How to Demo the Sensors Demo Kit



The sensors demo kit is designed to show off a wide variety of different sensor technologies offered by Banner. The kit comes in a case with an empty foam insert that you can fill with other sensors of your choosing, depending on what you'd like to show off or what fits in your territory. There are two bases with a variety of sensors mounted and wired to a junction block for a plug and play demo.

Demo Kit (DK-SENSORSDEMO KIT)

Plate 1 Models	Part Number	Description
QS18EP6XLPCQ8	97634	QS18 Photoelectric Sensor
Q4XTKLAF600-Q8	801918	Q4X Laser Distance Sensor
Q2XABAF150-Q5	801304	Q2X Miniature Sensor

Plate 2 Models	Part Number	Description
T30UXDAQ8	79995	T30UX Ultrasonic Sensor
K50RPB-4030-LDQ-DKSENS	818470	K50R Radar Sensor
K50Z-FA2000KD-Q8-DKSENS	814468	K50Z Multipoint Sensor

In this kit, most sensors are preconfigured for their demos. But the Q4X will be programmed during the demo to show off several features. It is always a good idea to set the Q4X to its factory defaults before the demo. This can be done beforehand or in front of the customer to prove it's in its factory defaults.

To Reset the Q4X

Action	Result
Press and hold the Mode button for 2 seconds	The display will read out1
Press the Mode button once	The display will read rSEt
Press the middle button once	The display will read no
Press the Mode button once	The display will read YES
Press the middle button once	The display will flash and the sensor will return to run mode

The Sensor Selection Guide brochure will be a great reference during this demonstration and it's recommended to show at the end of each section to illustrate the many different families of each technology.

Sensor Selection Guide

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Photoelectrics: Find the sensor that fits your needs

Photoelectric sensors are a non-contact sensing method. They have very fast response speeds and offer several different sensing modes to allow a lot of flexibility in solving an application. The first sensor to demo is the QS18. The QS18 family has **a comprehensive range of sensing modes** that can detect nearly any target, regardless of surface finish, including clear. It has **a familiar form factor** so a customer can standardize on cables, brackets, and other accessories while utilizing different sensing modes.

This QS18 is a retroreflective sensor. That means it contains both the emitter and receiver elements in the same housing, and bounces emitted light off a reflective target opposite the sensor back to the receiver. When the light gets blocked, the output is going to change. This is **a very robust sensing mode** because all it requires is for the beam to be blocked. There is a similar sensing mode to this called opposed mode. The biggest difference between opposed and retro is instead of using a reflector, there is a separate receiver unit. The big benefit of opposed mode sensing is there is a lot **more power, also called excess gain**, because there is a direct transmission path from emitter to the receiver. This **translates to longer ranges and better performance in dusty or dirty environments**. One potential downside to opposed mode sensors is power needs to be on both sides of the setup.

Opposed mode and retro sensing modes are very good at detecting nearly any target: dark, light, or shiny. But one target that can be particularly challenging for photoelectric sensors is a clear target. Fortunately, this QS18 is a clear object detection model which has **a special algorithm that allows it to see clear objects**.

Teach the QS18 to reliably detect clear objects.

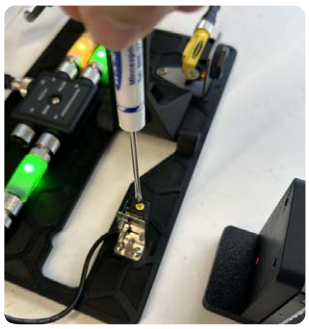
Action	Result
Align the reflector to the sensor and make sure no targets are in the way.	
Press and hold the button 2 or more seconds.	The green LED will flash 3 times. Then both LEDs will rapidly flash 5 times then return to run mode.

Present the clear object and note the output switching.

Photoelectrics: Convenient one-sided sensing solutions

The QS18 shows the beam break sensing modes, but there is also beam make. The difference between the two is, instead of breaking the beam with the target, the target reflects the light back to the receiver, which will be demonstrated by the Q2X. The Q2X is Banner's miniature photoelectric family. It's **very small to fit into tight spaces** and has **many different sensing modes**. This Q2X is an adjustable field background suppression sensor with a range of 150 millimeters (6 inches). That means it can ignore objects in the background and only detect targets in front of a certain cutoff distance.

Configure the Q2X adjustable field sensor



1. With a screwdriver, turn the screw on the Q2X clockwise 2 or 3 turns.

2. Present a target to demonstrate diffuse detection.

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1. Position the back side of the reflector stand in front of the Q2X, 3 to 4 inches away.

2. With a screwdriver, turn the screw until the amber LED turns on.

3. Turn the screwdriver counterclockwise until the amber LED just turns off.

4. Present a target to show detection is possible while ignoring the background condition.

These are some examples of Banner's photoelectric offerings, and there are many other form factors and sensing modes available. With all this variety, photoelectrics are a fantastic option for detecting nearly any target.

- Common applications:
    - o Presence/absence
    - o Leading edge detection
- Show the Sensor Selection Guide Brochure

Laser Measurement: Best-in-class combination of accuracy, range, and versatility

The Q4X is a laser distance measurement sensor. It can tell if something is present or not, and it can also tell where that thing is. The Q4X is an easy to use, problem solving sensor. There are three buttons on top and a seven segment, 4-digit display to program everything locally. It also has IO-Link and a remote input wire giving full programmability however you need it. The Q4X has an **IP67, IP68, and IP69K FDA-grade stainless-steel housing** for use in harsh environments, including high temperature, high pressure washdown. The rugged design **resists mechanical impact, overtightening, and extreme vibration**. The laser provides powerful sensing, even on dark targets, and a small spot size makes alignment simple.

The default teach mode on the Q4X is 2-point teach. For that, the sensor is taught two separate points, then a switch point is set halfway in between. This will allow it to ignore anything in the background and only detect the target we want to see.

Remember to reset your sensor before doing the demo!

Action	Result
Raise the arm the Q4X is mounted on	The display shows the distance measured from the face of the sensor to the table
Press and hold the middle button for 2 seconds	The display will read SEt 1St
Place the black plastic of the demo target under the beam	
Press the middle button once	The display will read SEt 2nd
Move the black foam under the beam	
Press the middle button once	A number representing the new switch point will flash on the display, then the sensor returns to run mode

- Move the target from the black plastic to the foam to show it can **provide precise measurement from as close as 25 mm and as far as 610 mm**.
- Move the target from the black foam to the white foam and show the output stays on as the sensor **detects regardless of color**.
- Present the shiny metal and show the output stays off regardless of the background color, demonstrating the sensor's ability to **reliably ignore the background**.
- Pick up the target and present it at a variety of angles to show the **high excess gain** that allows the sensor to maintain detection, even with dark targets at steep angles.
- Explain this is an example of the Q4X's ability to reliably **detect across a variety of target colors, materials, and surfaces, including dark or shiny objects**.

Laser Measurement: Expand the range of problems solved with a single device

Dual mode uses distance and intensity to detect any change. It can be used for contrast or clear object detection by considering both a distance measurement and an intensity value to determine if something has changed. This requires a reference target the Q4X uses to compare the distance and intensity values against. This target can be practically anything but for demo purposes, this will use the foam target.

Put the sensor into Dual mode

1. Press and hold MODE for two seconds until the display changes.
2. Press + until tch1 appears and push the middle button.
3. Press + until DUAL appears.
4. Press and hold SELECT for 2 seconds to confirm the selection and return to Run Mode. The display will read 999P.

Teach the sensor in Dual Mode

Action	Result
Press and hold the middle button for 2 seconds	The display will read SEt On
Present the white foam	
Press the middle button once	The display will flash 75P then return to run mode and read 100P

Present a clear target like the clear demo target, a water bottle, or a pair of glasses. This shows the sensor can enable clear object detection with a static reference target instead of needing a retroreflector. Next, move the target to the black foam. Even though there wasn't a change in distance, the intensity changed so the output switches. This allows the sensor to solve contrast and error-proofing applications.

Another useful note is that the reference point does not need to be within the range of the sensor, allowing for more flexibility in mounting.

- Common applications:
    - o Quality inspection/error proofing
    - o Precision detection and measurement
    - o Detection of difficult targets
- Show the Sensor Selection Guide Brochure

Ultrasonics: Reliably measure clear and liquid surfaces with sound

Ultrasonic technology uses sound waves as its emitted beam. This means it cares much less about the color or finish of the target. It can see light, dark, shiny, and clear targets, as long as the target can reflect sound waves well. It also can provide a measurement of where the target is. This gives ultrasonics an advantage over other technologies when measuring clear targets, especially within the first meter.

The T30UX can be taught minimum and maximum limits to create a range where the output will be conducting.

To teach the T30UX

Action	Result
Press the Discrete button for 2 seconds	The green power LED turns off and the amber output LED turns on
Position the first target about 300 mm (12 in) away from the sensor	The red signal indicator will turn on
Push the Discrete button once	The red signal indicator will be on, and the amber indicator will begin flashing
Position the second target about 600 mm (24 in) away and press the Discrete button again	The sensor will return to run mode

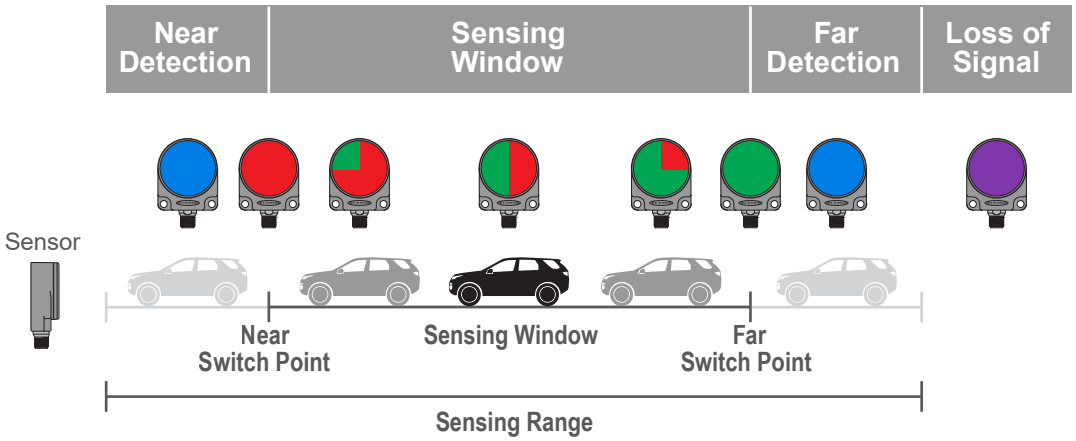
Present the clear plastic target to the T30UX to show detection of the target, regardless of color or finish.

- Common applications:
    - o Detection and measurement of clear and opaque objects
- Show the Sensor Selection Guide Brochure

Radar: Powerful detection and measurement in nearly any environment

Radar is an innovative sensing technology that offers robust sensing in challenging environments. It offers **immunity to ambient weather including rain, snow, sun, dust, and dirt**. It has **long sensing ranges** so it can see targets near and far. Lastly, Banner's radar sensors come in a **variety of beam patterns** ranging from a narrow 15° x 15° to a wide 120° x 40°. And like ultrasonics it can detect and measure clear targets but it has the additional benefits previously stated that ultrasonics lack.

The K50R is connected to a WLS15 light with a special output called Pulse Pro that uses a pulsed frequency modulation (PFM) signal to provide **instant visual feedback without the need for a controller**. The K50R only needs to be connected directly to the light. Also, the K50R has lights built into the face of the sensor that will provide visual, distance feedback. This can be customized to a variety of different colors and animations.



Place your hand, body, or a demo target in the beam of the K50R and move it back and forth to see the distance change on the WLS15 and the K50R. The K50R has been preconfigured for a range of 200 millimeters to 1 meter.

Another advantage of radar is that it can see through certain materials. Something like a tank level application where the sensor cannot be mounted inside the tank. As long as the tank is plastic, the radar sensor can be mounted on the outside and still provide reliable measurement.

Place the black or clear plastic target directly on the lens of the K50R and use your hand or body as a target to show the K50R seeing through the plastic.

- Common applications:
    - o Collision avoidance
    - o Object detection
    - o Level measurement
- Show the Sensor Selection Guide Brochure

3D Time of Flight: Detect more reliably across a wide area

The K50Z is a wide area, multipoint sensor capable of detecting multiple objects. It has a 45° x 45° beam angle and up to 2 meter sensing range for detection in a large area. To demonstrate the wide area, move your hand left, right, up, and down over the sensor to show when the outputs turn on and off. **64 individual measurement points** are available for detection, and which ones are active can be configured in the Banner Measurement Sensor Software. The K50Z is configured with DO1 detecting half of the field of view with a 0.75 meter switch point and DO2 is set to detect the other half with a 0.5 meter switch point.

A target can be anywhere within the sensor's configured field of view and still be detected. This means that a target does not need to present itself in the exact same location every time for reliable detection. Also, because there are **two independently configured outputs**, two separate areas can be monitored with a single sensor, effectively reducing the amount of hardware (sensors, cabling, brackets etc.) needed to do the same job.

- Common applications:
    - o Bin filling
    - o Depalletizing
    - o Wide area detection
- Show the Sensor Selection Guide Brochure