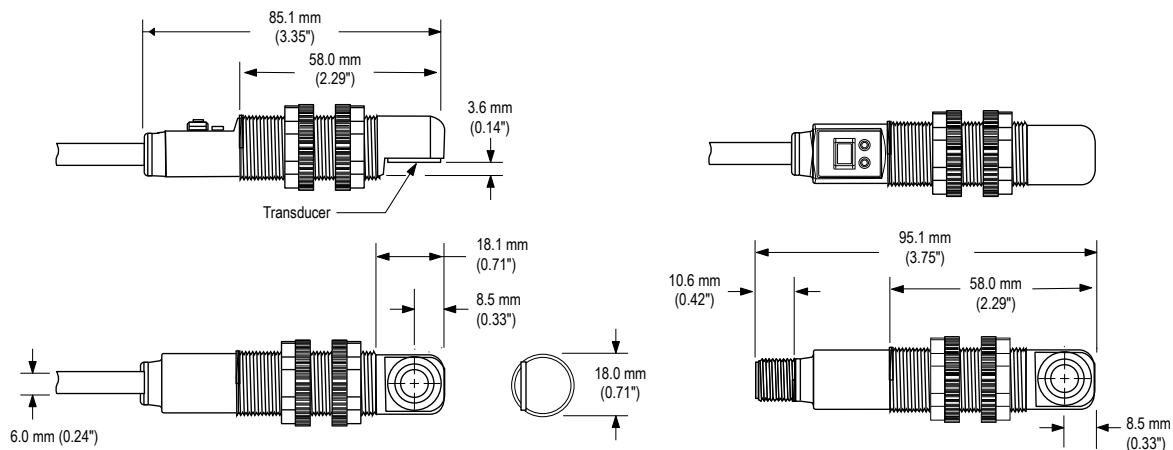
Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions

Straight Housing



Right-Angle Housing



Response Curves

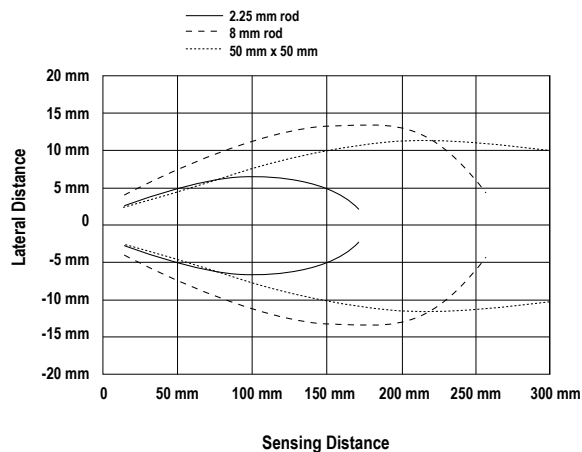


Figure 7. Effective Beam Pattern (Typical)

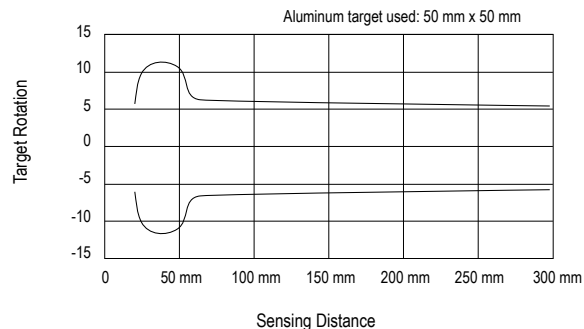


Figure 8. Maximum Target Rotation Angle

Accessories

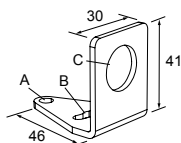
Quick-Disconnect Cables

5-Pin Threaded M12/Euro-Style Cordsets—with Shield				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)			
MQDEC2-506RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

Brackets

SMB18A

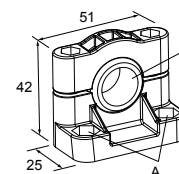
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware



Hole center spacing: A to B = 24.2
Hole size: A = \varnothing 4.6, B = 17.0 x 4.6, C = \varnothing 18.5

SMB18SF

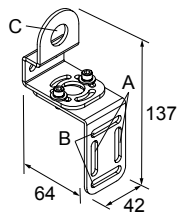
- 18 mm swivel bracket with M18 x 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included



Hole center spacing: A = 36.0
Hole size: A = \varnothing 5.3, B = \varnothing 18.0

SMB18UR

- 2-piece universal swivel bracket
- 300 series stainless steel
- Stainless steel swivel locking hardware included
- Mounting hole for 18 mm sensor



Hole center spacing: A = 25.4, B = 46.7
Hole size: B = 6.9 × 32.0, C = ø 18.3

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

Ramco Innovations

Toll Free 800-280-6933

www.ramcoi.com

WORLD-BEAM QS18U Ultrasonic Sensors



Datasheet

Miniature Ultrasonic Sensors with TEACH-Mode Programming



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Ultra-compact housing
- One discrete output: NPN or PNP, depending on model
- Two bi-colored status LEDs
- Rugged encapsulated version for harsh environments
- Choose 2 meter or 9 meter unterminated cable, 4-pin Euro-style or 4-pin Pico-style QD connectors (either integral or with 150 mm pigtail)
- Wide operating range of -20 °C to 60 °C (-13 °F to 140 °F)
- Temperature compensation
- Configurable for normally open or normally closed operation
- Fast response time (15 milliseconds)



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.

Models

Models	Sensing Range	TEACH Option	Cable	Supply Voltage	Output
QS18UNA	50 mm to 500 mm (2 in to 20 in)	Integral push button or remote TEACH (IP67, NEMA 6P)	4-wire, 2 m (6.5 ft) cable with shield	12-30 V dc	NPN
QS18UPA					PNP
QS18UNAE		Remote TEACH (epoxy- encapsulated, IP68, NEMA 6P)			NPN
QS18UPAE					PNP

Only standard 2 m (6.5 ft) cable models are listed. For 9 m (30 ft) shielded cable, add suffix "W/30" to the model number (e.g., QS18UNA W/30). A model with a QD connector requires a mating cordset. For QD models:

- For 4-pin integral Euro-style QD, add suffix "Q8" (for example, QS18UNAQ8).
- For 4-pin Euro-style 150 mm (6 in) pigtail QD, add suffix "Q5" (for example, QS18UNAQ5).
- For 4-pin integral Pico-style QD, add suffix "Q7" (for example, QS18UNAQ7).
- For 4-pin Pico-style 150 mm (6 in) pigtail QD, add suffix "Q" (for example, QS18UNAQ).

Principles of Operation

Ultrasonic sensors emit one or multiple pulses of ultrasonic energy, which travel through the air at the speed of sound. A portion of this energy reflects off the target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor. The distance to the object is then calculated using the following formula: $D = ct \div 2$

D = distance from the sensor to the target

c = speed of sound in air

t = transit time for the ultrasonic pulse

To improve accuracy, an ultrasonic sensor may average the results of several pulses before outputting a new value.



Temperature Effects

The speed of sound is dependent upon the composition, pressure and temperature of the gas in which it is traveling. For most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature may fluctuate.

In air, the speed of sound varies with temperature according to the following approximation:

In metric units: $C_{m/s} = 20 \sqrt{273 + T_C}$

$C_{m/s}$ = speed of sound in meters per second

T_C = temperature in °C

In English units: $C_{ft/s} = 49 \sqrt{460 + T_F}$

$C_{ft/s}$ = speed of sound in feet per second

T_F = temperature in °F

Temperature Compensation

Changes in air temperature affect the speed of sound, which in turn affects the distance reading measured by the sensor. An increase in air temperature shifts both sensing window limits closer to the sensor. Conversely, a decrease in air temperature shifts both limits farther away from the sensor. This shift is approximately 3.5% of the limit distance for a 20° C change in temperature.

The QS18U series ultrasonic sensors are temperature compensated. This reduces the error due to temperature by about 90%. The sensor will maintain its window limits to within 1.8% over the -20° to +60° C (-4° to +140° F) range.



NOTE:

- Exposure to direct sunlight can affect the sensor's ability to accurately compensate for changes in temperature.
- If the sensor is measuring across a temperature gradient, the compensation will be less effective.
- The temperature warmup drift upon power-up is less than 7% of the sensing distance. After 5 minutes, the apparent switchpoint will be within 0.6% of the actual position. After 25 minutes, the sensing position will be stable.

Sensor Programming

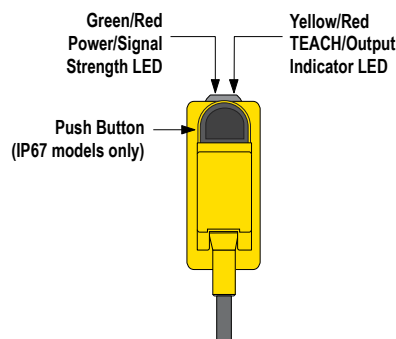


Figure 1. Sensor Features

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

Programming is accomplished by following the sequence of input pulses (see [programming procedures](#)). The duration of each pulse (corresponding to a push button "click"), and the period between multiple pulses, are defined as "T: 0.04 seconds < T < 0.8 seconds."

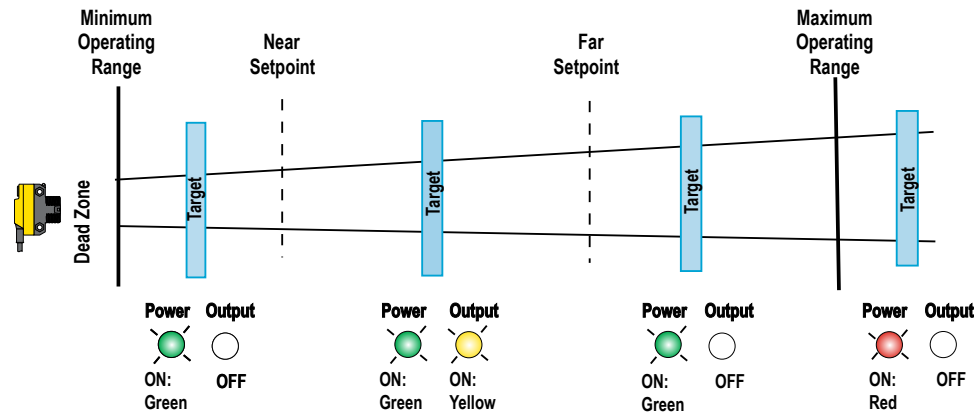


Figure 2. TEACH Interface

Status Indicators

Power ON/OFF LED	Indicates	Output/Teach LED	Indicates
OFF	Power is OFF	OFF	Target is outside window limits (normally open operation).
ON Red	Target is weak or outside sensing range.	Yellow	Target is within window limits (normally open operation).
ON Green	Sensor is operating normally, good target.	ON Red (solid)	In Teach Mode, waiting for first limit.
		ON Red (flashing)	In Teach Mode, waiting for second limit.

Teaching Minimum and Maximum Limits

General Notes on Programming

- The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
- After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
- To exit Program mode without saving any changes, press and hold the programming push button for more than 2 seconds (before teaching the second limit). The sensor reverts to the last saved limits.

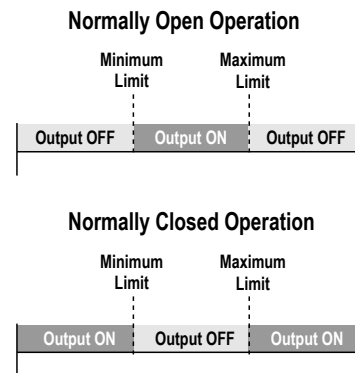







Figure 3. Teaching independent minimum and maximum limits

	Procedure		Result
	Push Button (0.04 sec ≤ Click ≤ 0.8 sec)	Remote Line (0.04 sec < T < 0.8 sec)	
Programming Mode	Press and hold push button 	No action required; sensor is ready for 1st limit teach	Output LED: ON Red Power LED: ON Green (good signal) or ON Red (no signal)
Teach First Limit	Position the target for the first limit	Position the target for the first limit	Power LED: Must be ON Green

	Procedure		Result
	Push Button (0.04 sec \leq Click \leq 0.8 sec)	Remote Line (0.04 sec < T < 0.8 sec)	
	"Click" the push button 	Single-pulse the remote line 	<u>Teach Accepted</u> Output LED: Flashing Red <u>Teach Unacceptable</u> Output LED: ON Red
Teach Second Limit	Position the target for the second limit	Position the target for the second limit	Power LED: Must be ON Green
	"Click" the push button 	Single-pulse the remote line 	<u>Teach Accepted</u> Output LED: Yellow or OFF <u>Teach Unacceptable</u> Output LED: Flashing Red

Teaching Limits Using the Auto-Window Feature

Teaching the same limit twice automatically centers a 20 mm window on the taught position.

General Notes on Programming

- The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
- After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
- To exit Program mode without saving any changes, press and hold the programming push button for more than 2 seconds (before teaching the second limit). The sensor reverts to the last saved program.

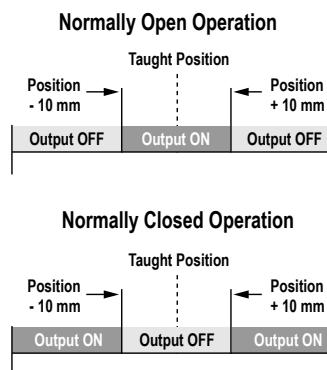







Figure 4. Using the Auto-Window feature for programming each output

	Procedure		Result
	Push Button (0.04 sec \leq Click \leq 0.8 sec)	Remote Line (0.04 sec < T < 0.8 sec)	
Programmin g Mode	Press and hold push button 	No action required; sensor is ready for 1st limit teach	Output LED: ON Red Power LED: ON Green (good signal) or ON Red (no signal)
Teach First Limit	Position the target for the first limit	Position the target for the center of the window	Power LED: Must be ON Green
	"Click" the push button 	Single-pulse the remote line 	<u>Teach Accepted</u> Output LED: Flashing Red <u>Teach Unacceptable</u> Output LED: ON Red
Re-Teach Limit	Without moving the target, "click" the push button again 	Without moving the target, single-pulse the remote line again 	<u>Teach Accepted</u> Output LED: Yellow or OFF <u>Teach Unacceptable</u> Output LED: Flashing Red

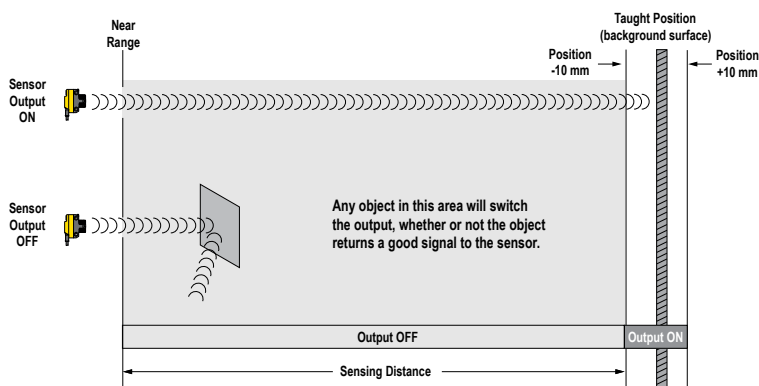
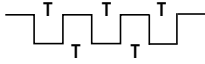


Figure 5. An application for the Auto-Window feature (retroreflective mode)

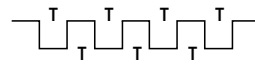
Normally Open/Normally Closed Operation Select

Configure the sensor for either normally open or normally closed operation using the remote teach wire (white). A series of three pulses on the line toggles between normally open (NO) and normally closed (NC) operation. Normally open is defined as the output energizing when the target is present. Normally closed is defined as the output energizing when the target is absent. (See [Figure 3](#) on page 3 and [Figure 4](#) on page 4.)

	Procedure		Result
	Push Button (0.04 sec \leq Click \leq 0.8 sec)	Remote Line (0.04 sec < T < 0.8 sec)	
Toggle between NO/NC Operation	Not available via push button	Triple-pulse the remote line 	Selects either Normally Open or Normally Closed operation depending on the previous condition.

Push Button Lockout

Enables or disables the push button to prevent unauthorized personnel from adjusting the program settings.

	Procedure		Result
	Push Button (0.04 sec \leq Click \leq 0.8 sec)	Remote Line (0.04 sec < T < 0.8 sec)	
Push Button Lockout	Not available via push button	Four-pulse the remote line 	Push buttons are either enabled or disabled, depending on condition.

Specifications

Sensing Range
50 to 500 mm (2 to 20 inches)

Supply Voltage
12 to 30 V dc (10% maximum ripple); 25 mA max (exclusive of load)

Ultrasonic Frequency
300 kHz, rep. rate 7.5 ms

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
SPST solid-state switch conducts when target is sensed within sensing window; one NPN (current sinking) or one PNP (current sourcing), depending on model.

Output Protection
Protected against short-circuit conditions

Output Rating
Rating: 100 mA maximum load; see Application Note 1
Off-state leakage current: less than 10 μ A (sourcing); less than 200 μ A (sinking); see Application Note 2
ON-state saturation voltage: NPN: less than 1.6 V @ 100 mA; PNP: less than 3.0 V @ 100 mA

Output Response
15 milliseconds

Delay at Power Up
300 milliseconds

Application Notes

1. If supply voltage is > 24 V dc, derate maximum output current 5 mA/°C above 50 °C.
2. NPN off-state leakage current is < 200 μ A for load resistances > 3 k Ω or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current.
3. Objects passing inside the specified near limit may produce a false response.

Environmental Rating

Leakproof design, rated NEMA 6P; IEC IP67 or IP68 depending on model; UL Type 1

Operating Conditions

Temperature: -20 °C to 60 °C (-4 °F to 140 °F)
Relative Humidity: 100% (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", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 ms duration, half sine wave.

Certifications



Repeatability

0.7 mm

Minimum Window Size

5 mm

Hysteresis

1.4 mm

Adjustments

Sensing Window Limits: TEACH-mode programming of near and far window limits may be set using the push button or remotely via TEACH input

Indicators

Range Indicator (Red/Green) and Teach/Output Indicator (Amber/Red)

Range Indicator: Green - Target is within sensing range; Red - Target is outside sensing range; OFF - Sensing Power is OFF

Teach/Output Indicator: Amber - Target is within taught limits; OFF - Target is outside taught window limits; Red - Sensor is in TEACH mode

Construction

ABS housing, TPE Push Button, ABS Push Button housing, Polycarbonate lightpipes

Connections

2 m (6.5 ft) or 9 m (30 ft) 4-conductor PVC jacketed attached cable, or 4-pin Euro-style integral QD (Q8), or 4-pin Pico-style integral QD (Q7), or 4-pin Euro-style 150 mm (6 in) pigtail QD (Q5), or 4-pin Pico-style 150 mm (6 in) pigtail QD (Q)

Temperature Warmup Drift

See [Temperature Compensation](#) on page 2

Temperature Effect

Non-encapsulated models: $\pm 0.05\%$ per °C from -20 to 50 °C, $\pm 0.1\%$ per °C from 50 to 60 °C

Encapsulated models: $\pm 0.05\%$ per °C from 0 to 60 °C, $\pm 0.1\%$ per °C from -20 to 0 °C

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.

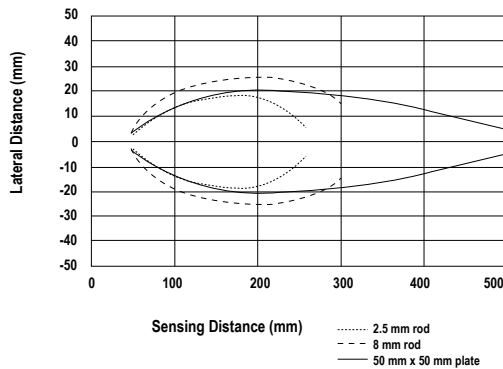
For additional product support, go to <http://www.bannerengineering.com>.

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

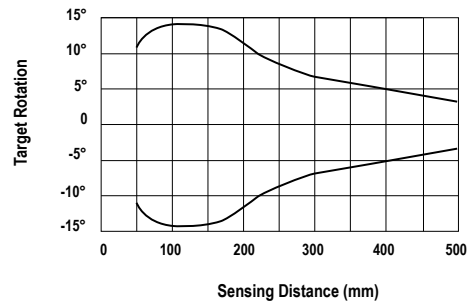
For Application/Technical Support Contact Ramco Innovations

WORLD-BEAM QS18U Ultrasonic Sensors

QS18U Effective Beam Pattern (Typical)

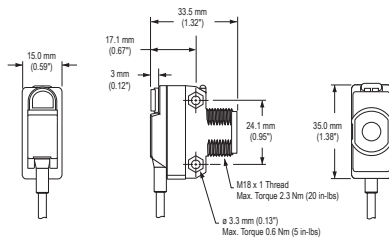


QS18U Maximum Target Rotation Angle

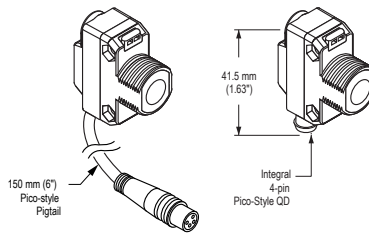


Dimensions

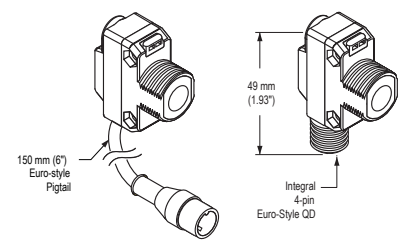
Cabled Models



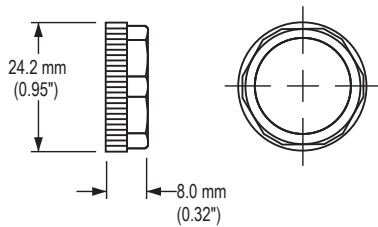
Pico-Style QD Models



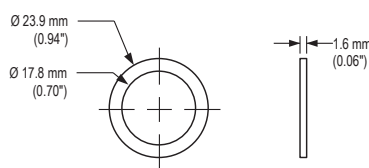
Euro-Style QD Models



Locknut (included with all models)



Washer (included with all models)

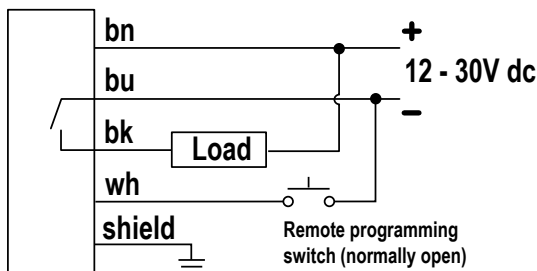


M3 Hardware Packet Contents

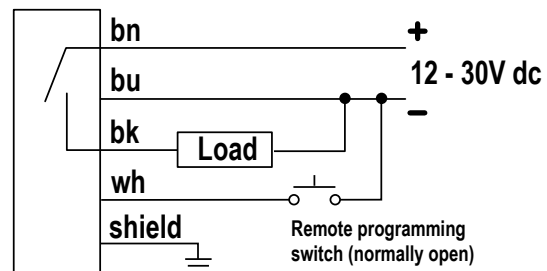
- 2 – M3 x 0.5 x 20 mm SS Screw
- 2 – M3 x 0.5 SS Hex Nut
- 2 – M3 SS Washer

Wiring Diagrams

NPN (Sinking) Output Models



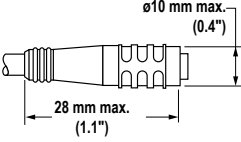
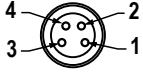
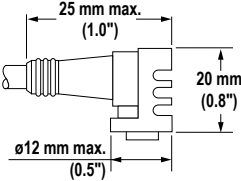
PNP (Sourcing) Output Models

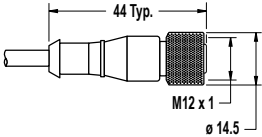
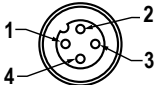
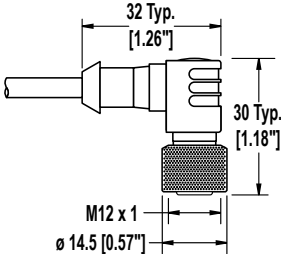


It is recommended that the shield wire be connected to earth ground. Shielded cordsets are recommended for all QD models. Cabled wiring diagrams are shown. Quick disconnect (QD) wiring diagrams are functionally identical.

Accessories

Quick-Disconnect (QD) Cordsets

4-Pin Snap-On M8/Pico-Style Cordsets with Shield				
Model	Length	Style	Dimensions	Pinout
PKG4S-2	2.00 m (6.56 ft)	Straight		 <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
PKW4ZS-2	2.00 m (6.56 ft)	Right Angle		

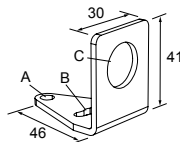
4-Pin Threaded M12/Euro-Style Cordsets with Shield				
Model	Length	Style	Dimensions	Pinout
MQDEC2-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDEC2-415	4.57 m (15 ft)			
MQDEC2-430	9.14 m (30 ft)			
MQDEC2-406RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-415RA	4.57 m (15 ft)			
MQDEC2-430RA	9.14 m (30 ft)			

Mounting Brackets

All measurements are listed in millimeters.

SMB18A

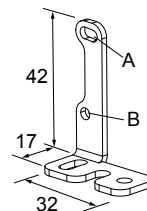
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware



Hole center spacing: A to B = 24.2
Hole size: A = \varnothing 4.6, B = 17.0 \times 4.6, C = \varnothing 18.5

SMBQS18RA

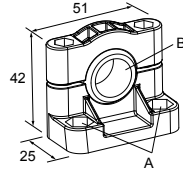
- Right-angle mounting bracket
- 14-ga. 304 stainless steel



Hole center spacing: A to B=20.3
Hole size: A = 4.3 \times 9.3, B= \varnothing 4.3

SMB18SF

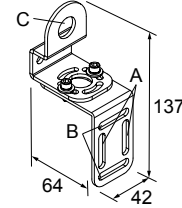
- 18 mm swivel bracket with M18 × 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included



Hole center spacing: A = 36.0
Hole size: A = \varnothing 5.3, B = \varnothing 18.0

SMB18UR

- 2-piece universal swivel bracket
- 300 series stainless steel
- Stainless steel swivel locking hardware included
- Mounting hole for 18 mm sensor



Hole center spacing: A = 25.4, B = 46.7
Hole size: B = 6.9 × 32.0, C = \varnothing 18.3

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.

Ramco Innovations

Toll Free 800-280-6933

www.ramcoi.com

U-GAGE T18U Series Sensor



Datasheet

Ultrasonic Opposed Mode Sensor Pairs with Dual Sensing Ranges



- Dual range/dual resolution opposed mode ultrasonic sensors; ideal for reliable sensing of clear objects or materials
- Rugged design for use in demanding environments: rated NEMA 6P (IEC IP67), wide-operating temperature range of -40°C to $+70^{\circ}\text{C}$ (-40°F to $+158^{\circ}\text{F}$)
- Alignment indicator flashes at a rate proportional to the received signal strength
- Highly immune to ambient sonic and electrical noise
- Popular T-style right-angle sensor package with 18 mm threaded mounting hub; cabled or quick disconnect models
- 12 to 30 V dc operation; choose receivers with either NPN (sinking) or PNP (sourcing) output; outputs are short-circuit protected

**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.

Models

Model ¹	Range ²	Output	Response Time
T186UE	-	-	-
T18VN6UR	Normal Resolution: 600 mm (24 in)	NPN (sinking)	Normal Resolution: 2 ms
T18VP6UR	High Resolution: 300 mm (12 in)	PNP (sourcing)	High Resolution: 1 ms

Overview

U-GAGE® T18U Series Sensor is an opposed mode ultrasonic emitter/receiver pair. It uses an advanced built-in microprocessor to analyze the received ultrasonic signal and control an indicator LED located on the back of the receiver. The receiver LED flashes at a rate proportional to the received sonic signal strength. This indicator greatly simplifies sensor alignment and alerts personnel to marginal sensing conditions because of gradual misalignment or environmental factors. The receiver is precisely tuned to the ultrasonic emitter, making this sensor pair highly immune to both sonic and electrical ambient noise.

T18U receivers may be wired for either of two resolution modes: NORMAL or HIGH. The modes are selected by the polarity of the supply voltage.

- The NORMAL resolution mode offers a sensing range of 600 mm (24 in) and maximizes sensing energy, as is required in demanding environments.
- The HIGH resolution mode yields a sensing range of up to 300 mm (12 in) and maximizes sensing response, as is needed in high-speed counting applications.

Opposed mode ultrasonics are very useful for highly reliable sensing of clear materials, which is always a challenge for photoelectric modes. T18U Series ultrasonic sensors are designed for demanding sensing environments. Housings are tough, NEMA 6P-rated PBT. Electronics are epoxy encapsulated. The acoustic face of both emitter and receiver are epoxy-reinforced for extreme durability and moisture resistance.

¹ The standard 2 m (6.5 ft) cable models are listed. To order a 4-Pin M12/Euro-style integral QD model, add suffix "Q" to the model number (e.g., T18VN6URQ). To order the 9 m (30 ft) cable model, add suffix "W/30" to the model number (e.g., T18VN6UR W/30). Models with a QD connector require a mating cable.

² T18U receivers may be wired for either of two resolution modes: Normal or High.



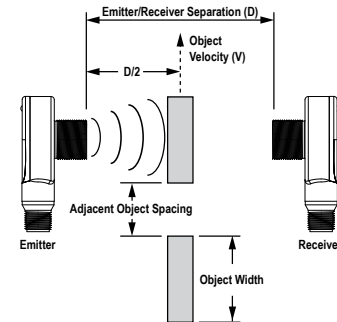
Installation Instructions

Object Detection

These figures reflect the following assumptions:

- Objects have square (not radiused) corners,
- Sensors are optimally aligned,
- Objects pass through the sensing area midway between the emitter and receiver (i.e. at $D/2$),³
- Operating conditions are stable, with minimal air turbulence.

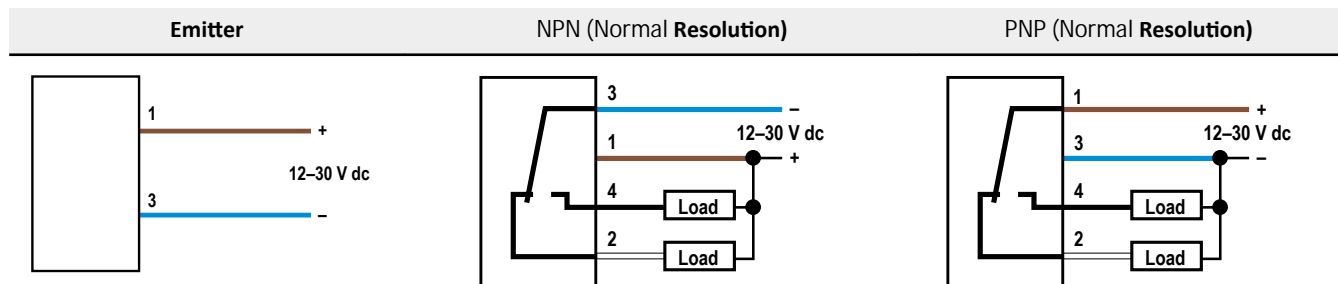
Individual results may differ based on ambient operating conditions, alignment, and the geometry of the objects to be detected.



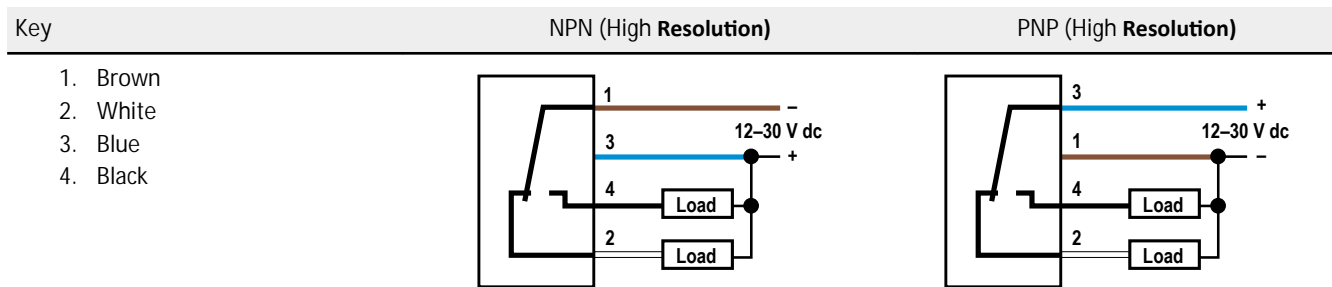
Minimum Object Width (Typical)				
Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0 mm/sec (0 in/sec)	Velocity = 1270 mm/sec (50 in/sec)	Velocity = 2540 mm/sec (100 in/sec)
Normal	150 mm (6 in)	25.4 mm (1 in)	35.6 mm (1.40 in)	38.1 mm (1.5 in)
	300 mm (12 in)	31.8 mm (1.25 in)	50.8 mm (2 in)	50.8 mm (2 in)
	600 mm (24 in)	25.4 mm (1 in)	44.5 mm (1.75 in)	44.5 mm (1.75 in)
High	150 mm (6 in)	15.2 mm (0.60 in)	19.1 mm (0.75 in)	20.3 mm (0.80 in)
	300 mm (12 in)	12.7 mm (0.50 in)	19.1 mm (0.75 in)	25.4 mm (1 in)

Minimum Adjacent Object Spacing (Typical)				
Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0 mm/sec (0 in/sec)	Velocity = 1270 mm/sec (50 in/sec)	Velocity = 2540 mm/sec (100 in/sec)
Normal	150 mm (6 in)	0.8 mm (0.03 in)	1 mm (0.04 in)	1.3 mm (0.05 in)
	300 mm (12 in)	2.5 mm (0.1 in)	3.8 mm (0.15 in)	5.1 mm (0.2 in)
	600 mm (24 in)	8.9 mm (0.35 in)	10.2 mm (0.4 in)	12.7 mm (0.5 in)
High	150 mm (6 in)	3.3 mm (0.13 in)	3.8 mm (0.15 in)	4.3 mm (0.17 in)
	300 mm (12 in)	10.2 mm (0.4 in)	11.4 mm (0.45 in)	11.4 mm (0.45 in)

Wiring Diagrams



³ In general, the minimum object width and minimum object spacing will decrease if the object (or space) to be detected is passed closer to the emitter or the receiver.



Specification

Supply Voltage
12 to 30 V dc (10% maximum ripple)

Supply Current
Emitters: 50 mA
Receivers: 35 mA, exclusive of output load

Output Protection Circuitry
Protected against overload and short circuit conditions. No false pulse upon receiver power-up.

Delay at Power-up
100 milliseconds

Beam Angle (-3dB full angle)
15 ± 2°

Output Rating
150 mA max. (each output) at 25°C, derated to 100 mA at 70°C (derate ≈ 1 mA per °C). Both outputs may be used simultaneously.
ON-state saturation voltage: < 1.5 V at 10 mA; < 2.0 V at 150 mA
OFF-state leakage current: < 1 microamp at 30 V dc

Rep Rate
Normal Resolution Mode: 125 Hz maximum
High Resolution Mode: 200 Hz maximum

Indicators
Emitters have a Green LED for Power ON.
Receivers have one Green Power LED and one Yellow Signal LED.
Green Power LED: ON indicates power on; Flashing indicates output overload
Yellow Signal LED: sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity)

Environmental Rating
NEMA 6P; IEC IP67

Operating Conditions
-40 °C to +70 °C (-40 °F to +158 °F)

Vibration and Mechanical Shock
All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 Hz to 60 Hz max., double amplitude 0.06 inch, maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 ms duration, half sine wave.
Method 213B conditions H&I.
Shock: 75G with unit operating; 100G for non-operation

Certifications



Sensing Range
Normal Resolution: 600 mm (24 in)
High Resolution: 300 mm (12 in)

Ultrasonic Frequency
230 kHz

Minimum Spacing (adjacent pairs)
50 mm for emitter-to-receiver separations of up to 150 mm
Add 10 mm of adjacent pair spacing for every 100 mm of emitter-to-receiver spacing beyond 150 mm

Receiver Output Configuration
NPN (sinking) or PNP (sourcing), depending on model; Normally Open (NO) and Normally Closed (NC) (complementary)

Output Response Time
Normal Resolution Mode: 2 milliseconds ON and OFF
High Resolution Mode: 1 millisecond ON and OFF

Mechanical Sensing Repeatability at 300 mm (12 in) Range
Normal Resolution Mode: < 2 mm (< 0.08 in)
High Resolution Mode: < 1 mm (< 0.04 in)

Construction

Patented T-style yellow PBT housing with black PBT back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy encapsulated.

Construction

Emitter: 2 m (6.5 ft) attached PVC-covered 2-wire cable or 4-pin Euro-Style quick disconnect fitting
Receiver: 2 m (6.5 ft) attached PVC-covered 4-wire cable or 4-pin Euro-Style quick disconnect fitting
9 m (30 ft) cables available by request.
A model with a QD connector requires a mating cable

Required Overcurrent Protection



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

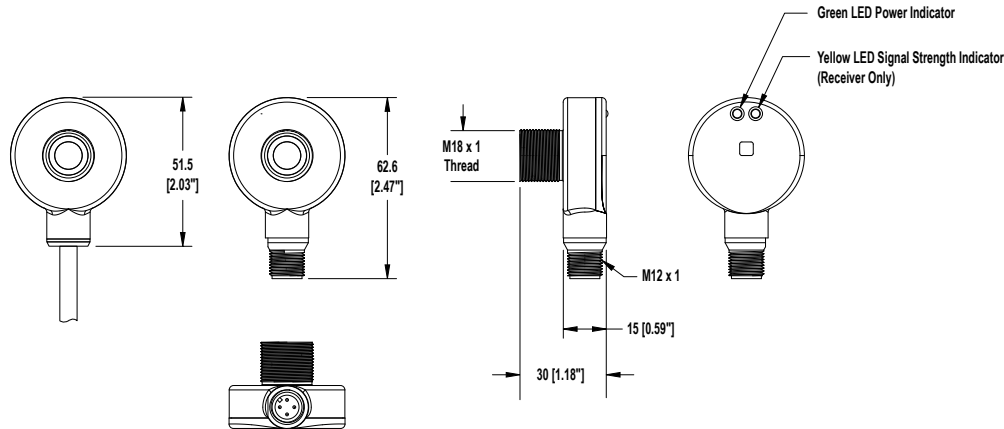
Overcurrent protection is required to be provided by end product application per the supplied table.

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

Dimensions



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

Accessories

Cordsets

4-Pin Threaded M12/Euro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	1.83 m (6 ft)	Straight		
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			
MQDC-406RA	1.83 m (6 ft)	Right-Angle		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
MQDC-415RA	4.57 m (15 ft)			
MQDC-430RA	9.14 m (30 ft)			
MQDC-450RA	15.2 m (50 ft)			

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to:

www.bannerengineering.com.

Ramco Innovations

Toll Free 800-280-6933

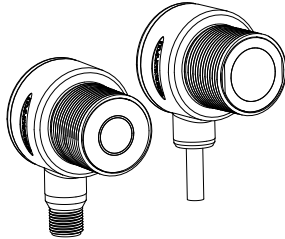
www.ramcoi.com

U-GAGE® T30 Series with Analog and Discrete Outputs



Datasheet

Ultrasonic Sensors with TEACH-Mode Programming



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Program both outputs together or independently, with either an upward or a downward analog output slope
- Remote TEACH for security and convenience
- Choose models with 150 mm to 1 m range (5.9 in to 39.4 in) or 300 mm to 2 m range (11.8 in to 78.7 in)
- Wide operating range of -20°C to $+70^{\circ}\text{C}$ (-4°F to $+158^{\circ}\text{F}$)
- Choose models with NPN or PNP discrete output, plus 0 to 10V dc or 4 to 20 mA sourcing analog output
- LED indicators for Power ON/OFF; Signal Strength; and Analog/Discrete Outputs Conducting
- Choose models with integral unterminated 2 m (6.5 ft) or 9 m (30 ft) cable, or with M12/Euro-style quick-disconnect connection
- Compact, self-contained sensor package
- Rugged design for use in demanding sensing environments; rated IEC IP67, NEMA 6P



WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models—Proximity Mode

Models	Range and Frequency	Cable ¹	Supply Voltage	Discrete Output	Analog Output	Response Time
T30UINA	150 mm to 1 m (5.9 in to 39 in) 228 kHz	2 m (6.5 ft)	12 V dc to 24 V dc	NPN	4 mA to 20 mA	48 milliseconds
T30UINAQ		5-pin Euro quick-disconnect				
T30UIPA		2 m (6.5 ft)		PNP		
T30UIPAQ		5-pin Euro quick-disconnect				
T30UUNA		2 m (6.5 ft)	15 V dc to 24 V dc	NPN	0 to 10 V dc	
T30UUNAQ		5-pin Euro quick-disconnect				
T30UUPA		2 m (6.5 ft)		PNP		
T30UUPAQ		5-pin Euro quick-disconnect				
T30UINB	300 mm to 2 m (11.8 in to 79 in) 128 kHz	2 m (6.5 ft)	12 V dc to 24 V dc	NPN	4 mA to 20 mA	96 milliseconds
T30UINBQ		5-pin Euro quick-disconnect				
T30UIPB		2 m (6.5 ft)		PNP		
T30UIPBQ		5-pin Euro quick-disconnect				
T30UUNB		2 m (6.5 ft)	15 V dc to 24 V dc	NPN	0 to 10 V dc	
T30UUNBQ		5-pin Euro quick-disconnect				
T30UUPB		2 m (6.5 ft)		PNP		
T30UUPBQ		5-pin Euro quick-disconnect				

Overview

The U-GAGE is an easy-to-use ultrasonic sensor, ideal for demanding environments. Simple push-button programming provides flexibility for a variety of applications. Excellent for measurement applications such as sensing of liquid levels in a tank or, for example, determining box heights for sorting purposes.

Each sensor includes both an analog and a discrete output, which may be programmed independently with different window limits or together with identical limits. Each output has the option of being set with a sensing distance set point centered within a 10-mm window.

¹

- To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, T30UINA/30.
- Models with a quick disconnect require a mating cordset.



Features and Indicators

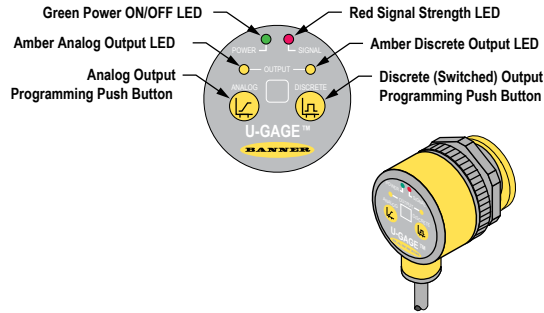


Figure 1. U-GAGE T30 Series sensor programming push buttons and indicators



Note: All LED indicators momentarily turn off when the sensor changes state between Program and Run modes.

The U-GAGE sensor has four LED indicators. The red Signal LED indicates the strength and condition of the sensor's incoming signal. Each amber Output LED, whether analog or discrete, turns on when a target is sensed within the programmed window limits. The green Power ON/OFF LED indicates the operating status of the sensor. There are two modes of indication for the LED indicators: Run Mode and Program Mode.

In Run mode:

Indicator	Mode	Description
Green Power ON/OFF LED	Off	Power is OFF
	On	Power is ON, sensor is operating normally
	Flashing	Discrete output is overloaded
Red Signal Strength LED	Off	No signal is received, or the target is beyond the range limitations of the sensor (with some tolerance beyond the recommended minimum and maximum sensing distance)
	Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal
Amber Analog Output LED	On	Target is inside window limits
Amber Discrete Output LED	On	Output conducting

In Program mode:

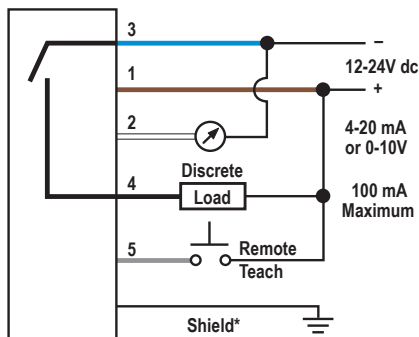
Indicator	Mode	Description
Green Power ON/OFF LED	Off	Sensor is in Program mode, if other LEDs are ON
Red Signal Strength LED	Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal
Amber Analog Output LED	On	Ready for first window limit
	Flashing	Ready for second window limit
	Off	Not teaching analog limits
Analog Discrete Output LED	On	Ready for first window limit
	Flashing	Ready for second window limit
	Off	Not teaching discrete limits

For Application/Technical Support Contact Ramco Innovations

U-GAGE® T30 Series with Analog and Discrete Outputs

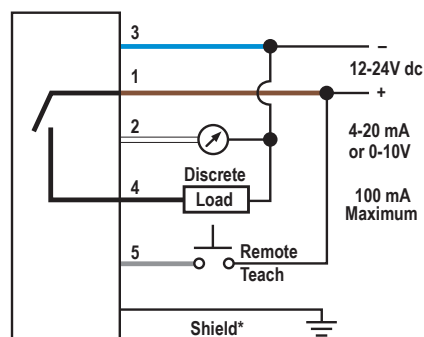
Wiring

NPN



*It is recommended that the shield wire be connected to either earth ground or DC common.

PNP



*It is recommended that the shield wire be connected to either earth ground or DC common.

Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.

Configuring a Sensor

Window Limits

Window limits can be taught to the sensor in several ways, using either the push buttons on the back of the sensor or remote input.



Note: When the sensor changes state between PROGRAM and RUN modes, all of the LED indicators turn OFF momentarily, before the appropriate LEDs come ON as described below. The sensing window limits expand temporarily to full scale (max range) during PROGRAM mode.

Remote Input

To program the sensor remotely or to disable the keypad, use the Remote Programming function. In addition to programming the sensor, use the remote input to disable the buttons for security, preventing unauthorized or accidental programming changes. Connect the gray wire of the sensor to +12 V dc to 24 V dc, with a remote programming switch connected between them.



Note: The impedance of the remote teach input is 55 kΩ.

Programming 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 defined as: 0.04 seconds < T < 0.8 seconds.



Note: To exit PROGRAM mode without saving any changes, hold the Remote line high > 2 seconds (before teaching the second limit). The sensor reverts to the last saved program.

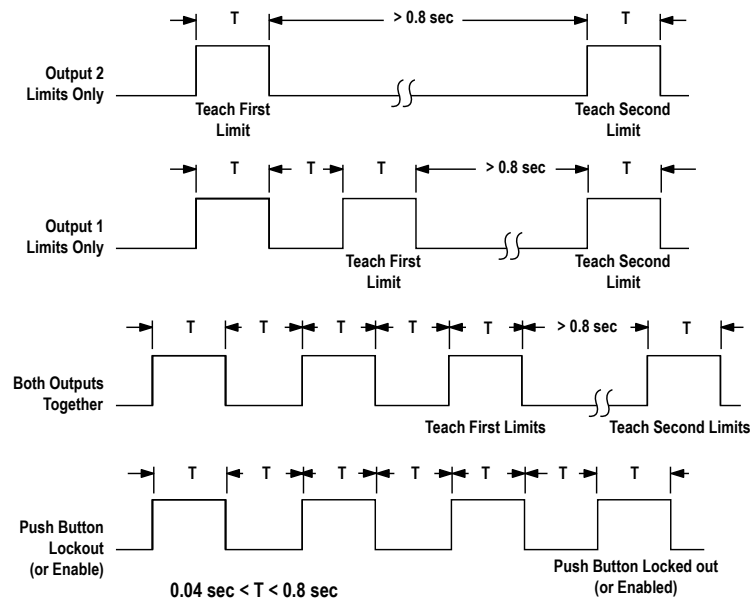


Figure 2. Timing programs for remote TEACH programming

General Notes on Configuration

- The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
- After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
- To exit PROGRAM mode without saving any changes, press and hold the programming push button > 2 seconds or hold the Remote line high > 2 seconds (before teaching the second limit). The sensor reverts to the last saved program.

Configuring Limits for Either Analog or Discrete Output



Note: To exit PROGRAM mode without saving any changes, press and hold the programming push button > 2 seconds or hold the Remote line high > 2 seconds (before teaching the second limit). The sensor reverts to the last saved program.

1. Choose the output for the first set of window limits (analog or discrete).

Method	Action	Result
Push Button	Press and hold the corresponding button (analog or discrete) until the green Power LED turns Off and the appropriate amber Output LED turns On.	Power LED: Off Output LED: On The sensor is waiting for the first limit.
Remote Input ²	No action required; sensor is ready for first limit teach.	None

2. Configure the first limit.

Method	Action	Result
Push Button	a. Position the target for the first limit. b. Briefly press the same button.	Output LED: On flashing The sensor is waiting for the second limit. The first limit is configured.
Remote Input	a. Position the target for the first limit. b. Configure the first limit. <ul style="list-style-type: none"> • To configure the first discrete limit, pulse the remote input one time. • To configure the first analog limit, pulse the remote input two times. c. Wait > 0.8 seconds.	The first limit is configured.

3. Teach the second limit.

Method	Action	Result
Push Button	a. Position the target for the second limit. b. Press the button again. The second limit is configured.	Power LED: On Output LED: Off The sensor returns to Run mode.
Remote Input	a. Position the target for the second limit (no time out). b. Pulse the remote input one time to configure the second limit for either discrete or analog.	The second limit is configured.

4. Repeat for the other output (analog or discrete) if a second output is desired.

² 0.04 seconds < T < 0.8 seconds

Configure Analog or Discrete Limits Using the Auto-Zero Feature

For some applications, a sensing distance set point centered within a minimum sensing window may be required. The TEACH procedure for this application is simple: configuring the same limit twice causes the sensor to program a 10-mm window centered on the position taught (position ± 5 mm).



Note: The sensor allows for some forgiveness in this procedure. If the two limits are not exactly the same (but closer than the minimum 10-mm window required), the sensor places the set point at the average of the two limits.

Configuring Identical Limits for Both Analog and Discrete Outputs Simultaneously

To set both the analog and the discrete outputs at exactly the same limits, both may be set simultaneously.

1. Enter PROGRAM mode.

Method	Action	Result
Push Button	a. Press and hold either the analog or discrete button until Output LED turns On. b. Press and hold the other button (analog or discrete) until its Output LED turns On.	Both Output LEDs: On The sensor is waiting for the first limit.
Remote Input³	No action required; sensor is ready for first limit teach.	None


2. Configure the first limit.

Method	Action	Result
Push Button	a. Position the target for the first limit. b. Press either the analog or the discrete button.	Both Output LEDs: On flashing The sensor is waiting for the second limit. The first limit is configured.
Remote Input	a. Position the target for the first limit. b. Pulse the remote input three times to configure the first limit.	The first limit is configured.

3. Teach the second limit.

Method	Action	Result
Push Button	a. Position the target for the second limit. b. Press either the analog or the discrete button.	Power LED: On Both Output LEDs: On, if the outputs are conducting within the window limits The sensor returns to Run mode. The second limit is configured.
Remote Input	a. Position the target for the second limit. b. Pulse the remote input one time to configure the second limit.	The second limit is configured.

Push Button Lockout

Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
Procedure	Result	Procedure	Result
Not available via push button	Not applicable	<ul style="list-style-type: none"> Four-pulse the remote line 	<ul style="list-style-type: none"> Push buttons are either enabled or disabled, depending on previous condition

Analog Output

The U-GAGE T30 Series sensor may be configured for either a positive or a negative output slope, based on which condition is taught first (see [Figure 3](#) on page 6). If the near limit is taught first, the slope is positive; if the far limit is taught first, the slope is negative. Banner's scalable analog output automatically distributes the output signal over the width of the programmed sensing window.

The U-GAGE T30 Series also features a 2-second hold upon loss of the received analog signal, which is useful for harsh and unstable applications. In the event of analog signal loss for longer than 2 seconds, the analog output goes to 3.6 mA or 0 V dc, which may be used to trigger an alarm.

³ 0.04 seconds < T < 0.8 seconds

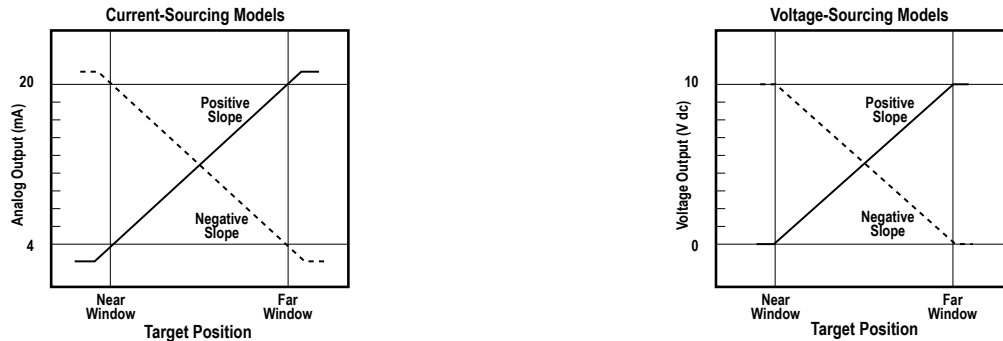


Figure 3. Positive and Negative Output Slopes

Note: The analog current output tracks slightly past each window limit (from 3.8 to 20.5 mA).

Self-Diagnostic Error Mode

In the unlikely event of a microprocessor memory error, all of the LEDs will flash in sequence. If this occurs, the setup parameters have been lost and the sensor may be corrupt. Contact Banner Engineering for further information.

Specifications

Proximity Mode Range

A suffix models: 150 mm (5.9 in) minimum near limit; 1 m (39 in) maximum far limit
B suffix models: 300 mm (11.8 in) minimum near limit; 2 m (79 in) maximum far limit

Supply Voltage

Current-sourcing analog output models: 12 V dc to 24 V dc (10% maximum ripple) at 90 mA, exclusive of load
Voltage-sourcing analog output models: 15 V dc to 24V dc (10% maximum ripple) at 90 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configurations

Discrete (switched) output: SPST solid-state switch conducts when target is sensed within sensing window; choose NPN or PNP models
Analog output: Choose 0 V dc to 10 V dc sourcing or 4 mA to 20 mA sourcing output models; output slope may be selected via TEACH sequence (see [Window Limits](#) on page 3)

Output Ratings

Discrete (switched) output: 100 mA maximum
Off-state leakage current: less than 5 microamps
On-state saturation voltage: less than 1 V at 10 mA and less than 1.5 V at 100 mA
Analog output:
Voltage sourcing: 0 V dc to 10 V dc (at 1K Ω minimum resistance)
Current sourcing: 4 to 20 mA, 1 Ω to Rmax
 $R_{max} = V_{supply} - 7V / 20 \text{ mA}$

Output Protection Circuitry

Protected against output short-circuit, continuous overload, transient overvoltages, and false pulse on power-up

Output Response Time

Discrete output:
"A" suffix models: 48 milliseconds
"B" suffix models: 96 milliseconds

Analog output:

"A" suffix models: 48 milliseconds average, 16-millisecond update
"B" suffix models: 96 milliseconds average, 32-millisecond update

Construction

Molded reinforced thermoplastic polyester housing

Sensing Performance

Note: Specified using a 10 cm x 10 cm aluminum target at 25 °C under fixed sensing conditions.

Analog sensing resolution: $\pm 0.25\%$ of measured distance
Analog linearity: $\pm 0.5\%$ of full-scale sensing range
Sensing repeatability: $\pm 0.25\%$ of distance
Minimum window size: 10 mm (0.4 in)
Hysteresis of discrete output: 2.5 mm (0.10 in)

Adjustments

Sensing window limits (analog or discrete): TEACH-mode programming of near and far window limits may be set using the push buttons on the sensor or remotely via TEACH input (see [Configuring a Sensor](#) on page 3). Discrete and analog window limits may be programmed separately, or together.
Analog output slope: the first limit taught is assigned to the minimum output value (4 mA or 0V)

Environmental Rating

Leakproof design is rated IEC IP67; NEMA 6P

Connections

2 m (6.5 ft) or 9 m (30 ft) 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting

Operating Conditions

Temperature: -20 °C to +70 °C (-4 °F to +158 °F)
100% maximum relative humidity

Application Notes

Objects passing inside the specified near limit will produce a false response.

Note: For more information about out-of-range and signal loss response of the analog output, see [Analog Output](#) on page 5.

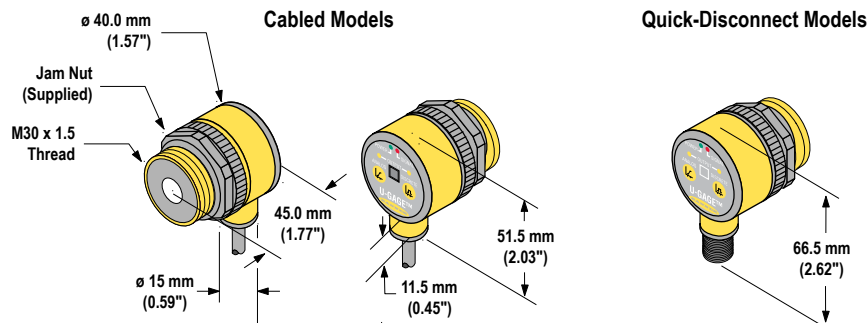
Vibration and Mechanical Shock

All models meet MIL-STD-202F, Method 201A (Vibration: 10 Hz to 60 Hz maximum, 0.06 inch (1.52 mm) double amplitude, 10G maximum acceleration) requirements. Also meets IEC 60947-5-2 (Shock: 30G 11 ms duration, half sine wave) requirements.

Certifications



Dimensions



Performance Curves

Effective Beam with Plate Target (Typical)

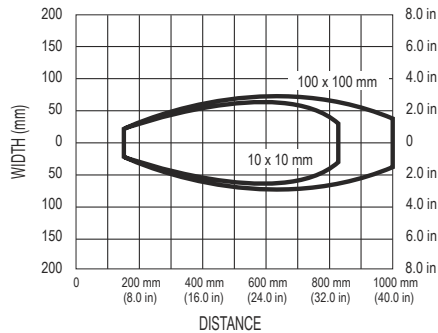


Figure 4. A Models

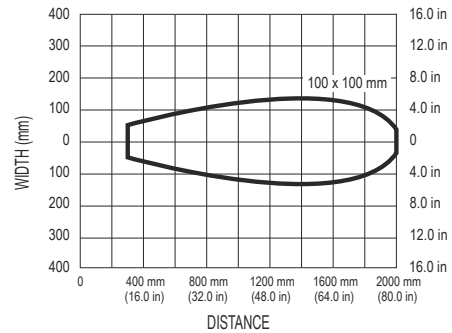


Figure 5. B Models

Effective Beam with Rod Target (Typical)

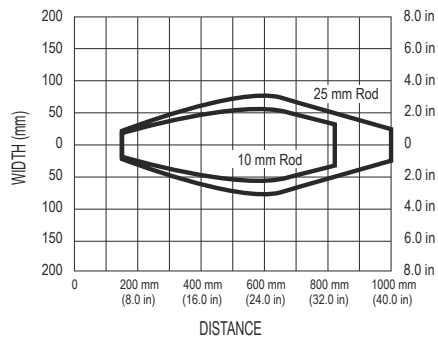


Figure 6. A Models

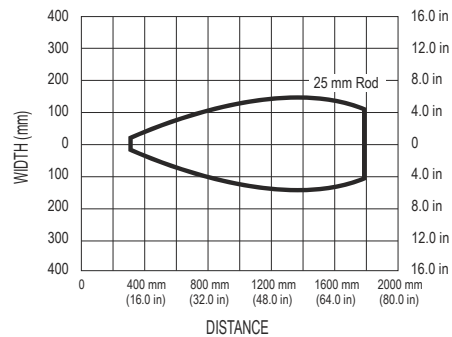
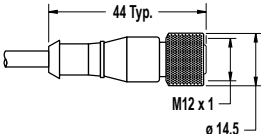
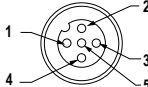
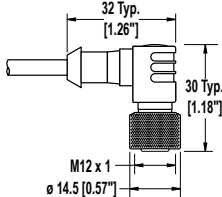


Figure 7. B Models

Accessories

Cordsets

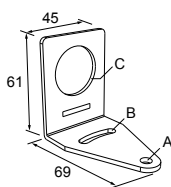
5-Pin Threaded M12/Euro-Style Cordsets—with Shield				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)	Right-Angle		
MQDEC2-506RA	1.83 m (6 ft)			
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

Brackets

All measurements are in mm.

SMB30A

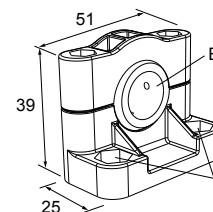
- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel



Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

SMB1815SF

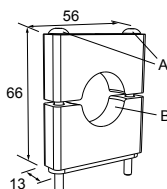
- Swivel with set screws for mounting sensors by the cable hub
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware and hex wrench included



Hole center spacing: A = 36.0
Hole size: A = ø 5.0, B = ø 15.0

SMB30C

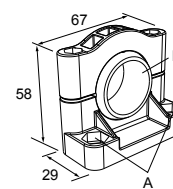
- 30 mm split clamp, black PBT bracket
- Stainless steel mounting hardware included
- Mounting hole for 30 mm sensor



Hole center spacing: A=ø 45
Hole size: B=ø 27.2

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.

Ramco Innovations

Toll Free 800-280-6933

www.ramcoi.com



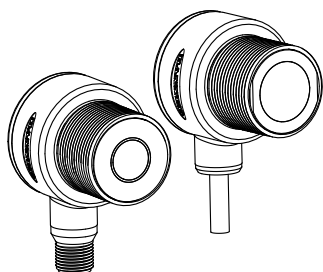
more sensors, more solutions

U-GAGE® T30 Series with Dual Discrete Outputs



Datasheet

Ultrasonic Sensors with TEACH-Mode Programming



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Choose to set a specific window size and position, or a set point centered within its own 10 mm window, for either or both outputs
- Program both outputs together or independently. The two outputs may be identical, independent, overlapping, or complementary
- Remote TEACH for security and convenience
- Choose models with 150 mm to 1 m range (5.9 in to 39.4 in) or 300 mm to 2 m range (11.8 in to 78.7 in)
- Wide operating range of -20°C to $+70^{\circ}\text{C}$ (-4°F to $+158^{\circ}\text{F}$)
- Choose models with either NPN or PNP dual discrete outputs
- LED indicators for Power ON/OFF, Signal Strength, and Discrete Outputs Conducting
- Choose models with integral unterminated 2 m (6.5 ft) or 9 m (30 ft) cable, or with M12/Euro-style quick-disconnect connection
- Compact, self-contained sensor package
- Rugged design for use in demanding sensing environments; rated IEC IP67, NEMA 6P

**WARNING:**

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Models	Range and Frequency	Cable ¹	Supply Voltage	Discrete Output	Response Time
T30UDNA	150 mm to 1 m (5.9 in to 39 in) 228 kHz	2 m (6.5 ft)	12 to 24 V DC	NPN (sinking)	48 ms
T30UDNAQ		5-pin M12/Euro-style QD			
T30UDPA		2 m (6.5 ft)		PNP (sourcing)	
T30UDPAQ		5-pin M12/Euro-style QD			
T30UDPAQ	300 mm to 2 m (11.8 in to 79 in) 128 kHz	2 m (6.5 ft)		NPN (sinking)	96 ms
T30UDNB		5-pin M12/Euro-style QD			
T30UDPB		2 m (6.5 ft)		PNP (sourcing)	
T30UDPBQ		5-pin M12/Euro-style QD			

Overview

The U-GAGE is an easy-to-use ultrasonic sensor, ideal for demanding environments. Simple push-button programming provides flexibility for a variety of applications. Excellent for gauging applications such as sensing of liquid levels in a tank or for sensing most clear materials.

Each sensor includes two discrete outputs, which may be programmed independently with different window limits or together with identical limits. Each output has the option of being set with a sensing distance set point centered within a 10 mm window.

¹ To order the 9 m (30 ft) cable models, add **W/30** to the model number of any cabled sensor (for example, **T30UDNA W/30**). A model with a QD connector requires an optional mating cable; see [Cordsets](#) (p. 7).



Configuration Instructions

Sensor Programming

Window limits may be taught to the sensor in several ways. The following methods describe the programming procedures using the push buttons on the back of the sensor; remote programming (remote TEACH) procedures are described in [Remote Programming](#) (p. 3).

Note: When the sensor changes state between Program and Run modes, all of the LED indicators turn OFF momentarily, before the appropriate LEDs turn ON as described below. The sensing window limits expand temporarily to full scale (max range) during Program mode.

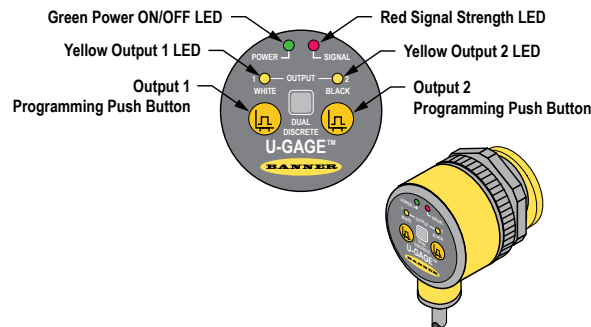


Figure 1. U-GAGE T30 Series sensor programming push buttons and indicators

Program the outputs independently to define separate sensing windows (both their size and placement) or program the outputs simultaneously for complementary or fixed field operation.

Sensing windows may be as large as 0.85 m for 1 m range models, and as large as 1.7 m for 2 m range models. Use the procedures as described, or combine them for specialized applications.

Note: Output 1 = White wire, Output 2 = Black wire

General Notes on Programming:

1. The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
2. After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
3. Press and hold the programming push button > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor will revert to the last saved program.
4. The sensor allows for some forgiveness in the teaching of a set point. If both near and far limits are not exactly the same (but are closer than the minimum 10 mm required to define a window), the sensor will set a 10 mm window with the center at the "average" of the two limits.

To Program Separate Sensing Window Limits

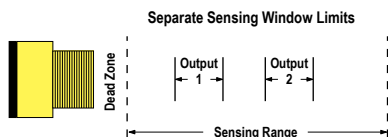


Figure 2. Programming separate sensing window limits

Each output conducts when the target is inside that output's window limits. The two sets of window limits may overlap or be completely independent.

1. Press and hold the push button for the selected output until the green Power LED turns OFF and the yellow LED for the programmed output turns ON.
2. Position the target at the first limit and click the push button. The yellow Output LED flashes.
3. Position the target at the second limit and click the push button. The green Power LED turns ON. The sensor is in Run mode.
4. Repeat the procedure for the second output, if desired.

To Program Separate Sensing Set Point Limits

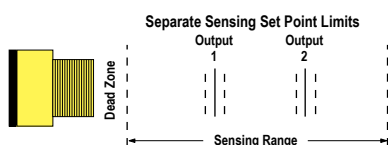


Figure 3. Programming separate sensing set point limits

Each output conducts when the target is inside that output's 10 mm limits (centered on the taught set point, or the average of the two limits). The window limits for the two outputs may overlap or be completely independent.

1. Press and hold the push button for the selected output until the green Power LED turns OFF and the yellow LED for the programmed output turns ON.
2. Position the target at the set point and click the push button. The yellow Output LED flashes.
3. While the target remains at the first limit (or within 10 mm), click the push button once more. The green Power LED turns ON. The sensor is in Run mode.
4. Repeat the procedure for the second output, if desired.

To Program A Single Pair of Sensing Window Limits, with Complementary Outputs

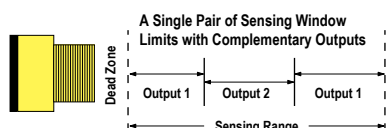


Figure 4. Programming a single pair of sensing window limits, complementary outputs

Output 2 conducts when inside the programmed window limits; Output 1 conducts for all other conditions.

1. Press and hold both push buttons (or press and hold one and then the other) until the green Power LED turns OFF and both yellow Output LEDs turn ON.
2. Position the target at the first limit and click a push button. The yellow Output LED flashes.
3. Position the target at the second limit and click a push button. The green Power LED turns ON. The sensor is in Run mode.



Note: The window limits must be ≥ 10 mm or the sensor will default to fixed-field style.

To Program A Single Sensing Set Point, with Complementary Outputs (Fixed-Field Style)

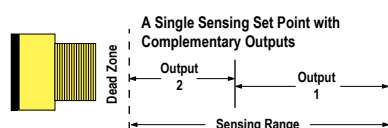


Figure 5. Programming separate sensing set point limits, complementary outputs

Output 2 conducts when inside the programmed set point; Output 1 conducts outside (away) from this point.

1. Press and hold both push buttons (or press and hold one and then the other) until the green Power LED turns OFF and both yellow Output LEDs turn ON.
2. Position the target at the first limit and click a push button. The yellow Output LED flashes.
3. While the target remains at the first limit (or within 10 mm), click the push button once more. The green Power LED turns ON. The sensor is in Run mode.

Remote Programming

Use the Remote Programming function to program the sensor remotely or to disable the keypad. Disabling the keypad prevents anyone from adjusting any of the programming settings directly from the sensor. Connect the gray wire of the sensor to +12 to 24V dc, with a remote programming switch connected between them.



Note: The impedance of the remote teach input is 55 k Ω .

Follow the sequence of input pulses to program the sensor. The duration of each pulse (corresponding to a push button "click"), and the period between multiple pulses, is defined as: 0.04 seconds < T < 0.8 seconds.

- **1 pulse:** Programs first Output 2 limit. Wait > 0.8 seconds. Next pulse programs second Output 2 limit.
- **2 pulses:** Programs first Output 1 limit. Wait > 0.8 seconds. Next pulse programs second Output 1 limit.
- **3 pulses:** Programs both outputs together (complementary or fixed-field mode). First 3-pulse programs the first limit; wait > 0.8 sec. Next pulse programs second limit and determines output configuration.
- **4 pulses:** Disables (locks out) or enables the keypad for security.

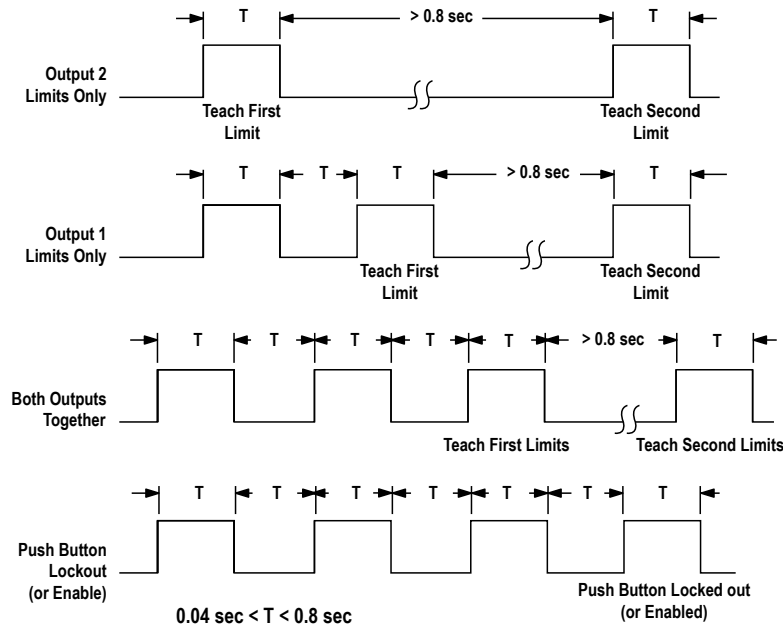


Figure 6. Timing programs for remote TEACH programming

Note: Hold the Remote line high > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor will revert to the last saved program.

Wiring Diagrams

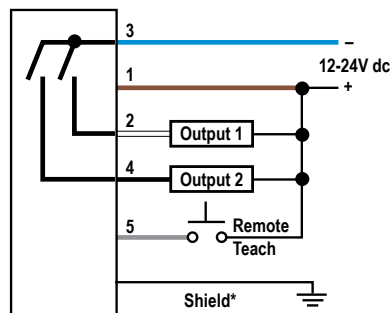


Figure 7. Cabled NPN

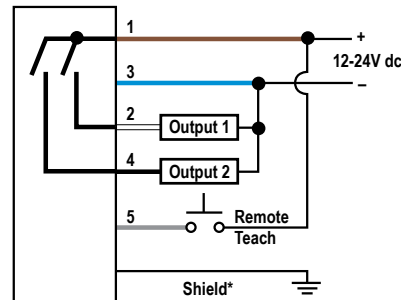
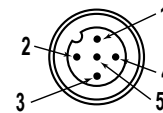


Figure 8. Cabled PNP

5-pin M12/Euro-style male connector models



Key

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

It is recommended that the shield wire is connected to earth ground or dc common.

Run Mode

Note: All LED indicators momentarily turn OFF when the sensor changes state between Program and Run modes.

Signal LED

The red Signal LED indicates the strength and condition of the sensor's incoming signal.

Signal LED Status	Indicates
OFF	No signal is received, or the target is beyond the range limitations of the sensor (with some tolerance beyond the recommended minimum and maximum sensing distance)
Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal

Output LEDs

For Application/Technical Support Contact Ramco Innovations

U-GAGE® T30 Series with Dual Discrete Outputs

Each amber Output LED lights when a target is sensed within the programmed window limits.

Power ON/OFF LED

The green Power ON/OFF LED indicates the operating status of the sensor.

Power ON/OFF LED	Indicates
OFF	Power is OFF (or in Program mode, if other LEDs are ON)
ON Solid	Sensor is operating normally (power is ON, Run mode)
Flashing	Discrete output is overloaded (Run mode)

Self-Diagnostic Error Mode

In the unlikely event of a microprocessor memory error, all of the LEDs will flash in sequence. If this occurs, the setup parameters have been lost and the sensor may be corrupt. Contact Banner Engineering for further information.

Specifications

Proximity Mode Range

"A" suffix models: 150 mm (5.9 in) min. near limit; 1 m (39 in) max. far limit
"B" suffix models: 300 mm (11.8 in) min. near limit; 2 m (79 in) max. far limit

Supply Voltage

12 to 24 V dc (10% max. ripple) at 90 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configurations

SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models

Output Ratings

Dual Discrete Outputs: 100 mA maximum, total – both outputs

OFF-state leakage current: less than 10 microamps

ON-state saturation voltage: less than 1 V at 10 mA and less than 1.5 V at 100 mA

Output Protection

Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up

Output Response Time

"A" suffix models: 48 milliseconds

"B" suffix models: 96 milliseconds

Sensing Performance

Sensing repeatability: $\pm 0.25\%$ of distance

Minimum window size: 10 mm (0.4 in)

Hysteresis of discrete output: 2.5 mm (0.10 in)

Indicators

Status LEDs	Run Mode	Program mode
Green	ON: Power ON, Run mode Flashing: Output is overloaded	OFF: Program Mode
Red	Flashing: Relative received signal strength	Flashing: Relative received signal strength
Amber (2)	ON: Output energized (conducting)	ON: Ready for first window limit
		Flashing: Ready for second limit
		OFF: Not teaching this output

Adjustments

Sensing window limits: TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely via TEACH input. Window limits may be programmed separately, or together

Construction

Molded reinforced thermoplastic polyester housing

Environmental Rating

Leakproof design is rated IEC IP67, NEMA 6P

Connections

2 m (6.5 ft) or 9 m (30 ft) 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting

Operating Conditions

Temperature: -20°C to $+70^{\circ}\text{C}$ (-4°F to $+158^{\circ}\text{F}$)

Humidity: 100% maximum relative humidity

Vibration and Mechanical Shock

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

Certifications



Application Notes

Objects passing inside the specified near limit will produce a false response

Performance Curves

Effective Beam with Plate Target (Typical)

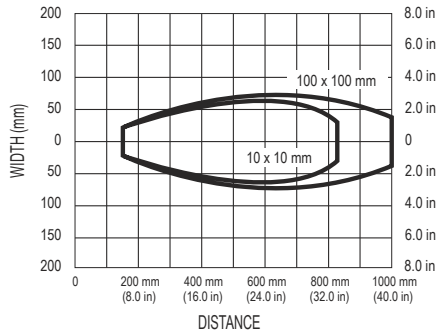


Figure 9. A Models

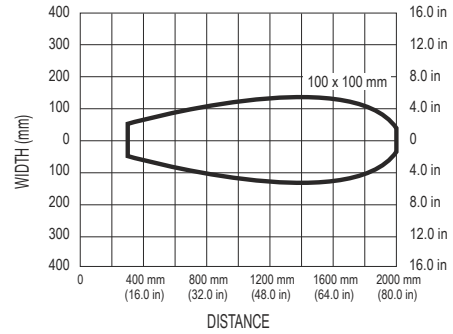


Figure 10. B Models

Effective Beam with Rod Target (Typical)

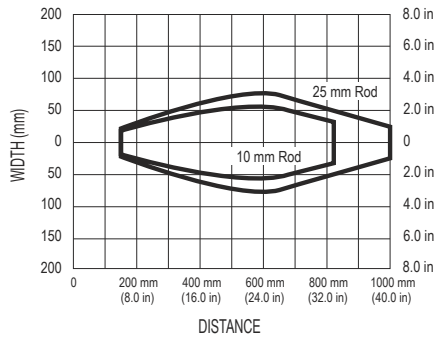


Figure 11. A Models

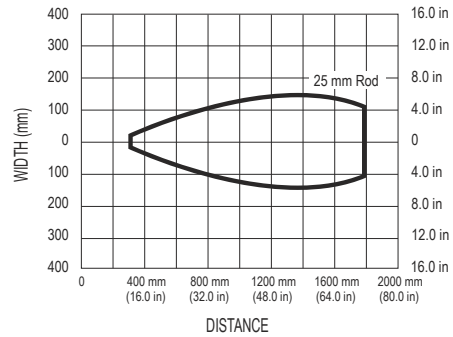
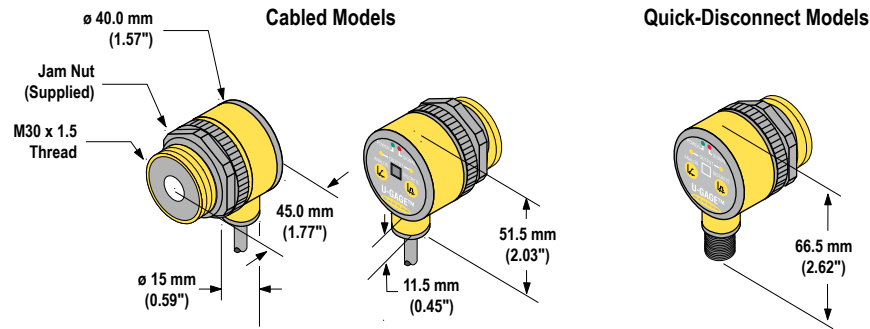


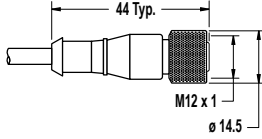
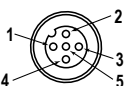
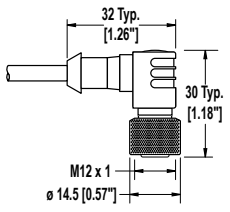
Figure 12. B Models

Dimensions



Accessories

Cordsets

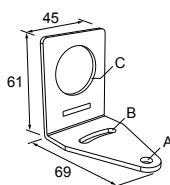
5-Pin Threaded M12/Euro-Style Cordsets with Shield—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		 <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p>
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)			
MQDEC2-506RA	1.83 m (6 ft)	Right-Angle		
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

Brackets

All measurements are in mm.

SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel

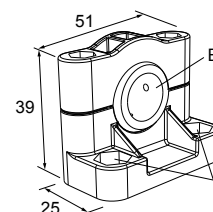


Hole center spacing: A to B=40

Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

SMB1815SF

- Swivel with set screws for mounting sensors by the cable hub
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware and hex wrench included

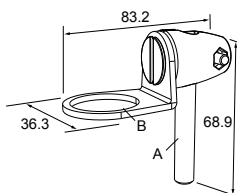


Hole center spacing: A = 36.0

Hole size: A = ø 5.0, B = ø 15.0

SMB30FA

- Swivel bracket with tilt and pan movement for precise adjustment
- Mounting hole for 30 mm sensor
- 12-ga. 304 stainless steel
- Easy sensor mounting to extrude rail T-slot
- Metric and inch size bolt available

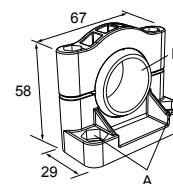


Bolt thread: SMB30FA, A= 3/8 - 16 x 2 in; SMB30FAM10, A= M10 - 1.5 x 50

Hole size: B= ø 30.1

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8

Hole size: A=ø 7.0, B=ø 30.0

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.

Ramco Innovations Toll Free 800-280-6933 www.ramcoi.com



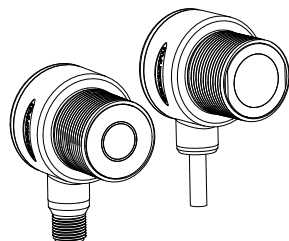
more sensors, more solutions

U-GAGE® T30U Series Sensors - Pump-In/Pump-Out



Datasheet

Ultrasonic Sensors with Pump-In/Pump-Out Switching Logic



- Fast, easy-to-use TEACH-Mode programming; no potentiometer adjustments
- Program both outputs together or independently. The two outputs may be identical, independent, overlapping, or complementary
- Remote TEACH for security and convenience
- Choose models with 150 mm to 1 m range (5.9 in to 39.4 in) or 300 mm to 2 m range (11.8 in to 78.7 in)
- Wide operating range of -20 °C to +70 °C (-4 °F to +158 °F)
- Choose models with either NPN or PNP dual discrete outputs
- LED indicators for Power ON/OFF, Signal Strength, and Discrete Outputs Conducting
- Choose models with integral unterminated 2 m (6.5 ft) or 9 m (30 ft) cable, or with M12/Euro-style quick-disconnect connection
- Compact, self-contained, right-angle sensor package with fully encapsulated electronics
- Rugged design for use in demanding sensing environments; rated IEC IP67, NEMA 6P



WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Models	Range and Frequency	Cable	Supply Voltage	Discrete Output	Response Time
T30UHNA	150 mm to 1 m (5.9 in to 39 in) 228 kHz	2 m (6.5 ft)	12 to 24 V DC	NPN (sinking)	48 ms
T30UHNAQ		5-pin M12/Euro-style QD		PNP (sourcing)	
T30UHPA		2 m (6.5 ft)			
T30UHPAQ		5-pin M12/Euro-style QD		NPN (sinking)	96 ms
T30UHNB	300 mm to 2 m (11.8 in to 79 in) 128 kHz	2 m (6.5 ft)			
T30UHNBQ		5-pin M12/Euro-style QD			
T30UHPB		2 m (6.5 ft)			
T30UHPBQ		5-pin M12/Euro-style QD			

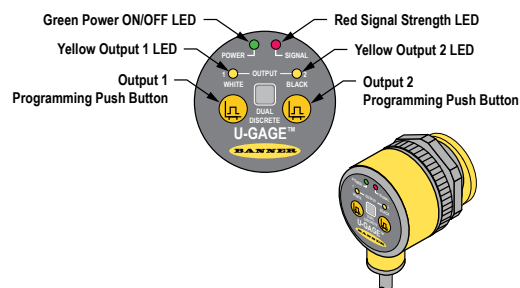
Overview

U-GAGE® is an easy-to-use ultrasonic sensor, ideal for demanding environments. Simple push-button programming provides flexibility for a variety of applications. Excellent for gauging applications such as sensing liquid levels in a tank or for sensing most clear materials.

Each sensor includes two discrete outputs, which may be programmed independently with different window limits or together with identical limits.

Pump-In/Pump-Out Switching Function

Pump-in/pump-out operation provides the switching logic required for fill-level control, web tensioning control, and similar applications. In this mode, Output 2 energizes when the target reaches the farthest sensing window limit, and stays energized until the target moves to the nearest limit. Output 1 de-energizes at the farthest limit and does not re-energize until the target moves to the nearest limit. Figure 2 shows how pumping action might be controlled directly by the sensor in a fill-level-control application.

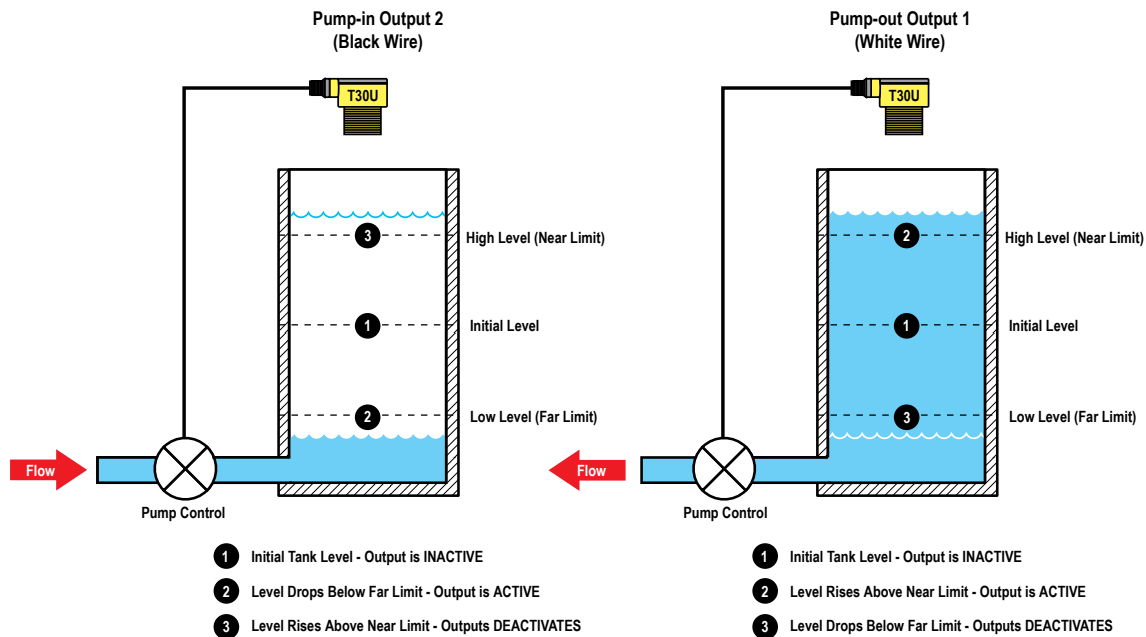


Output 1 = Pump-Out
Output 2 = Pump-In

Figure 1. Sensor features

To order the 9 m (30 ft) cable models, add **W/30** to the model number of any cabled sensor (for example, **T30UHNA W/30**). A model with a QD connector requires an optional mating cable; see [Cordsets](#) (p. 7)





If no echo is received by the sensor, the target is assumed to be beyond the far window limit.

Figure 2. Fill-level-control application

Configuration Instructions

Sensor Programming

Window limits may be taught to the sensor using the push buttons on the back of the sensor or using remote programming.



Note: When the sensor changes state between Program and Run modes, all of the LED indicators turn OFF momentarily, before the appropriate LEDs turn ON. The sensing window limits expand temporarily to full scale (max range) during Program mode.

Program the outputs independently to define separate sensing windows (both their size and placement) or program the outputs simultaneously for complementary operation. Sensing windows may be as large as 0.85 m for 1 m range models, and 1.7 m for 2 m range models. **Note:** Output 1 = White wire (Pump-Out), Output 2 = Black wire (Pump-In).

General Notes on Programming:

1. The sensor returns to Run mode if the first TEACH condition is not registered within 120 seconds.
2. After the first limit is taught, the sensor remains in Program mode until the TEACH sequence is finished.
3. Press and hold the programming push button > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor will revert to the last saved program.

Remote Programming

Use the Remote Programming function to program the sensor remotely or to disable the keypad. Disabling the keypad prevents anyone from adjusting any of the programming settings directly from the sensor. Connect the gray wire of the sensor to +12 to 24V dc, with a remote programming switch connected between them.



Note: The impedance of the remote teach input is 55 kΩ.

Follow the sequence of input pulses to program the sensor. The duration of each pulse (corresponding to a push button "click"), and the period between multiple pulses, is defined as: 0.04 seconds < T < 0.8 seconds.



Note: Hold the Remote line high > 2 seconds (before teaching the second limit) to exit Program mode without saving any changes. The sensor will revert to the last saved program.

Teaching Separate Window Limits for Each Output

Each output conducts in its respective manner (either pump-in or pump-out) independently, in response to the target distance. The two outputs may overlap or may be completely independent. For fill-level applications, set the window limits for Output 2 (pump-in) farther from the sensor than for Output 1 (pump-out); see figure on the right.

The distance between the taught near and far limits for each output must be at least 10 mm.

To readjust window limits for either output, follow the teach procedure for that output only.

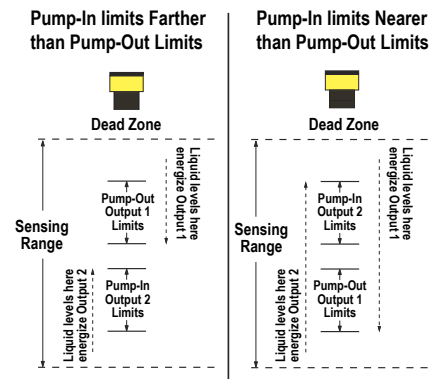








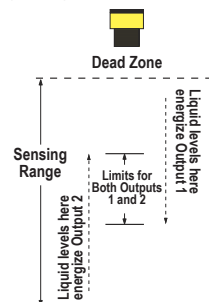
Figure 3. Programming separate sensing window limits for each output

Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
Procedure	Result	Procedure	Result
Programming Mode			
<ul style="list-style-type: none"> Push and hold push button for selected output² <p>>2 sec.</p> 	<ul style="list-style-type: none"> Green Power LED turns OFF Corresponding Output LED turns ON Yellow Sensor waits for first limit 	<ul style="list-style-type: none"> No action required 	
Teach First Limit			
<ul style="list-style-type: none"> Position the target for the first limit "Click" the same push button 	<ul style="list-style-type: none"> After a short delay, the Yellow LED flashes Sensor learns first limit and waits for second limit 	<div> <div> Output 1 (Pump-Out) <ul style="list-style-type: none"> Double-pulse the remote line  </div> <div> Output 2 (Pump-In) <ul style="list-style-type: none"> Single-pulse the remote line  </div> </div>	<ul style="list-style-type: none"> Green Power LED turns OFF Corresponding Output LED turns ON Yellow After a short delay, the Yellow LED flashes
Teach Second Limit			
<ul style="list-style-type: none"> Position the target for the second limit "Click" the same push button 	<ul style="list-style-type: none"> After a short delay, the Green Power LED goes ON Sensor learns second limit and returns automatically to Run mode 	<ul style="list-style-type: none"> Position the target for the second limit Single-pulse the remote line 	<ul style="list-style-type: none"> After a short delay, the Green Power LED turns ON Sensor learns second limit and returns automatically to Run mode
Program Second Output			
Repeat as needed for other output.			

² Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

Teaching Identical (Complementary) Window Limits for Both Outputs

A Single Pair of Sensing Window Limits is taught; only one output is on at any time



Only one output conducts at any time in response to the target distance. Under no conditions will both outputs conduct at the same time; see [Overview](#) (p. 1) and the figure on the left.


The distance between the taught near and far limits must be at least 10 mm in this complementary mode for proper sensor operation.

Figure 4. Programming one pair of sensing window limits, complementary outputs

Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
Procedure	Result	Procedure	Result
Programming Mode			
<ul style="list-style-type: none"> Press and hold both push buttons (or press and hold one and then the other)⁸ <p>>2 sec.</p>	<ul style="list-style-type: none"> Green Power LED turns OFF Both Output LEDs turn ON Yellow Sensor waits for first limit 	<ul style="list-style-type: none"> No action required 	
Teach First Limit			
<ul style="list-style-type: none"> Position the target for the first limit "Click" either push button 	<ul style="list-style-type: none"> After a short delay, the Yellow LEDs flashes Sensor learns first limit and waits for second limit 	<ul style="list-style-type: none"> Position the target for the first limit Triple-pulse the remote line 	<ul style="list-style-type: none"> Green Power LED turns OFF Both Output LEDs turn ON Yellow After a short delay, the Yellow LEDs flash
Teach Second Limit			
<ul style="list-style-type: none"> Position the target for the second limit "Click" either push button 	<ul style="list-style-type: none"> After a short delay, the Green Power LED goes ON Sensor learns second limit and returns automatically to Run mode 	<ul style="list-style-type: none"> Position the target for the second limit Single-pulse the remote line 	<ul style="list-style-type: none"> After a short delay, the Green Power LED turns ON Sensor learns second limit and returns automatically to Run mode

⁸ Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

Push Button Lockout

Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
Procedure	Result	Procedure	Result
Not available via push button	Not applicable	<ul style="list-style-type: none"> Four-pulse the remote line 	<ul style="list-style-type: none"> Push buttons are either enabled or disabled, depending on previous condition

Wiring Diagrams

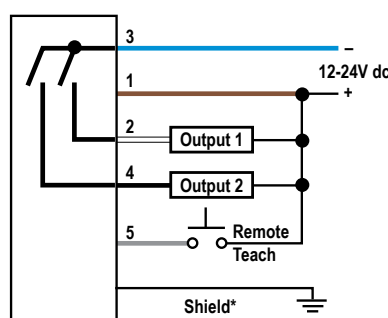


Figure 5. Cabled NPN

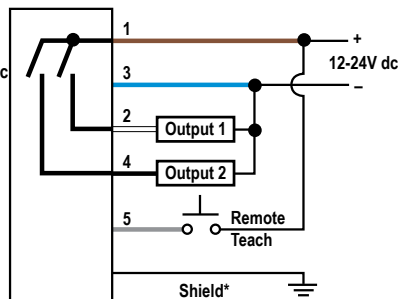


Figure 6. Cabled PNP

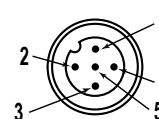


Figure 7. 5-pin M12/Euro-style male connector

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

It is recommended that the shield wire is connected to earth ground or dc common.

Run Mode



Note: All LED indicators momentarily turn OFF when sensor changes state between Program and Run modes.

Signal LED

The Red Signal LED indicates the strength and condition of the sensor's incoming signal.

Signal LED Status	Indicates
OFF	No signal is received, or the target is beyond the range limitations of the sensor (with some tolerance beyond the recommended minimum and maximum sensing distance)
Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal

Output LEDs

Each Yellow Output LED lights when the corresponding output (pump-in or pump-out) is energized.

Power ON/OFF LED

The Green Power ON/OFF LED indicates the operating status of the sensor.

Power ON/OFF LED	Indicates
OFF	Power is OFF (or in Program mode, if other LEDs are ON)
ON Solid	Sensor is operating normally (power is ON, Run mode)
Flashing	Discrete output is overloaded (Run mode)

Self-Diagnostic Error Mode

In the unlikely event of a microprocessor memory error, all of the LEDs will flash in sequence. If this occurs, the setup parameters have been lost and the sensor may be corrupt. Contact Banner Engineering for further information.

Specifications

Proximity Mode Range

"A" suffix models: 150 mm (5.9 in) min. near limit; 1 m (39 in) max. far limit
"B" suffix models: 300 mm (11.8 in) min. near limit; 2 m (79 in) max. far limit

Supply Voltage

12 to 24 V dc (10% max. ripple) at 90 mA, exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Ratings

Dual Discrete Outputs: 100 mA maximum, total – both outputs

OFF-state leakage current: less than 10 microamps

ON-state saturation voltage: less than 1 V at 10 mA and less than 1.5 V at 100 mA

Output Configurations

SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models

Output Protection

Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up

Output Response Time

"A" suffix models: 48 milliseconds

"B" suffix models: 96 milliseconds

Sensing Performance

Sensing repeatability: $\pm 0.25\%$ of distance

Minimum window size: 10 mm (0.4 in)

Hysteresis of discrete output: 2.5 mm (0.10 in)

Adjustments

Sensing window limits: TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely via TEACH input. Window limits may be programmed separately, or together

Construction

Molded reinforced thermoplastic polyester housing

Environmental Rating

Leakproof design is rated IEC IP67, NEMA 6P

Connections

2 m (6.5 ft) or 9 m (30 ft) 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting

Operating Conditions

Temperature: -20°C to $+70^{\circ}\text{C}$ (-4°F to $+158^{\circ}\text{F}$)

Humidity: 100% maximum relative humidity

Vibration and Mechanical Shock

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

Certifications



Application Notes

Objects passing inside the specified near limit will produce a false response

Indicators

Status LEDs	Run Mode	Program mode
Green	ON: Power ON, Run mode Flashing: Output is overloaded	OFF: Program Mode
Red	Flashing: Relative received signal strength	Flashing: Relative received signal strength
Amber (2)	ON: Output energized (conducting)	ON: Ready for first window limit
		Flashing: Ready for second limit
		OFF: Not teaching this output

Performance Curves

Effective Beam with Plate Target (Typical)

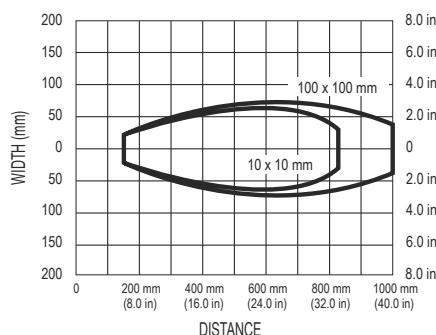


Figure 8. A Models

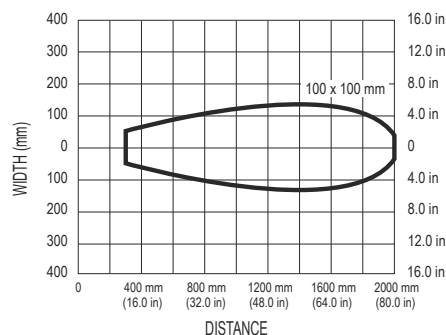


Figure 9. B Models

Effective Beam with Rod Target (Typical)

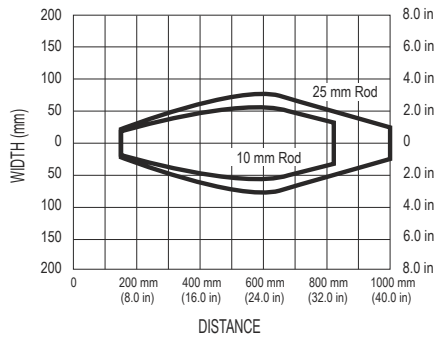


Figure 10. A Models

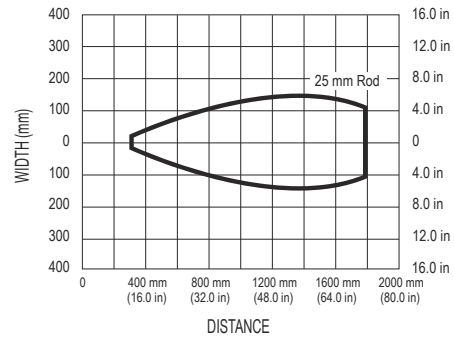
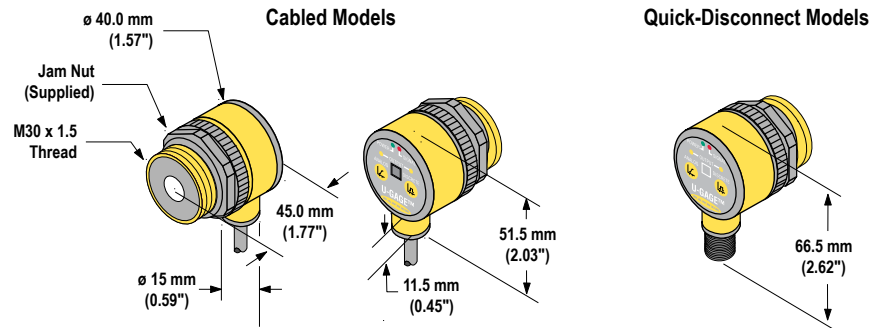


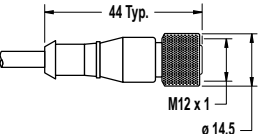
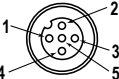
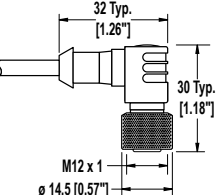
Figure 11. B Models

Dimensions



Accessories

Cordsets

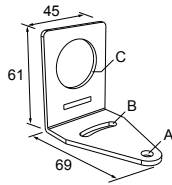
5-Pin Threaded M12/Euro-Style Cordsets with Shield—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MQDEC2-506	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDEC2-515	4.57 m (15 ft)			
MQDEC2-530	9.14 m (30 ft)			
MQDEC2-550	15.2 m (50 ft)	Right-Angle		
MQDEC2-506RA	1.83 m (6 ft)			
MQDEC2-515RA	4.57 m (15 ft)			
MQDEC2-530RA	9.14 m (30 ft)			
MQDEC2-550RA	15.2 m (50 ft)			

Brackets

All measurements are in mm.

SMB30A

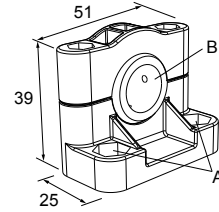
- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel



Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

SMB1815SF

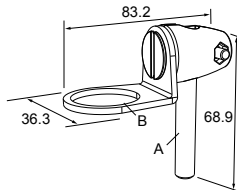
- Swivel with set screws for mounting sensors by the cable hub
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware and hex wrench included



Hole center spacing: A = 36.0
Hole size: A = ø 5.0, B = ø 15.0

SMB30FA

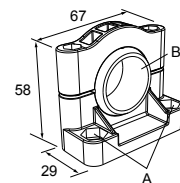
- Swivel bracket with tilt and pan movement for precise adjustment
- Mounting hole for 30 mm sensor
- 12-ga. 304 stainless steel
- Easy sensor mounting to extrude rail T-slot
- Metric and inch size bolt available



Bolt thread: SMB30FA, A= 3/8 - 16 x 2 in; SMB30FAM10, A= M10 - 1.5 x 50
Hole size: B= ø 30.1

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0

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. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.

Ramco Innovations

Toll Free 800-280-6933

www.ramcoi.com



more sensors, more solutions