

Radar Sensor Solutions




Radar Sensing


The ultimate outdoor sensing solution

Benefits of Radar Sensing


Resistant to wind, rain, snow, fog, and sunlight




Long sensing range




No moving parts, durable, less downtime



Operates with a wide temperature range to function in extreme environments

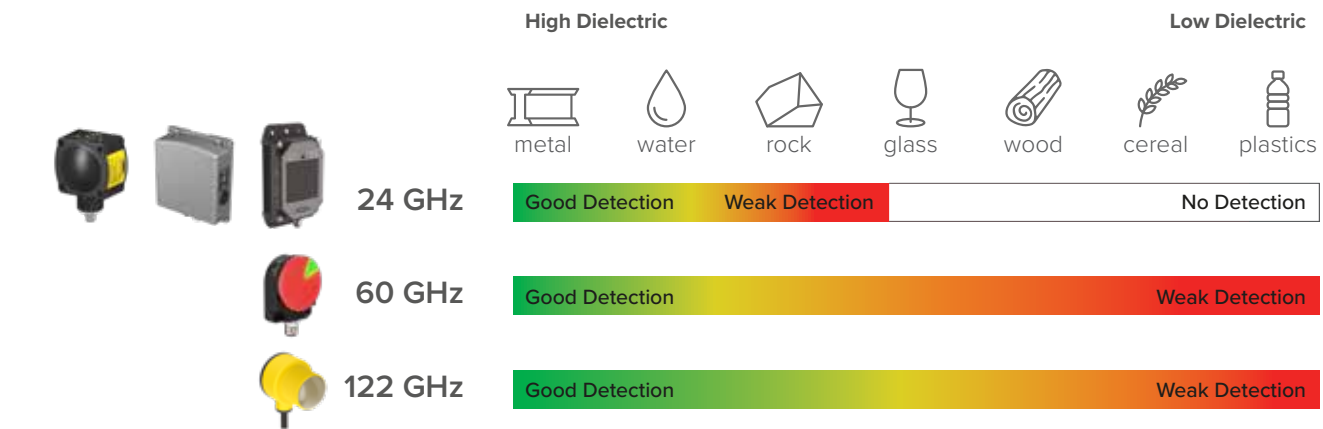


Detects moving and stationary objects



Operating Frequency

Different radar frequencies affect not only the range of the sensor but also what materials it can detect. 24 GHz radar has a long range and ignores ambient weather like heavy rain or snow. However, its detection is limited to stronger radar targets. 122 GHz radar provides greatly increased accuracy and can see a much wider range of materials compared to 24 GHz. 60 GHz conveniently falls between 24 GHz and 122 GHz in terms of performance. It has remarkable resistance to ambient weather and can detect a similar range of materials to 122 GHz with a better accuracy than 24 GHz.



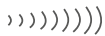
Metal, water, and other high-dielectric materials provide a stronger return signal than plastic, wood, or other organic materials.

Beam Pattern Considerations

Radar sensors are available in narrow and wide beam patterns. Narrow beam patterns avoid false detection of objects outside of the region of interest and allow for a more precise measurement. Wide beam patterns provide coverage of larger areas and provide more reliable detection of irregular surfaces and targets presented at steep angles.

Narrow Beam Applications

- Drive-thru
- Gantry crane
- Overhead crane
- Loading docks
- Tank level

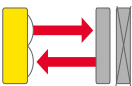


Wide Beam Applications

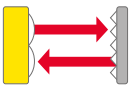
- Mobile equipment collision avoidance
- Vehicle detection: trains, cars, boats



Adjustable-Field (Diffuse) and Retroreflective Radar Sensors



An adjustable-field radar sensor can detect vehicles and other objects by sensing the reflection of the radio waves bouncing off the object.



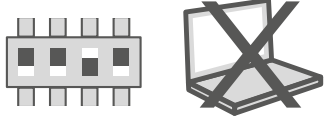
A retroreflective radar sensor uses a taught reference condition like a wall, floor, or special retroreflective target. The sensor detects objects between it and the reference target by looking for disruptions in the signal coming back from the reference target.

Retroreflective sensing has the most reliable detection with no dead zone. The output will turn on even if the object being sensed does not reflect the signal back to the sensor, as long as it blocks or disrupts the signal from the reference target.

Configuration

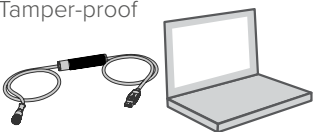
DIP Switch Configuration

- Easy to set up
- No PC required



GUI Configuration

- Clear visual of the entire sensor view for setup and troubleshooting
- Tamper-proof



Remote Teach

- Remotely configure sensor
- No manual interaction required



IO-Link

- Read and change device remotely
- Dynamically change parameters

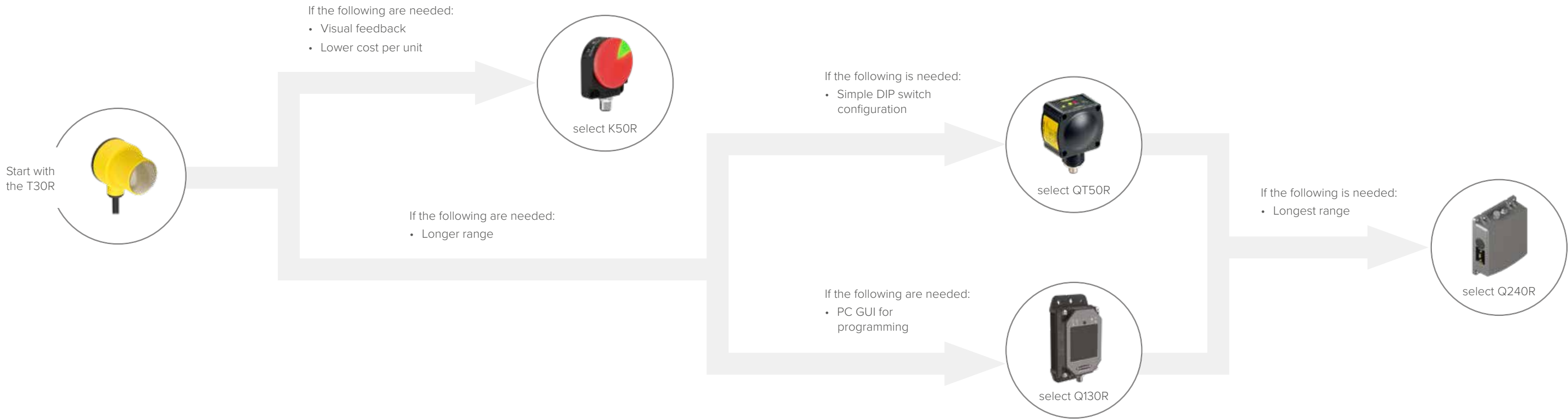






Push Button

- Simple configuration
- Click and teach



Choosing a Banner Radar Sensor



	 T30R	 K50R	 Q130R	 QT50R	 Q240R
Sensing Mode	Adjustable-field, Retroreflective	Adjustable-field, Retroreflective	Adjustable-field	Adjustable-field, Retroreflective	Adjustable-field
Frequency	122 GHz	60 GHz	24 GHz	24 GHz	24 GHz
Max. Range (m)	6, 10, 15, or 25	3	24 or 40	3.5, 12, or 24	40 or 100
Number of Zones	2	2	1	1 or 2	2
Beam Pattern (Horz x Vert)	15° x 15° or 45° x 45°	80° x 60°	90° x 76° or 24° x 50°	90° x 76°	11° x 13°
Output	Analog and Discrete with IO-Link, Dual-discrete with IO-Link and Pulse Pro	Dual-discrete or PFM	Single-discrete	Single-discrete, Dual-discrete, or Discrete and Analog	Dual-discrete or Discrete and Analog
Configuration	PC GUI, IO-Link, remote teach, push buttons	PC GUI or remote teach	PC GUI or remote teach	DIP switch	DIP switch
Country or Region of Compliance**	US, Europe, UK, Australia/ New Zealand, Malaysia	US, Europe, UK, Canada, Australia/ New Zealand	US, Europe, UK, Canada, China, Australia/New Zealand, Brazil	US, Europe, China, Brazil, Japan, South Korea, Australia/New Zealand, Singapore, Taiwan, Canada	US, Europe, China, Brazil, Japan, South Korea, Singapore, Taiwan, Canada, Mexico, Australia/New Zealand

*Visit bannerengineering.com for more solutions
**See manual for details

Vehicle Detection

Radar sensors use Frequency Modulated Continuous Wave (FMCW) technology to reliably detect targets, including cranes, cars, trains, trucks, and cargo in extreme weather conditions. FMCW radar is an ideal solution for these applications because it can detect moving and stationary objects in all weather conditions.

The ability to reliably detect vehicles offers significant advantages for asset management, resource allocation, site safety, traffic control, and loading-dock monitoring. Application needs and deployment requirements can be diverse, ranging from indoor, outdoor, and partially protected ones.



Boats on Waterways, Locks, and Dams: Shipyard Logistics

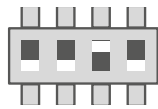


Challenge

To establish and maintain an efficient operating routine, all vessel traffic must be monitored as it enters and exits ports. Ship detection can be difficult because of local wind and wave conditions, ship size/type, and close-range noise. Sensing solutions must accurately detect a ship's arrival.

Solution

- The Q130R radar sensor functions are unaffected by wind, rain, fog, light, humidity, and air temperature, making it ideal for outdoor harbor conditions
- The radar sensor detects objects up to a specified distance, ignoring objects and backgrounds beyond the set point, allowing for accurate ship detection



DIP Switches Configurable

Train Detection Including Flatbeds and Tank Cars

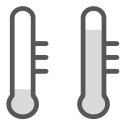


Challenge

Railways present many difficulties for sensing equipment. The harsh and dirty environment is extra challenging. Passing trains create high winds and kick up dirt. Proper identification of the content on cargo trains is essential. Radar sensors detect container trains to activate RFID antennas.

Solution

- The Q130R radar sensor is an effective alternative to ultrasonic or photoelectric sensors
- Radar technology is unaffected by wind or by dust and dirt buildup on the sensor
- FMCW radar can detect both stationary and moving targets, making it a more reliable solution than doppler radar



Resistant to Weather

Loading Dock Monitoring, Vehicle Counting

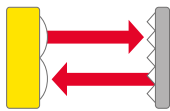


Challenge

For an efficient flow of products in and out of a truck, it is important that operators are immediately notified of a truck's arrival. In order to accurately detect the presence of vehicles at a loading dock, a reliable sensor is needed to withstand extreme weather conditions.

Solution

- The T30R can be set up as a retroreflective sensor to provide the most reliable detection with no dead zone
- Compact housing for simple installation



Retroreflective Sensing

Detecting Parking Spot Availability in a Public Ramp

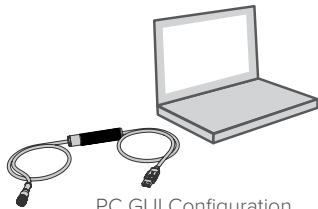


Challenge

Drivers entering major multi-level parking structures often struggle to find open parking spaces. To improve efficiency, a method is needed to inform them of real-time parking availability and guide them to the appropriate open spaces.

Solution

- Placing a K50R sensor above each parking space, provides an accurate method for counting the number of occupied or available parking spaces, and presenting that data to incoming drivers
- K50R sensors can be placed in ramps that are exposed to outdoor air and varying temperatures
- K50R Pro sensors feature RGB LEDs, which can be set to illuminate red or green depending on the availability (or lack of availability) of a given space
- Radar sensors provide a cost-competitive alternative to other parking-spot-sensing systems



Vehicle Detection (continued)



Car Wash

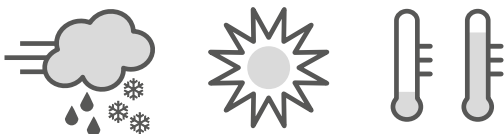


Challenge

Reliably detecting a vehicle in a car wash can be problematic. Steam, fog, water spray, and temperature changes are challenging for some types of sensors.

Solution

- The T30R uses radio waves to reliably detect the vehicle, ignoring fog, steam and water
- The IP67-rated housing dependably operates in a wet environment
- Superior temperature stability provides consistent measurements even during extreme temperature swings



Resistant to Weather

Electric Vehicle Charging

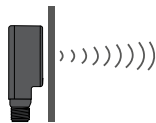


Challenge

Shared electric vehicle services require a method to keep unauthorized non-electric vehicles from parking at charging stations, which are generally located in outdoor public places.

Solution

- A K50R radar sensor installed inside a charging station can detect the presence of a vehicle parked at that station, at any time of day and in any weather condition
- If a parked vehicle is detected but not plugged in for charging, a signal is sent to a central location, alerting authorities so that the vehicle can be removed
- Because the K50R has a short operating range with a maximum distance of 2.5 meters, it can safely ignore irrelevant targets outside of the parking area
- The sensor can be housed within the body of typical charging stations to prevent potential vandalism



Ignore Certain Materials within Dead Zone



Tank-Level Monitoring

Storage tanks, totes, and containers can be found in a wide variety of environments, from indoor or outdoor installations to above or below ground deployments. Properly monitoring and managing levels inside these tanks can help owners and asset managers increase productivity and profitability.

Plastic Tank Level

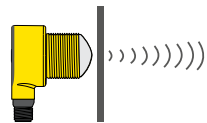


Challenge

Mounting a sensor inside a tank is often impractical, and it is not an ideal setup if direct contact with a liquid substance could damage or negatively affect the sensor.

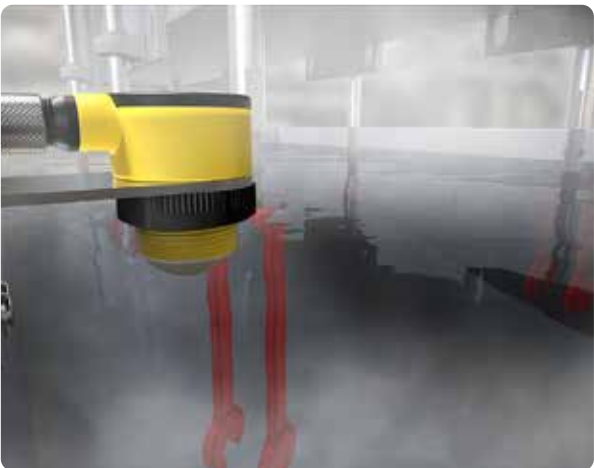
Solution

- Easily installed outside the tank with the SMBT30RTM tank bracket
- The high-frequency radio wave signal penetrates through the plastic container wall down to the liquid's surface.



Ignore Certain Materials within Dead Zone

Quench Tank Level



Challenge

When die-cast metal parts are hardened in a quench tank, the liquid level must be refilled to ensure that the parts are completely submerged. Ultrasonic and photoelectric sensors would not be effective for tank-level measurement because the process releases large amounts of steam.

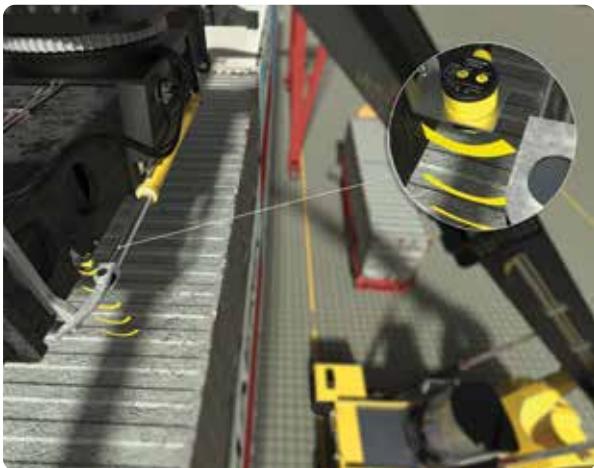
Solution

- The T30R Near Range sensor uses radar to detect targets, which is effective even in the presence of steam that obscures the visibility of liquid levels
- The T30R series also excels in the presence of moisture, and it features an IP67-rated housing to protect electronic components in wet environments
- Accurate liquid level readings are especially crucial for smaller quench tanks; fortunately, the Near Range T30R features improved performance at close range, compared to the standard T30R, and a short dead zone of only 100 mm



Precise Measurement

Reach Stacker

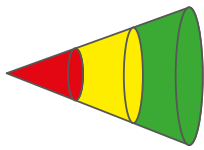


Challenge

At large ports, shipping containers need to be quickly and safely moved from one place to another. Because of this speed, lifting equipment often collides with containers, resulting in lost time and damaged goods and equipment.

Solution

- The T30R with dual discrete outputs can provide collision protection with safe speed and stop positions
- The robust IP67-rated housing and radar beam is ideal for working outdoors



Dual Zone

Ground Support Equipment



Challenge

Damaging an airplane results in expensive repairs and disruptive delays, as any contact with the aircraft requires it to be pulled from service for inspection. New standards are requiring ground support equipment such as baggage handlers to be equipped with collision-avoidance sensors such as the T30R.

Solution

- The T30R measures the distance of ground support equipment from the aircraft and signals an alert when it reaches a programmed distance to prevent collisions
- The T30R's 45° beam pattern reliably detects curved surfaces, such as the body of an airplane
- Radar sensors are resistant to ambient weather and temperature changes



Precise Detection



Wide Beam Radar Sensors

Collision Avoidance

In many industries including ports, mining, and agriculture, mobile equipment is a large investment, and damage to that equipment results in downtime and requires costly repair or replacement. Banner Engineering's radar sensors are the perfect rugged solution for collision avoidance, even in harsh outdoor conditions. Sensing functions are unaffected by wind, rain or snow, fog, sunlight, humidity, and fluctuating air temperatures. The sensors also utilize a robust steady-state design that is more durable than laser products with moving parts.



(Indoor) Overhead Crane in Dusty or Harsh Environments

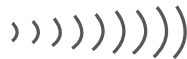


Challenge

Detection from cranes to prevent collision during operation can be extra challenging in dusty or harsh environments.

Solution

- The narrow beam Q240R is used to avoid the roof and other indoor obstacles
- Radar works in dusty environments where laser products are not as reliable
- It has no moving parts, and its rugged design resists high-shock and vibration conditions, making it a more reliable solution than tradition laser scanners



Narrow Beam Radar Sensors

Collision Avoidance

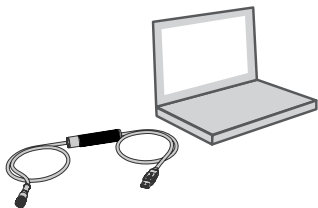


Challenge

Collision avoidance solutions for mining equipment minimize the risk of accidents, save costs, and improve efficiency. Poor visibility, blind spots, dust and debris, and ambient weather conditions can reduce the effectiveness of collision-avoidance measures.

Solution

- Q130RA radar sensors are installed at the front and rear of mining vehicles and provide active object detection in vehicle blind spots
- The Q130RA is unaffected by dirt, dust, wind, rain, and other environmental challenges
- The IP67-rated housing ensures reliable operation even in harsh conditions



PC GUI Configuration

Crane-to-Crane Proximity Detection

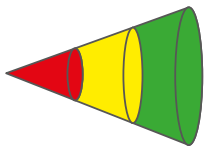


Challenge

When multiple cranes are moving in tight spaces, it's imperative to ignore adjacent shipping containers while reliably detecting the presence of another crane or obstacle to activate stop or warning signals for the operator.

Solution

- The Q240R radar sensor features a very narrow 11° by 13° beam pattern, which is ideal for monitoring a specific area without detecting adjacent objects
- With two independent, adjustable sensing zones, the sensor provides far and near proximity warning signs with the capability to detect objects up to 100 m away
- Extremely robust; provides reliable detection capabilities, which are ideal for outdoor applications



Dual Zone

RTG Collision Avoidance



Challenge

Rubber tire gantry cranes (RTG) are used in port and mobile equipment industries to transport heavy and cumbersome loads. Since RTG cranes are hauling such large loads, it is vital to ensure they move safely throughout the port area to avoid collisions.

Solution

- The Q120R radar sensor has a narrow beam pattern, high sensitivity, and long-range detection to view obstacles in the way of the crane
- The sensor has no moving parts, and its rugged design resists high-shock and vibration conditions better than laser scanners



No Moving Parts

Radar Configuration Software Overview

The Banner Radar Configuration Software and Pro-Kit with Converter Cable allow for easy setup and configuration of range, sensitivity, and output.

- Get up and running in three easy steps: simply set the switch point distance, signal strength threshold, and response time using the intuitive configuration software. Now the radar sensor is ready to begin detecting targets.
- Easily monitor status via the software or bright on-board LED indicators.
- Visualize the application in real-time.
- Make adjustments to settings on the fly.

Navigation Toolbar

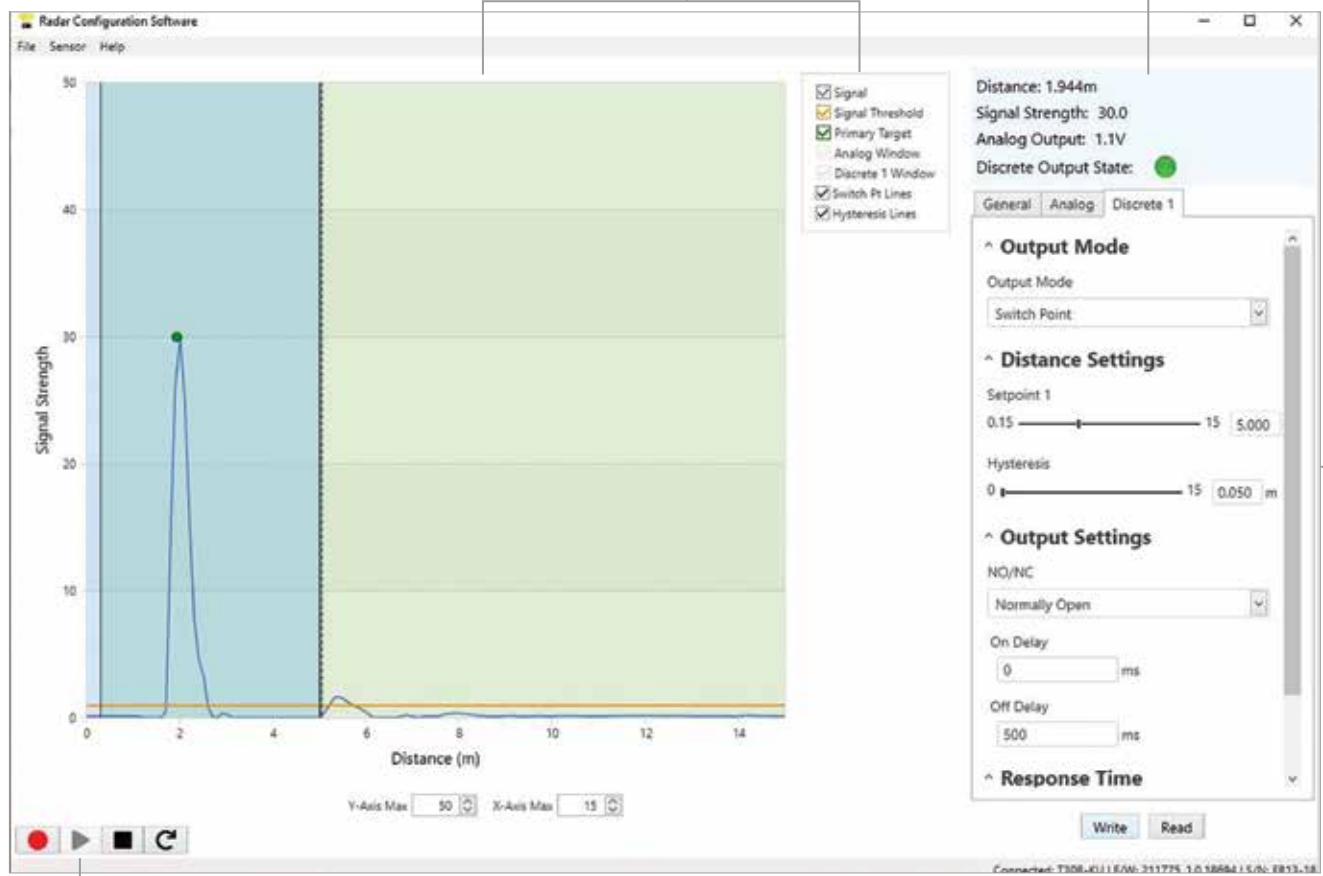
Connect to the sensor, save or load a configuration, or reset to factory defaults

Live Sensor Data and Legend

Signal strength versus distance, select options to display data on the graph

Summary pane

Displays the distance to the target, the signal strength, and the output status



Live Sensor Data Controls

Record, freeze, and play real-time sensor data

Status Bar

Shows that the sensor is connected, a software update is available, and if the sensor data is being recorded to a file

Sensor Settings

Set the sensor parameters



T30R Series

Bridges the Gap Between Radar and Ultrasonics

- Operates at 122 GHz with two independent, adjustable sensing zones, which enables higher-precision measurements with a narrow or wide beam pattern up to 15 meters away
- Compact, rugged IP67-rated housing for operation in harsh environments
- Detects a wider range of targets than traditional 24 GHz radar, including high-dielectric materials like metal and lower-dielectric materials like wood, rock, or organic material
- Dual discrete outputs for slow and stop positions or analog and IO-Link for absolute measurement values
- Radar configuration software, IO-Link, remote teach, and push buttons for flexible setup
- Pulse Pro output for direct process feedback that only requires power
- The T30R-1515, in both Standard and Near Range versions, offers the most precise measurement and ignores objects outside of a region of interest, making it ideal for vehicle detection, tank-level monitoring, and positioning feedback

Beam Pattern	Linearity	Detection Range	Telecom Approval	Output	Model
15° x 15°	< ±20 mm at < 500 mm < ±4 mm > 500 mm	0.15–15 m	US, Europe, UK, Australia/New Zealand, Malaysia	2 Discrete (NPN/PNP configurable) with IO-Link and Pulse Pro	T30R-1515-KDQ
				1 Analog (4–20 mA) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-KIQ
				1 Analog (0–10 V) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-KUQ
15° x 15°	< ±4 mm	0.1–6 m	US	2 Discrete (NPN/PNP configurable) with IO-Link and Pulse Pro	T30R-1515-CKDQ
				1 Analog (4–20 mA) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-CKIQ
				1 Analog (0–10 V) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-CKUQ
15° x 15°	< ±20 mm at < 500 mm < ±4 mm > 500 mm	0.15–25 m	US, Europe, UK, Australia/New Zealand, Malaysia	2 Discrete (NPN/PNP configurable) with IO-Link and Pulse Pro	T30R-1515-LKDQ
				1 Analog (4–20 mA) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-LKID
				1 Analog (0–10 V) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-1515-LKUQ
45° x 45°	< ±20 mm at < 500 mm < ±4 mm > 500 mm	0.3–10 m	US, Europe, UK, Australia/New Zealand, Malaysia	2 Discrete (NPN/PNP configurable) with IO-Link and Pulse Pro	T30R-4545-KDQ
				1 Analog (4–20 mA) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-4545-KIQ
				1 Analog (0–10 V) 1 Selectable Discrete (PNP/NPN) with IO-Link	T30R-4545-KUQ

To order the pigtail QD model, add a "P" to the end of the model number (e.g., T30R-1515-KDQP)

Accessories



SMB30A

right-angle bracket



SMB30MM

right-angle bracket with curved mounting slots



SMB30SC

split clamp with swivel bracket



SMB30FA

swivel bracket with tilt and pan movement



SMBT30RTM

tank mounting bracket



SAFT30R-PVC-G2

M30 to 2 in. NPT adapter



PRO-KIT

Required for PC configuration



K50R Series

Robust Detection, Industrial Package

- For detection and measurement of moving and stationary targets
- Self contained, all-in-one solution
- Bright, visible indication; available in Pro models with configurable LEDs
- Easy setup and configuration of range, sensitivity, and output using the Banner Radar Configuration Software
- Compact, rugged IP67-rated housing withstands harsh environments

Beam Pattern	Range	Type	Telecom Approval	Output	Model
80° x 60°	100 mm–3 m	Standard	US, Europe, UK, Canada, Australia/ New Zealand	2 Discrete (NPN/PNP configurable) with Pulse Pro	K50RF-8060-LDQ
	100 mm–3 m	Pro with Configurable LEDs			K50RPF-8060-LDQ



Q130RA Series

PC GUI Configurable, Narrow and Wide Beam Sensor

- One adjustable sensing zone to reliably detect moving or stationary objects up to 40 meters away
- Simple setup and precise control with intuitive graphical user interface
- Unaffected by ambient weather, including rain, snow, fog, sunlight, and temperatures from -40 to 65° C
- Rugged IP67-rated housing for dependable long-term operation in harsh environments

Beam Pattern	Range	Telecom Approval	Output	Model
90° x 76°	24 m	US, Europe, UK, Canada, China, Australia/New Zealand, Brazil	Bipolar NPN/PNP N.O./N.C. Configurable	Q130RA-9076-AFQ
24° x 50°	40 m	US, Europe, UK, China, Australia/ New Zealand, Brazil		Q130RA-2450-AFQ

Accessories



MQDC-506-USB
pro converter
cable

Accessories



SMBWSQ120
rear-mount
rain cover



SMBQ240SS1
bracket for ±20°
of tilt on one axis



SMBQ240SS2
bracket for ±20° of
tilt on second axis



SMBQ240SS3
bracket for ±20° of
tilt in all directions



Q130WS
hydrophobic
coated rain cover



MQDC-506-USB
pro converter
cable



Q240RA Series

Narrowest Beam, Longest Range Sensor

- Reliably detect moving or stationary objects within a narrow beam pattern up to 100 meters away
- Two independent, adjustable sensing zones
- Narrow 11° × 13° beam pattern
- Rugged IP67-rated housing withstands harsh environments

Range	Output	Telecom Approval	Model
40 m	2 Discrete (NPN/PNP configurable)	US, UK, Canada, Brazil, Mexico, Taiwan	Q240RA-US-AF2Q
		US, Europe, UK, Australia/New Zealand, Brazil, Japan, Singapore, South Korea	Q240RA-EU-AF2Q
		China	Q240RA-CN-AF2Q
100 m	2 Discrete (NPN/PNP configurable)	US, UK, Canada, Brazil, Mexico, Taiwan	Q240RA-US-AF2LQ
		US, UK, Europe, Australia/New Zealand, Brazil, Japan, Singapore, South Korea	Q240RA-EU-AF2LQ
		China	Q240RA-CN-AF2LQ
100 m	1 Analog (0–10 V) and 1 Selectable NPN/PNP	US, UK, Canada, Brazil, Mexico, Taiwan	Q240RA-US-ULQ
100 m	1 Analog (4–20 mA) and 1 Selectable NPN/PNP	US, UK, Canada, Brazil, Mexico, Taiwan	Q240RA-US-ILQ
		US, Europe, UK, Australia/New Zealand, Brazil, Japan, Singapore, South Korea	Q240RA-EU-ILQ



QT50R Series

QT50R Series sensors are available in both adjustable-field models, which can use diffuse sensing to detect an object, or in retroreflective models, which use a reference signal retroreflective target, floor, wall, or other stationary object) for reliable detection of weak objects.

QT50R-AF

Widest Beam, Small Package

- Detects objects up to 24 m away
- Analog and discrete outputs available
- One or two independent, adjustable sensing zones
- Total beam pattern 90° (± 45) x 76° (± 38)
- Rugged IP67-rated housing withstands harsh environments

QT50R-RH

Robust Retroreflective Sensing Mode

- Detects objects up to 12 m away
- Effective beam equals size of retro target
- Ignores objects in the background beyond the retroreflective target
- Rugged IP67-rated housing withstands harsh environments

Range	Sensing Mode	Output	Telecom Approval	Model
24 m	Adjustable-field	Bipolar NPN/PNP	US, UK, Canada, and Brazil	QT50R-US-AFHQ
			US, Europe, UK, Australia/New Zealand, Japan, China	QT50R-EU-AFHQ
			South Korea*	QT50R-KR-AFHQ
			Taiwan	QT50R-TW-AFHQ
24 m	Adjustable-field	2x Bipolar NPN/PNP	US, UK, Canada, and Brazil	QT50R-US-AF2Q
			US, Europe, UK, Australia/New Zealand, Japan, China	QT50R-EU-AF2Q
			Taiwan	QT50R-TW-AF2Q
24 m	Adjustable-field	2x Selectable NPN/PNP and 0–10 V analog	US, Europe, UK, Australia/New Zealand	QT50R-EU-AF2UQP
3.5 m	Adjustable-field	Bipolar NPN/PNP	US, Europe, UK, Australia/New Zealand, Japan, China	QT50R-EU-AFSQ
0 to 12 m	Retroreflective	Bipolar NPN/PNP	US, UK, Canada, and Brazil	QT50R-US-RHQ
			US, Europe, UK, Australia/New Zealand, Japan, China	QT50R-EU-RHQ

For five-wire 2 m integral cable versions, remove suffix Q from the model number (e.g., QT50R-EU-AFH)

* Models for South Korea: 12 to 24 V dc

Accessories



SMBQ240SS1
bracket for ±20° of tilt on one axis



SMBQ240SS2
bracket for ±20° of tilt on second axis



SMBQ240SS3
bracket for ±20° of tilt in all directions



Q240WS
hydrophobic coated rain cover



BRTR-CC20E
corner-cube reflector (required with -RH models)



QT50RCK
weather deflector



SMB30SC
split clamp bracket with swivel



SMB30MM
right-angle bracket with curved mounting slots



QT50RWS
hydrophobic coated rain cover



Banner Engineering manufactures industrial automation products that include sensors, LED lights and indicators, machine safety components, and industrial wireless devices. These products help produce the cars we drive, the food we eat, the medicine we take, and many of the things we touch every day. Headquartered in Minneapolis since 1966, Banner is an industry leader with more than 10,000 active products, operations on six continents, and over 5,500 employees, factory and field representatives, and application engineers. Every 3.5 seconds a Banner product is installed somewhere in the world.

