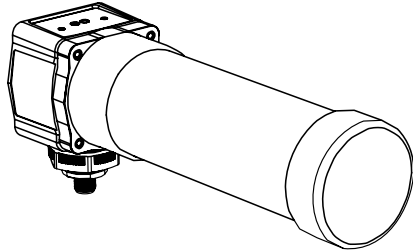


Datasheet

Radar-Based Dual-Zone Narrow-Beam Sensors for Detection of Moving and Stationary Targets



- Fourth generation FMCW (true-presence) radar detects moving and stationary objects
- Narrow beam pattern
- Two independent, adjustable sensing zones
- Easy setup and configuration of range, sensitivity, and output with simple DIP switches
- Sensing functions are unaffected by wind, falling rain or snow, fog, humidity, air temperatures, or light
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band
- Rugged IP67 housing withstands harsh environments

Protected by US patents



CAUTION: Make No Modifications to this Product

Any modifications to this product not expressly approved by Banner Engineering could void the user's authority to operate the product. Contact Banner Engineering for more information.



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 ¹	Maximum Range	Connection	Supply Voltage	Telecom Approval ²	Output
QT50R-US-AF2W	24 m (78 ft)	5-wire 2 m (6.5 ft) Integral cable	12 to 30 V dc	Telecom approved for US, Canada and Brazil	DIP-switch-selectable NPN or PNP and N.O. or N.C.
QT50R-EU-AF2W				Telecom approved for Europe, UK, Australia, New Zealand, China, and Japan	
QT50R-KR-AF2W			12 to 24 V dc	Telecom approved for South Korea	
QT50R-TW-AF2W			12 to 30 V dc	Telecom approved for Taiwan	

¹ Cabled models only are listed. For integral 5-pin Euro-style (M12) quick-disconnect fitting, add suffix "Q" to the model number (for example, QT50R-xx-AF2WQ). OD models require a mating cordset; see [Quick Disconnect \(QD\) Cordsets](#) on page 6.

² For additional countries, contact Banner Engineering.



Overview

The R-GAGE sensor emits a well-defined beam of high-frequency radio waves from an internal antenna. Some of this emitted energy is reflected back to the receiving antenna. Signal processing electronics determine the distance from the sensor to the object based on the time delay of the return signal. The sensor can be configured to two independent sensing zones.

The two sensing zones are factory pre-set to default distances; they can be reconfigured for different distances using the DIP switches on the back of the sensor. The sensor is plug-in ready for immediate operation.

The sensitivity was precalibrated at the factory, assuming that the sensing field will be clear of obstacles. The sensitivity can be adjusted using the DIP switches on the back of the sensor.

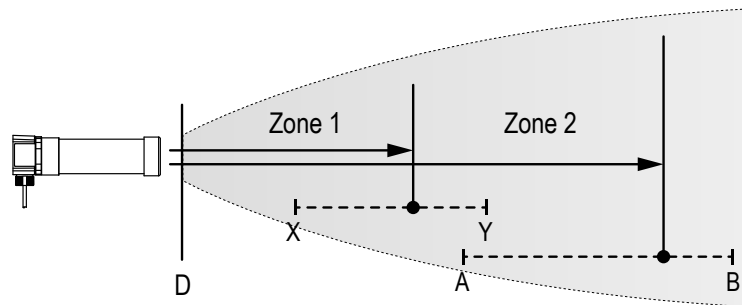


Figure 2. R-GAGE setpoint distances

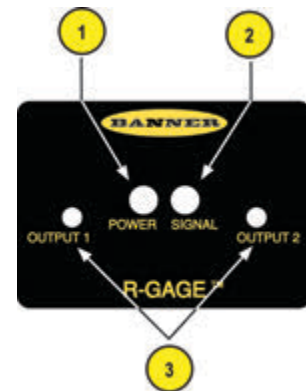


Figure 1. R-GAGE features

1. Power LED: Green (power ON)
2. Signal Strength LED: Red (flashes in proportion to the signal strength)
3. Output LEDs: Yellow (output energized); Red (configuration)

Access the DIP switches behind the threaded cap on the sensor back (not shown)

		EU, KR Models	TW, US Models
X	Minimum Zone 1 setpoint distance	3 m (9.8 ft)	3.5 m (11.5 ft)
Y	Maximum Zone 1 setpoint distance	12 m (39.4 ft)	12 m (39.4 ft)
A	Minimum Zone 2 setpoint distance	8 (26.2 ft)	8 (26.2 ft)
B	Maximum Zone 2 setpoint distance	24 (78.7 ft)	24 (78.7 ft)
D	Dead Zone ³		

Sensor Configuration

The sensing zone distance, sensitivity, and output configuration can be selected via the DIP switches on the back of the sensor. Use the included spanner to open the screw-off cover on the back of the sensor and access the DIP switches.



Important: Tighten the DIP switch cover a full quarter turn after contact to maintain the watertight seal.

DIP Switch Functions

Switch	Function
1, 2, 3	Zone 1 and Zone 2 distance pairs
4, 5	Sensitivity
6	Dual NPN/PNP output functionality
7	Normally Open/Normally Closed output functionality
8	Response Speed

DIP switch 1 is on the left and DIP switch 8 is on the right.

³ Typical dead zone: 0.4 m (1.3 ft) for moving and 1.0 m (3.3 ft) for stationary targets, but varies with target reflectivity.

Distance Settings

* Default settings

Switch 1	Switch 2	Switch 3	EU, KR Models	TW, US Models	All
			Zone 1	Zone 1	Zone 2
0	0	0	3 m (9.8 ft)	3.5 m (11.5 ft)	8 m (26.2 ft)
0	0	1	4 m (13.1 ft)	4 m (13.1 ft)	10 m (32.8 ft)
0	1	0	6 m (19.7 ft)	6 m (19.7 ft)	12 m (39.4 ft)
0	1	1	8 m (26.2 ft)	8 m (26.2 ft)	16 m (52.5 ft)
1*	0*	0*	8 m (26.2 ft)	8 m (26.2 ft)	20 m (65.6 ft)
1	0	1	10 m (32.8 ft)	10 m (32.8 ft)	20 m (65.6 ft)
1	1	0	10 m (32.8 ft)	10 m (32.8 ft)	24 m (78.7 ft)
1	1	1	12 m (39.4 ft)	12 m (39.4 ft)	24 m (78.7 ft)



NOTE: Highest sensitivity is achieved only if sensing distance is 8 m (26.2 ft) or less

Sensitivity Selection

* Default settings

Switch 4	Switch 5	Sensitivity
0*	0*	4 (Highest)
0	1	3 (High)
1	0	2 (Medium)
1	1	1 (Low)

Output Configuration

* Default settings

Switch 6	NPN / PNP	Switch 7	NO / NC
0*	NPN	0*	NO
1	PNP	1	NC

Response Speed

* Default settings

Switch 8	On Total	Off Total	Total
0	30	70	100
1*	50	300	350

Specifications

Range

The sensor is able to detect a proper object (see Detectable Objects) from 1 to 24 m (3.3 to 78.7 ft), depending on target

Detectable Objects

Objects containing metal, water, or similar high-dielectric materials

Operating Principle

Frequency modulated continuous-wave (FMCW) radar

Operating Frequency

US, TW Models: 24.075–24.175 GHz, ISM Band

EU, KR Models: 24.050–24.250 GHz, ISM Band

Supply Voltage

12 to 30 V dc, less than 100 mA, exclusive of load

For KR models: 12 to 24 V dc, less than 100 mA exclusive of load

Supply Protection Circuitry

Protected against reverse polarity and transient overvoltages

Delay at Power-up

Less than 2 seconds

Output Configuration

DIP switch 6 selects dual NPN (default) or dual PNP operation; DIP switch 7 selects N.O. (default) or N.C. operation; 150mA each

- Zone 1 output: white wire
- Zone 2 output: black wire

Output Protection

Protected against short circuit conditions

Response Time

DIP switch 8 selects ON/OFF response time

Indicators/Indicators

Power LED: Green (power ON)

Signal Strength LED: Red, flashes in proportion to signal strength. Steady on at 4x excess gain. Only indicates signal amplitude, not target distance.

Output LEDs: Yellow (output energized) / Red (configuration)

See [Figure 1](#) on page 2

Adjustments

DIP-switch-configurable sensing distance, sensitivity, response time, and output configuration

Construction

Housing: ABS/polycarbonate

Lightpipes: Acrylic

Access Cap: Polyester

Operating Temperature

–40 °C to +65 °C (–40 °F to +149 °F)

Environmental Rating

IEC IP67

Connections

Integral 5-wire 2 m (6.5 ft) cable or M12 Euro-style QD fitting. QD models require a mating cordset

Certifications



ETSI/EN 300 440

FCC part 15

RSS-210

ANATEL Category II

CMIIT Category G

ARIB STD T-73

KC mark - MSIP/RRA

NCC

for others, contact Banner Engineering

Country of Origin: USA

FCC ID: UE3QT50RUS—This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IC: 7044A-QR50RCA—This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux CNR exempts de licence d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) Ce dispositif ne peut causer des interférences; et (2) Ce dispositif doit accepter toute interférence, y compris les interférences qui peuvent entraîner un mauvais fonctionnement de l'appareil.



Este equipamento opera em caráter secundário, isto é, não tem direito à proteção contra interferência prejudicial, mesmo de estações do mesmo tipo e não pode causar interferência a sistemas operando em caráter primário.

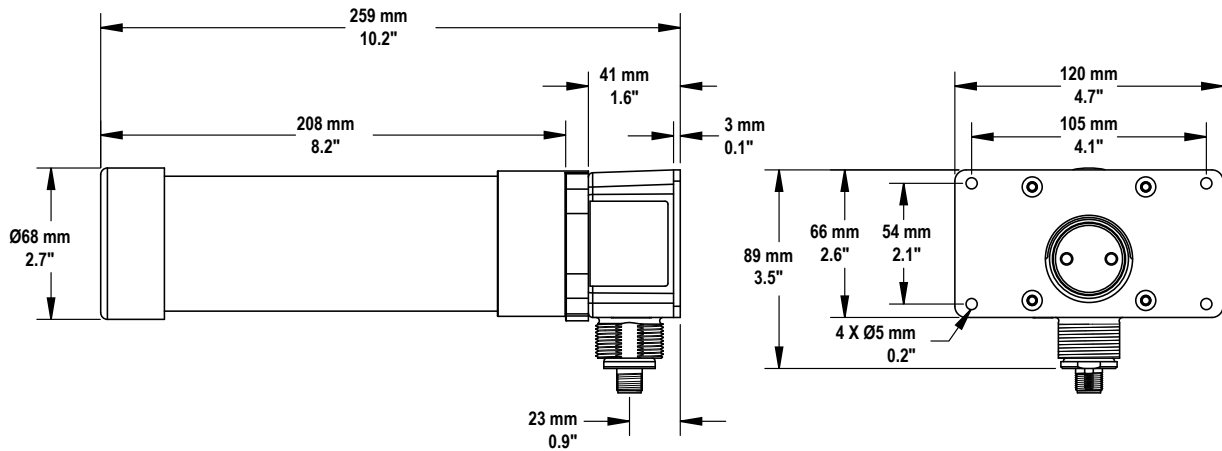
SRD24-IO3B24100.2TR0.1 South Korea Class A Certification

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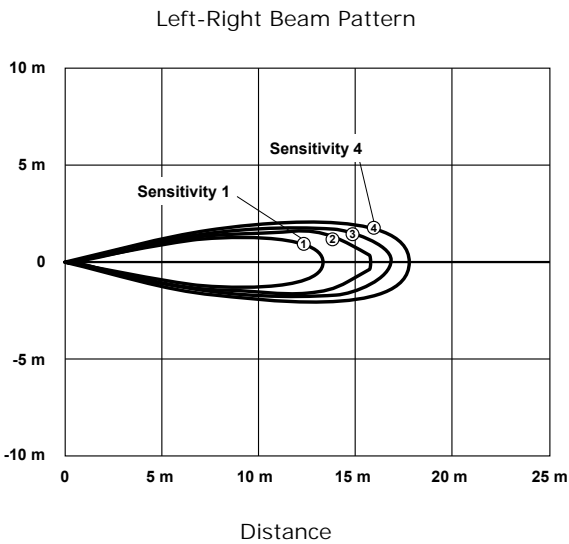
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Dimensions



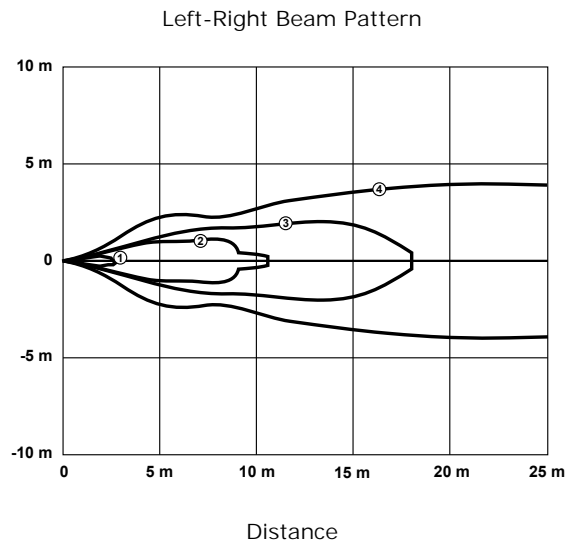
Beam Pattern

Typical Beam Pattern (with BRTR-CC20E Radar Target, Radar Cross Section = 50 m²)



1-4: Indicates sensitivity level

Typical Beam Pattern (with 4 different targets) at highest sensitivity level



- 1: Weak Object (Radar cross section = 0.25 m²)
- 2: Car (Radar cross section = 3 m²)
- 3: Large Truck (Radar cross section = 50 m²)
- 4: Passenger Train (Radar cross section = 300 m²)



NOTE: The effective beam pattern depends on the sensitivity level and target properties.

Windows

The R-GAGE sensor can be placed behind a glass or a plastic window, but the configuration must be tested and the distance from the sensor to the window must be determined and controlled prior to installation. There is typically a 20% signal reduction when the sensor is placed behind a window.

Polycarbonate at 4 mm thickness performs well in most situations, but the performance depends on filler materials. Thinner (1 to 3 mm) windows have high reflection. The amount of reflection depends on the material, thickness, and distance from the sensor to the window.

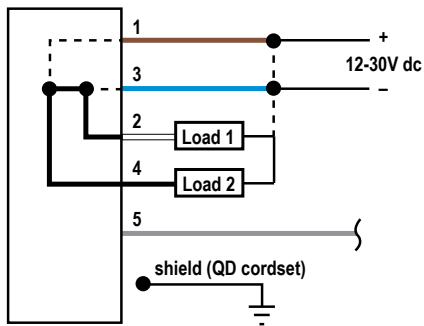
Locate the sensor in a position of minimum reflection from the window, which will repeat every 6.1 mm of distance between the sensor and the window. The positions of maximum reflection from the window repeat between the minimums, and decrease in effect until the window is approximately 150 mm (5.9 in) away. Consult the factory for pre-tested window materials which can be used at any distance without issue.

Additionally, the face of the window should be protected from flowing water and ice by use of a flow diverter or hood directly above the window. Falling rain or snow in the air in front of the window, light water mist, or small beads on the face of the window are typically not an issue. However, a thick, continuous surface of water or ice directly on the face of the window can be detected as a dielectric boundary.

Weather

The R-GAGE sensor can be used in the extreme weather conditions found in port harbors and near oceans. The water in the air does not affect the radar beam, but thick water or ice on the face of the radome can affect performance. In heavy rain or ice conditions, to prevent build-up of water or ice on the radome, use the SAQT50R-91611 accessory. This is a hydrophobic end cap that is easily attached over the sensor radome. This end cap, which is field-replaceable, will take the regular wear and tear from port operation to protect the sensor radome and prolong the life of the radar sensor.

Wiring



Wiring Key:

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black
- 5 = Gray (Do not connect)



NOTE: Banner recommends that the shield wire (quick disconnect (QD) fitting cordsets only) be connected to earth ground or dc common. Shielded cordsets are recommended for all QD models.

Accessories

Quick Disconnect (QD) Cordsets

5-Pin Threaded M12/Euro-Style Cordsets—with Shield				
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)			

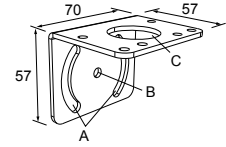
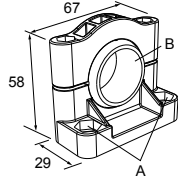


NOTE: Pin 5 is not used.

Mounting Brackets

All measurements are in mm

<p>SMB30SC</p> <ul style="list-style-type: none"> Swivel bracket with 30 mm mounting hole for sensor Black reinforced thermoplastic polyester Stainless steel mounting and swivel locking hardware included <p>Hole center spacing: A=Ø 50.8 Hole size: A=Ø 7.0, B=Ø 30.0</p>	<p>SMB30MM</p> <ul style="list-style-type: none"> 12-ga. stainless steel bracket with curved mounting slots for versatile orientation Clearance for M6 (¼ in) hardware Mounting hole for 30 mm sensor <p>Hole center spacing: A = 51, A to B = 25.4 Hole size: A = 42.6 x 7, B = Ø 6.4, C = Ø 30.1</p>
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Weather Deflector

<p>SAQT50R</p> <ul style="list-style-type: none"> Coated to help repel water and maximize signal strength Mounts using screws for easy application and replacement Required if the R-GAGE is exposed to rain or snow Prevents buildup of water or ice interfering with sensor performance 	
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