R-GAGE® T30R Sensor

more sensors, more solutions

Quick Start Guide

Radar-Based Sensors for Detection and Measurement of Moving and Stationary Targets

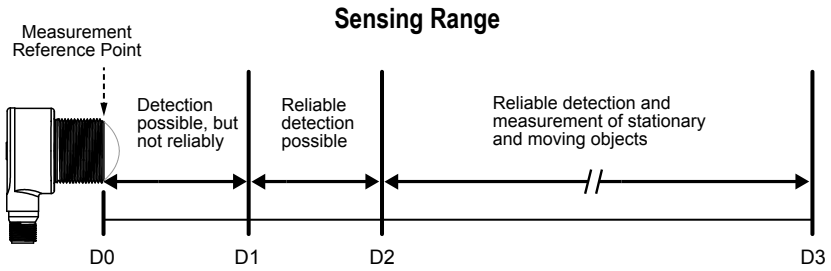
This guide is designed to help you set up and install the R-GAGE T30R sensor. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at www.bannerengineering.com. Search for p/n 217048 to view the Instruction Manual. Use of this document assumes familiarity with pertinent industry standards and practices.

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.

Overview

Figure 1. Sensing Range



Model	D0 (m)	D1 (m)	D2 (m)	D3 (m)
T30R-1515 Models	0	0.15	0.30	15
T30R-4545 Models	0	0.30	NA	10

Features and Indicators

Figure 2. T30R Features

	LED	Color	Description
1	Power	Green	Power ON
2	Signal Strength	Red	Flashes in proportion to the signal strength
3	Output 1	Amber	Target is within the taught analog span or discrete output status
4	Output 2	Amber	Discrete output status
5	NO/NC	Amber	Normally open/normally closed status of discrete output Dual discrete models have two LEDs
6	n/a	n/a	Output Teach buttons

Installation Instructions

Install the Software

Operating System
Microsoft® Windows® operating system version 10 [1]

Hard Drive Space
500 MB

Third-Party Software
.NET

USB Port
Available USB port

Important: Administrative rights are required to install the Banner Radar Configuration software.

[1] Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries.

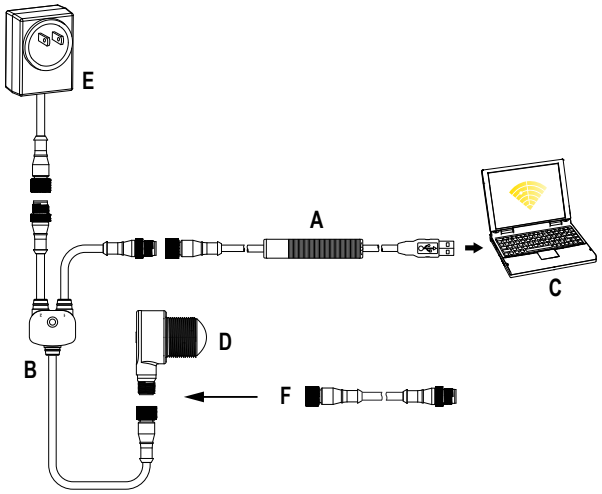
1. Download the latest version of the software from www.bannerengineering.com/us/en/products/sensors/software/radar-configuration.html.
2. Navigate to and open the downloaded file.
3. Click **Install** to begin the installation process.
4. Depending on your system settings, a popup window may appear prompting to allow Banner Radar Configuration to make changes to your computer. Click **Yes**.
5. Click **Close** to exit the installer.

Mount the Device Using the Threaded Barrel

1. If your device came with a lock washer, place the lock washer on the barrel of the device.
2. Insert the barrel of the device though a hole or a bracket.
   - If desired and available, insert the device through an appropriately sized hole in the machine or equipment at the desired location.
   - If a bracket is needed, insert the device into the bracket.
3. Thread the mounting nut onto the barrel of the device, finger tight.
4. If using a bracket, mount the device and the bracket to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
5. Check the device alignment, aiming it near parallel to, or down towards, the ground.

   If aiming at a target, alignment and signal strength can be checked via the red Signal Strength LED or the Banner Radar Configuration Software.
6. Tighten the nut.
7. If using a bracket, tighten the mounting screws to secure the device and the bracket in the aligned position.

Connect to the Sensor

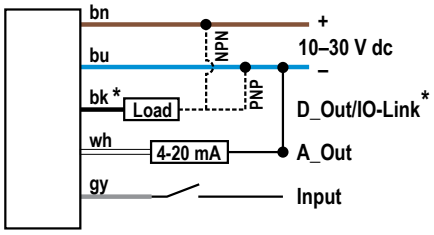


A = Pro Converter Cable (MQDC-506-USB)
B = Splitter (CSB-M1251FM1251M)
C = PC running Banner Radar Configuration software
D = T30R
E = Power Supply (PSW-24-1 or PSD-24-4)
F = Optional 5-Pin to 5-Pin Double-Ended Cordset (ex. MQDEC3-515SS)

Wiring

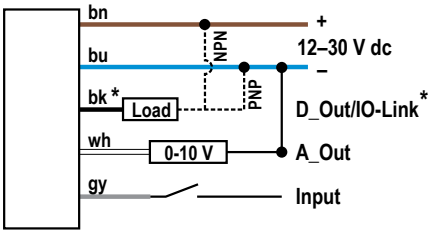
Quick disconnect wiring diagrams are functionally identical.

Push-pull Output and Analog Current Output



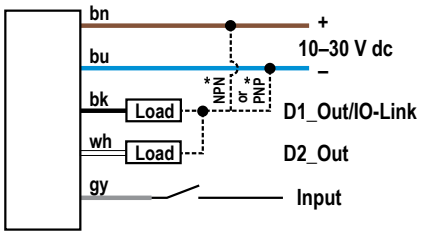
*** Push-Pull output. User-configurable PNP/NPN setting.**

Push-pull Output and Analog Voltage Output



*** Push-Pull output. User-configurable PNP/NPN setting.**

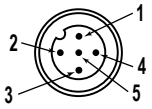
Dual Discrete Output



*** Push-Pull output. User-configurable PNP/NPN setting.**

Key:

1 = Brown
2 = White
3 = Blue
4 = Black
5 = Gray (Connect for use with remote input or Banner Radar Configuration software)



Getting Started

Power up the sensor, and verify that the power LED is ON green.

Connect to the Sensor

1. Connect the sensor to the splitter cable from the PRO-KIT.
2. Connect the external power and Pro Converter cable to the splitter cable.
3. Connect the Pro Converter cable to the PC.
4. Open the Banner Radar Configuration Software.
5. Go to **Sensor** > **Connect** on the **Navigation** toolbar.
   The **Connection** screen displays.
6. Select the correct **Sensor Model** and **Com Port** for the sensor.
7. Click **Connect**.
   The **Connection** screen closes and the sensor data displays.

Specifications

Range
The sensor can detect an object at the following ranges, depending on the material of the target:
T30R-1515 models:
Detection Range: 0.15 m to 15 m (0.5 ft to 49.2 ft)
Measurement Range: 0.3 m to 15 m (1.0 ft to 49.2 ft)
T30R-4545 models:
Detection Range: 0.3 m to 10 m (1.0 ft to 32.8 ft)
Measurement Range: 0.3 m to 10 m (1.0 ft to 32.8 ft)

Operating Principle
Frequency modulated continuous-wave (FMCW) radar

Operating Frequency
122 GHz

Supply Voltage (Vcc)
Analog Voltage models: 12 V DC to 30 V DC
Analog Current and Dual Discrete models: 10 V DC to 30 V DC
Use only with a suitable Class 2 power supply (UL) or Limited Power Supply (CE)

Power and Current Consumption, exclusive of load
Power consumption: < 2.4 W
Current consumption: < 100 mA at 24 V DC

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

Linearity [2]
< ± 4 mm

Delay at Power-up
< 300 ms

Output Configuration
Analog Outputs:
·**Current models**
Discrete Output (Black Wire): IO-Link, push/pull output, configurable PNP or NPN output
Analog output (White Wire): 4 mA to 20 mA
·**Voltage models**
Discrete Output (Black Wire): IO-Link, push/pull output, configurable PNP or NPN output
Analog output (White Wire): Configurable 0 V to 10 V or 0.5 V to 4.5 V
·**Dual Discrete models**
Discrete Output 1 (Black Wire): IO-Link, push/pull output, configurable PNP or NPN output
Discrete Output 2 (White Wire): Configurable PNP or NPN, or Pulse Frequency Modulated (PFM) output

Repeatability [3]
< 1 mm

Maximum Output Power
EIRP: 100 mW, 20 dBm

Output Protection
Protected against output short-circuit

Remote Input
Allowable Input Voltage Range: 0 to Vsupply
Active High (internal weak pull-down): High state > (Vsupply - 2.25 V) at 2 mA maximum
Active Low (internal weak pull-up): Low state < 2.25 V at 2 mA maximum

Response Time
Analog update rate: 2 ms
Discrete output response: 6 ms
Speeds given for fast mode. See the Instruction Manual for additional details.

Indicators
Power LED: Green, power on
Signal Strength LED:
Red Flash: weak signal
Red Solid: 4× threshold
Output LEDs: Amber, target within taught analog span/discrete output status
NO/NC LED: Amber, normally open/normally closed status of discrete output
See Figure 2 on p. 1

Construction
Housing: PBT
Window: COP

Connections
Integral M12 quick disconnect
150 mm (6 in) PUR cable with an M12 quick disconnect
Models with a quick disconnect require a mating cordset

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 acceleration) requirements. Method 213B conditions H&I.Shock: 75G with device operating; 100G for non-operation

Operating Temperature
–40 °C to +65 °C (–40 °F to +149 °F)

Temperature Effect
< ± 10 mm from –40 °C to +65 °C (–40 °F to +149 °F)

Environmental Rating
IEC IP67

[2] At ranges ≥ 0.5 m, from 0.3 m to 0.5 m, linearity ≤ ±15 mm. Reference target with RCS = 1m²
[3] Repeatability < 10 mm at Excess Gain < 10×.

Output Ratings

Analog Outputs:
· **Current Output (T30R….-.I.. models):** 1 kΩ maximum load resistance at 24 V; maximum load resistance = [(Vcc - 4.5)/0.02 Ω]
· **Voltage Output (T30R….-.U.. models):** 2.5 kΩminimum load resistance
Discrete Outputs:
· **Current rating = 50 mA maximum each**

Black wire specifications per configuration		
IO-Link Push/Pull	Output High	≥ Vsupply - 2.5 V
	Output Low	≤ 2.5V
PNP	Output High	≥ Vsupply - 2.5 V
	Output Low	≤ 1V (loads ≤ 1 MegΩ)
NPN	Output High	≥ Vsupply - 2.5 V
	Output Low	≤ 2.5 V

White wire specifications per configuration		
PNP	Output High	≥ Vsupply - 2.5 V
	Output Low	≤ 2.5 V (loads ≤ 70 kΩ)
NPN	Output High	≥ Vsupply - 2.5 V
	Output Low	≤ 2.5 V

Certifications

UL Environmental Rating: Type 1

ETSI EN 305 550-1 V.1.2.1
ETSI EN 305 550-2 V.1.2.1
FCC/CFR-47 part 18
for others, contact Banner Engineering
Country of Origin: USA

Beam Patterns

The beam pattern of the radar sensor is dependent on the radar cross section (RCS) of the target.

The beam pattern graphs are guides for representative object detection capabilities based on different sized radar cross sections and corresponding example real world targets. Use the following charts as a starting point in application setup. Note that applications vary.

- Use the Beam Width versus Distance chart to understand where corresponding objects can be detected. Adjusting the signal strength threshold also affects the beam pattern when the target is constant.
- Use the Beam Width versus Degrees chart to help determine how much the target can tilt from 90 degrees while still maintaining detection.

Unless otherwise specified, the following beam patterns are shown with Signal Strength Threshold = 1.

T30R-1515 Models

Figure 3. Typical beam pattern, in meters, of T30R-1515 on representative targets

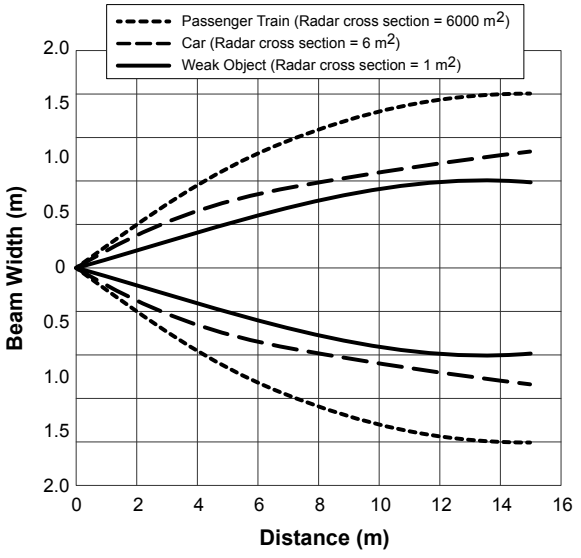
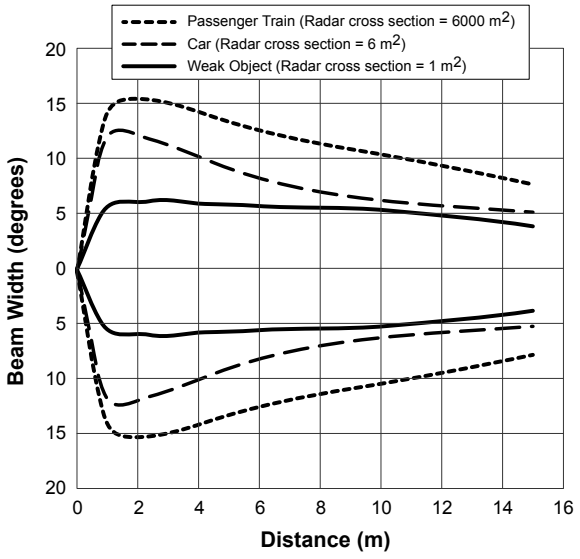


Figure 4. Typical beam pattern, in degrees, of T30R-1515 on representative targets



T30R-4545 Models

Figure 5. Typical beam pattern, in meters, of T30R-4545 on representative targets

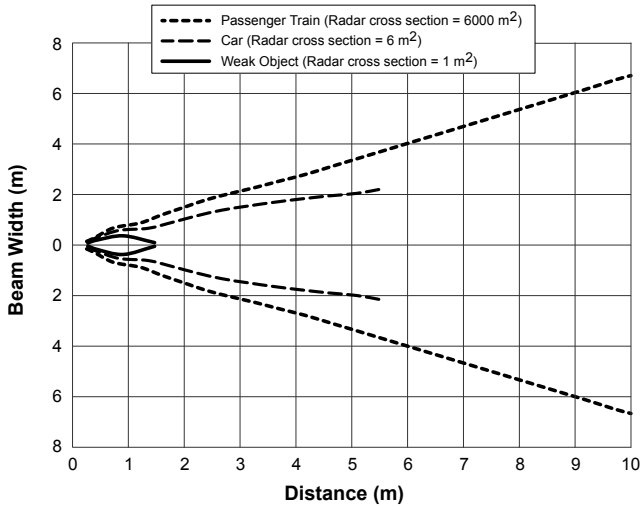


Figure 6. Typical beam pattern, in degrees, of T30R-4545 on representative targets

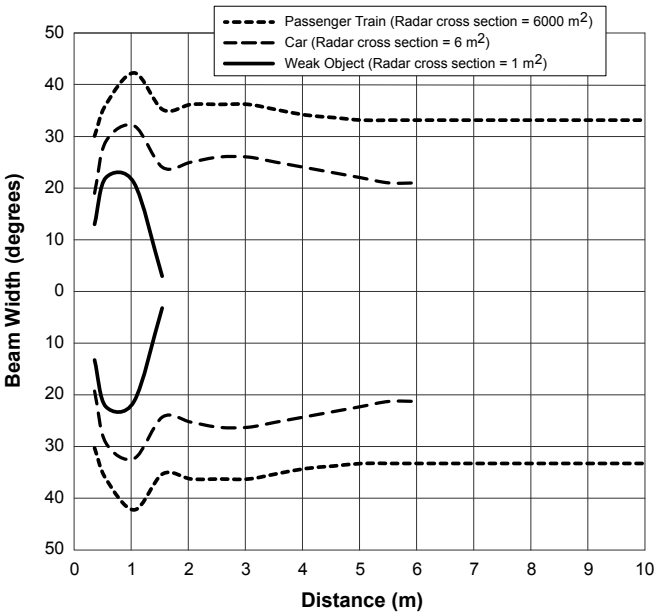
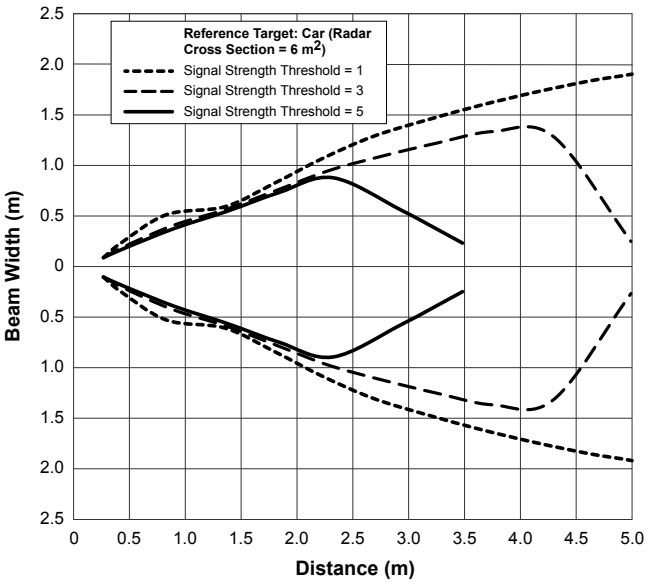


Figure 7. Typical Beam pattern, in meters, of T30R-4545 with fixed target and various Signal Strength Thresholds



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