



**PreView**  
**Side Defender® II**

**SDII87**

**Operating Manual**



[www.preco.com](http://www.preco.com)





## FCC STATEMENT

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.

**Warning:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**NOTE:** This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference.

## INDUSTRY CANADA STATEMENT

Per RSS-Gen, Section 8.4 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.

Par RSS - Gen, Section 8.4 Cet appareil est conforme à Industrie Canada exempts de licence standards RSS. Le fonctionnement est soumis aux deux conditions suivantes : ( 1 ) ce dispositif ne peut pas provoquer d'interférences et ( 2 ) cet appareil doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

## REGULATORY COMPLIANCE

The PreView Side Defender®II sensor is compliant with the following countries/regions and their regulations as of the published date of this manual. The sensor may be compliant in other countries/regions. Please check your local regulations or contact PRECO Electronics® for support.

- **United States** - FCC- Part 15.249
  - FCC ID: OXZJCKP2016
- **Canada** - RSS-210 Radio Standards Specification
  - IC ID:20379-PREVIEW24
- **European Union** - ETSI EN300 440-1 Electromagnetic Compatibility and Radio Spectrum Matters (ERM)
- **Australia/New Zealand** - AS/NZ 4268 Radio Equipment and Services – Short Range Devices

### Patent pending

This document may be amended, corrected, and enhanced in keeping with the sensor development progress. The most recent version can be found at [www.preco.com](http://www.preco.com)

## TRADEMARKS

The names of actual companies and products mentioned herein may be the trademarks of their respective owners. Any rights not expressly granted herein are reserved.

# Contents

Product Description .....	1
Sensor Description .....	1
Sensor Interfaces and Configuration .....	3
System Connections.....	4
Object Detection Capability .....	5
System Operation .....	6
Sensor Installation .....	7
Before you Start .....	7
Sensor Location.....	7
Sensor Mounting.....	7
Mounting Tolerances .....	8
Keep Out/Interference Zones .....	9
PreView® Daily Maintenance .....	10
Troubleshooting.....	12
Specifications .....	13
Sensor Pinout .....	14
Warranty Information.....	15
More PRECO Electronics® Safety Products.....	16

# Product Description

The PreView Side Defender®II is the FMCW radar included in the Side Defender®II object detection system that is designed to alert drivers of medium and heavy-duty vehicles of obstacles and vulnerable road users in their side blind zone. The Side Defender®II has intelligent modes of operation to minimize false alerts due to stationary objects such as guardrails and parked cars, while still providing reliable alerts when moving bicycles and other vehicles are in the detection zone.



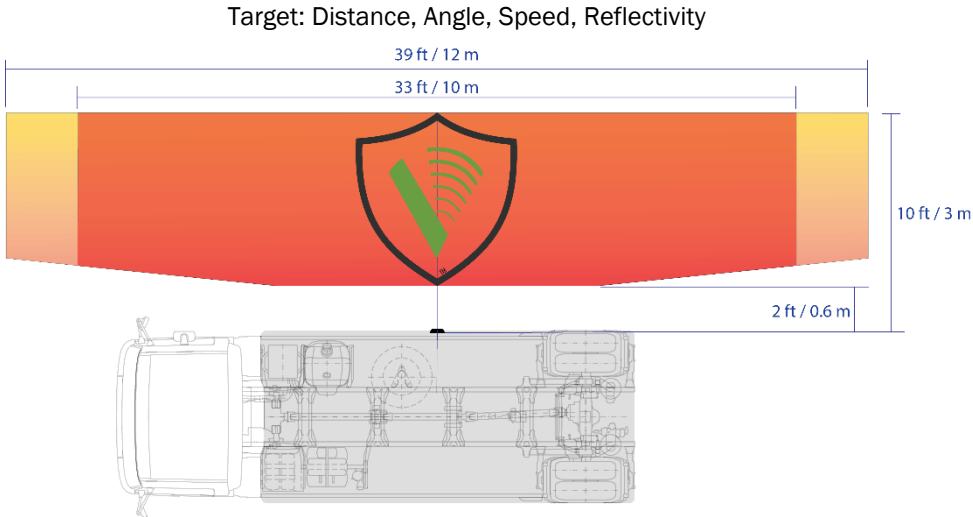
Figure 1- PreView Side Defender®II Radar Sensor

## Sensor Description

The PreView Side Defender®II is a small, rugged short range radar sensor designed and made by PRECO Electronics® in the USA for use in heavy-duty applications such as trucks/busses, waste vehicles and other applications requiring a robust, high-performance side blind-zone radar. The sensor transmits and receives low power narrow band 24 GHz radar signals. It then processes the returned signals to determine if an object has reflected any energy back to the sensor and determines if the object is moving. If an object is moving and presents a potential collision threat, it is reported by the operator display. The sensor is designed to process and report detections within 300 ms allowing the operator to quickly respond to any object within the detection zone. **The frequency band used is legal throughout most of the world, but check with PRECO Electronics® or your country's regulations before purchasing.**

The PreView® sensor has a continuous Built-In-Self-Test (BIST) that notifies the operator via the in-cab display of system failure within a fraction of a second. This test functions by monitoring the transmit and receive performance as well as other internal operations. The BIST reporting functionality is a critical feature for fail-safe operation.

Using frequency modulated transmit waveform (FMCW) technology, the Side Defender®II radar measures radial range, speed, angle, reflectivity, and other parameters of multiple stationary and moving targets simultaneously. This radar sensor has a wide horizontal field of view up to +/-75°, optimized for side object detection in large trucks and busses. The horizontal field-of-view is approximately 39 feet (12 m) along the vehicle side and extends approximately 10 feet (3 m) from the side of the vehicle.



**Figure 2 - Horizontal Detection Zone**

PreView Side Defender®II can detect moving bicycles, motorcycles and other cars/trucks and in certain circumstances, people within the detection zone, providing a visual alert on the in-cab LED display, as well as an audible alert if the turn signal is active.

The Side Defender®II radar performance is not affected by other PreView® Radar or similar sensors operating in close proximity with each other.

## Sensor Interfaces and Configuration

**CAUTION:** *Incorrectly connecting to a vehicle CAN bus can cause erratic and dangerous vehicle behavior.* **DO NOT** connect the PreView Side Defender®II sensor directly to the vehicle CAN bus. Always use a gateway such as the PreView D2002 display designed to ensure the connection allows one-way communication only from the vehicle CAN bus to the PreView Side Defender®. **DO NOT** allow PreView Side Defender®II J1939 messages to be transmitted on the vehicle CAN bus.

If using a gateway to the vehicle CAN bus for the speed message, the vehicle CAN bus, PreView Side Defender®II and in-cab LED display must all use the same baud rate.

### Speed Message

The Side Defender®II is designed to receive a vehicle speed message from the PreView® v2 Display. The G2000 version of the display generates the speed message through its integrated GPS receiver. The D2002 display is designed to connect to and receive the speed message from certain vehicle's CAN bus. Contact PRECO Electronics® for more information about how the D2002 can be used.

### Turn Signal Input

The Side Defender®II requires a turn signal input for proper in-cab display operation. When the turn signal is active, the display's audible alert will sound when an object is detected. Refer to the Wiring Connections diagram Figure 3 for more information.

### Reverse Signal Input

The Side Defender®II requires a reverse signal input for proper in-cab display operation. Refer to the Wiring Connections diagram Figure 3 for more information.

### Auxiliary Output

The Side Defender®II radar supports an auxiliary output signal that can be used to provide additional alerts.

This output is an Active Low (switch to ground). One example use of this output is to drive an LED indicator in a side mirror when there is an object in the side blind zone. Contact PRECO Electronics® for more information.



# System Connections

Locate the vehicle's ignition power and connect to the red wire on the body harness. If it is necessary to extend the power wire on the supplied harness, use 20 AWG wire as a minimum. Locate the vehicle's turn signal wire associated with the turn signal on the sensor side and connect to the blue wire on the body harness. **(Be sure that the turn signal wire selected activates ONLY when the turn signal is active and is the operational (not diagnostic) signal. On some trucks the daytime running lights and/or air brakes will activate the wires connected to the turn signal lamp).** Connect the black wire of the body harness to vehicle ground.

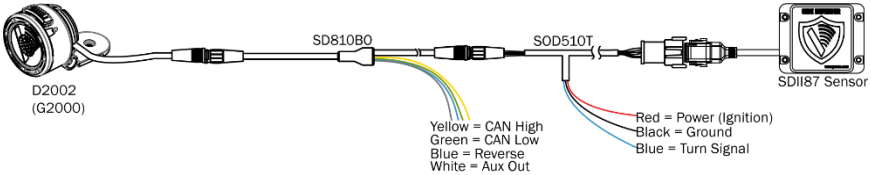


Figure 3 -Wiring Connections

# Object Detection Capability

The PreView Side Defender®II is a blind spot collision warning system designed to supplement other safety practices and/or devices. The vehicle operator is always the first line of defense when safely operating a vehicle.

The PreView Side Defender®II can detect most objects within the detection zone. However, there are some instances where objects can go undetected. Obstacle size, shape, orientation, relative location, and composition are all factors determining if, when, and where an object is detected. The Side Defender®II radar operates by transmitting low power electromagnetic energy. Any energy that strikes an object reflects a certain amount of this energy back to the Side Defender®II radar. If the returned energy is of sufficient magnitude, it is used to indicate the presence of an object and determine the object's distance. The Side Defender®II then uses the vehicle speed message to determine whether the detected object is in motion or stationary. While PreView® sensors can resolve multiple objects, only the detected object in motion closest to the vehicle is reported by the operator display since it represents the most significant collision threat.

The amount of energy returned is based on a few factors:

**Size** – a larger object usually reflects more energy than a smaller object.

**Composition** – a metal object typically reflects more energy than a non-metallic object.

**Scattering** – a solid object reflects more energy than a non-solid object such as tree branches, gravel, bushes, etc.

**Shape** – complex shapes cause energy to be returned in a very non-uniform way. Small variations or movement can change detection status.

**Angle** – an object flat side perpendicular to the sensor will reflect more energy than an object at an angle. See Figure 4 for an example of how angle can affect return energy.

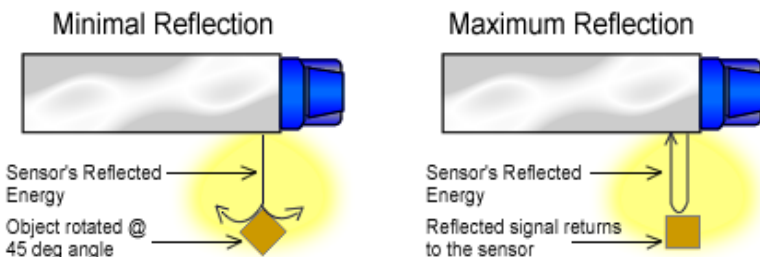


Figure 4 - Object Reflection

## **System Operation**

The Side Defender®II system is designed to ignore stationary objects such as guardrails and parked cars while alerting on moving objects such as bicyclists and moving vehicles in the adjacent lane. The detection zone for the Side Defender®II when the vehicle is stationary is 5 m fore and 5 m aft of the sensor out to 3 m from the side of the vehicle. When in motion, the detection zone expands to 6 m fore and 6 m aft of the sensor out to 3 m from the side.

## **Urban VRU Operation**

At speeds of 19 mph (30 km/h) or less, the Side Defender®II gives a priority to alerting the driver of moving bicyclists in the detection zone. A visual alert is provided on the in-cab display when a moving object is detected while both an audible and visual alert are provided when the turn signal is active and a moving object is detected. Stationary objects such as street signs and parked cars are ignored.

## **Lane Change Assist Operation**

When vehicle speed is above 19 mph (30 km/h), the Side Defender®II gives priority to alerting on moving vehicles in the adjacent lane. Stationary objects such as guardrails or concrete barriers are ignored to minimize 'nuisance alerts'. This mode is optimized for blind zone collision mitigation during lane changes and merging.

# Sensor Installation

## Before you Begin

Prior to installing the PreView® Object Detection System take time to familiarize yourself with all of the all documentation, theory of operation, and system components.

## Sensor Location

The Side Defender®II mounting location is important for proper system operation. The sensor should be mounted on the side of the vehicle with the bottom of the radar no lower than 23" (60 cm) and the top of the radar no more than 39" (1 m) above the ground and between 137" (3.5 m) and 197" (5 m) back from the front edge of the vehicle. The sensor face should be perpendicular to the ground with Side Defender® text up and V logo pointing down. Select a location that will provide some protection from impact and debris while allowing an unobstructed view of the target area of interest. Refer to the Keep Out/Interference Zones in Figure 7 for required clearance information.

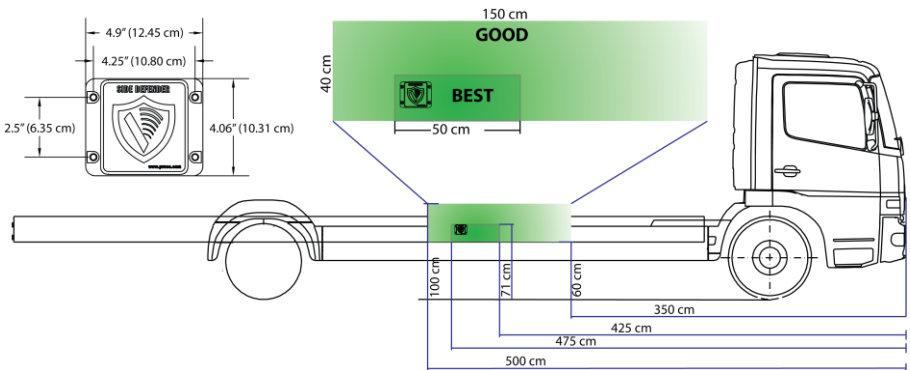


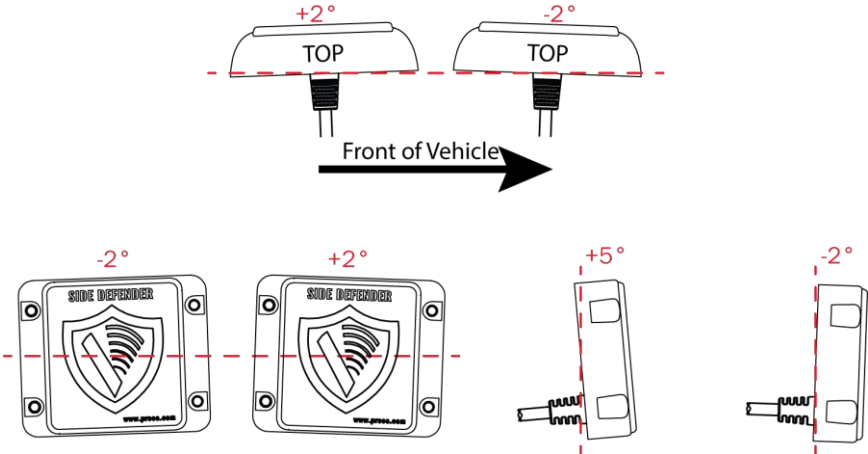
Figure 5 - Sensor Position on Vehicle

## Sensor Mounting

1. Select the appropriate location to mount the sensor (see Figure 5).
2. The standard mounting configuration is with 'Side Defender®' text, as shown in Figure 1.
3. Using the drill template, scribe position marks through the holes. Drill 1/4" (6 mm) holes centered on the marks.
4. For the pigtail, drill a 1 1/2" (38 mm) hole for the sensor connector and mating connector.
5. Secure the sensor to the equipment using the supplied hardware, with a maximum 22 in-lbs (2.5M-m) torque.

# Mounting Tolerances

For optimal performance, the vertical angle (up/down) tolerances are  $+5^\circ$  (up) and  $-2^\circ$  (down). The horizontal angle (side/side) tolerance is  $\pm 2^\circ$  and the fore/aft angle tolerance is  $\pm 2^\circ$ .



**Figure 6 - Vertical and Horizontal Angle Mounting Tolerances**

The performance of the sensor can be negatively impacted if the sensor is angled down, causing ground and curb detections. Any time the sensor is not perpendicular to the ground, the performance should be tested.

The sensor's horizontal field of view is  $\pm 75^\circ$  but can be up to  $\pm 85^\circ$  for objects with radar cross sections larger than a person. The vertical field of view is  $\pm 10^\circ$ .

For optimal performance, the sensor should protrude beyond any other portion of the vehicle.

## Keep Out/Interference Zones

Metallic and other strong radar reflecting objects must remain outside of the Keep Out Zones defined in Figure 7. Radar reflecting objects within these areas may affect operation. If those objects cannot be removed, testing must be performed to determine the influence on the system's performance.

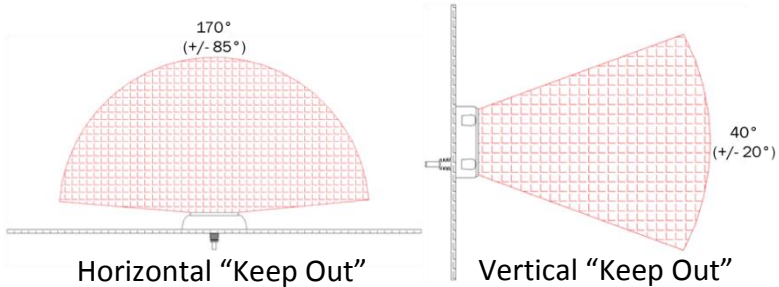


Figure 7 - Keep Out Zones

### ***Important!***

Before permanently installing the PreView Side Defender®II on the vehicle, verify that the selected sensor mounting location provides a clear detection zone. Take the vehicle to a clear area, temporarily attach the sensor in the proposed mounting location, apply power to the system, and verify that nothing is being detected.

# PreView® Daily Maintenance

## Safety Message to Vehicle Operators with PreView® Radar Systems

1. Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death. It is necessary to read, understand and follow all instructions shipped with the product.
2. Systems on operating equipment must be tested each day prior to the equipment operation. The equipment operator must check for proper operation at the beginning of every shift or safety inspection period.
3. The PreView® system is intended as an Object Detection System and should not be relied upon as your first line of defense for the safe operation of the equipment. It should be used in conjunction with established safety programs and procedures to augment the safe operation of the equipment, ground personnel, and adjacent property.
4. People's lives depend on the proper installation of this product in conformance with these instructions. Should the system become inoperative, it could jeopardize the safety or lives of those who depend on the system.
5. The PreView® Object Detection System is intended for commercial use. Proper installation of the object detection system requires a good understanding of equipment electrical systems and procedures, along with proficiency in the installation.
6. Store these instructions in a safe place and refer to them when maintaining and/or reinstalling the system.

## Testing and Maintenance

NOTE: A walk around test shall be performed every day to verify proper function of the system and to familiarize the operator with the zone of detection. More frequent inspections should be performed when:

- The equipment is operating in a particularly dirty or harsh environment.
- The operator has reason to suspect the system has been damaged.

This test should be performed with two people, the operator who remains in the cab, and the assistant who walks through the sensor field (detection zone).

1. Move the equipment to an open field larger than the detection zone to test.
2. Clean the sensor face of any accumulation of dirt, mud, snow, ice, or debris.
3. Visually inspect the attached wiring and cable and verify that they are properly secured, not chafing or dangling free where they could become snagged and damaged. Inspect the PreView® Sensor and Operator Display and verify that they are securely attached to the equipment.
4. Place the sensor in active mode. Make sure the equipment has been secured and remains stationary.

5. Verify the sensor is operational. Depending on operator notification, this may be: green Power LED (for display), green icon (in-cab video monitor), or beep (buzzer or SAS).
6. Assure the detection zone has been cleared of all obstacles. Any obstacles in the detection zone will interfere with the test.
7. The assistant should walk towards the sensor while the operator notes when the warning activates, signifying the sensor has detected the assistant and identifying the detection zone limits.
8. Next, the assistant should walk from the center of the sensor field straight back, away from the equipment (the center line of the detection zone) while the operator notes when the warning (notification) stops.
9. The assistant should move a meter to the left of the sensor and walk towards the sensor again while the operator notes the warning.
10. Repeat the above step by moving out another meter to the left and walking towards the sensor while the operator notes the warning.
11. Repeat this test sequence for the right side.
12. Finally, after the test, the operator and the assistant need to communicate the details on the detection zone.

For questions, call +1.844.787.2327 toll free in the USA. Call +1.208.323.1000 or send a fax request to +1.208.323.1034 for outside the USA, or submit an online request at [www.preco.com/contact-us/](http://www.preco.com/contact-us/)



# Troubleshooting

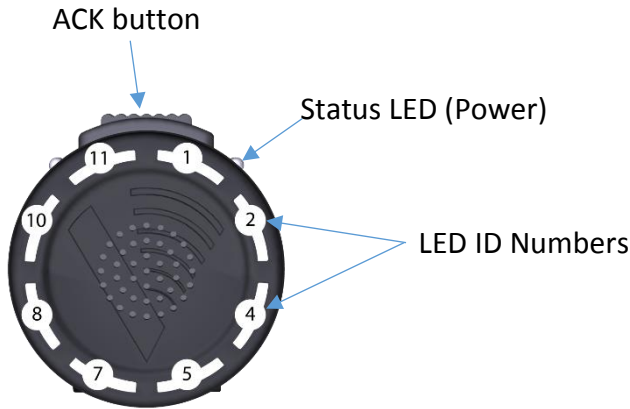


Figure 8 - PreView v2 Display

## Display Status LED is not illuminated:

- Verify that DC power (9-33V) is applied to the sensor.
- Verify that the cable between the sensor and display is connected.

## Display LEDs 2, 4 and 8, 10 are illuminated solid yellow:

- The display is not receiving the vehicle speed message. This error message can be cleared by holding down the ACK button; however, stationary objects will not be ignored until the display re-acquires the speed message. Check the connection with the external GPS antenna or the vehicle CAN.

## Detection LEDs are always illuminated when sensor is mounted:

- Verify the sensor is pointing outward from the vehicle in an open area with no obstructions. This may require removing the mounting screws and lifting the sensor out away from the side of the vehicle. If the detection LED is not active when the sensor is moved away from the vehicle, but is active when mounted, then the sensors' mounting position must be moved.

## Detection buzzer sounds when turn signal is not active:

- The harness turn signal wire is being set by other electronics, i.e., daytime running lights, air brakes, etc. Check turn signal wire connection.

## Two display LEDs are flashing yellow and red:

- A sensor located on the side (left, right, front or rear) indicated by the flashing LEDs is not communicating with the display. Check sensor to cable connection and ensure power is being provided to the sensor.

# Specifications

## Sensor Specifications

Transmitter	FMCW Radar - 24 GHz Narrow Band
Connector:	See Figure 9
Protection Rating:	IP69K
Housing Material:	Polycarbonate radome
Dimensions:	4.90" w x 4.06" h x 1.28" d (12.4 cm x 10.3 cm x 3.25 cm)
Weight:	1.0 lb (0.45 kg)
Operating Temperature:	-40 °C to +85 °C
Storage Temperature:	-55 °C to +105 °C
Vibration:	25 G, random, all three axis
Shock:	50 G
Mounting:	Four 0.22" (5.6 mm) diameter mounting holes.

Operating Characteristic	
Range:	Detection Zone – 10' (3 m) x 39' (12 m), see Figure 2
Range Accuracy:	0.3 m
Azimuth Field of View:	±75° (10 dBsm target)
Elevation Field of View:	±10° (10 dBsm target)
Angle Accuracy:	±2° @ ±10° FoV, ±5° @ ±30° FoV, ±10° @ ±75° FoV
Velocity Range:	± 30 m/sec (± 69 mph)
Velocity Accuracy:	0.2 m/sec (0.5 mph)
Target Resolution:	1.4 m for static targets, nearing 0.3 m for dynamic targets
Cycle Time:	120 ms
Target Detection Time:	300 ms
Power On to Active Time:	300 ms

Electrical Specifications	
Frequency:	24.00 – 24.25 GHz
Power Supply:	9 – 33 VDC, Reverse polarity and over-voltage protected
Current:	<0.5 A

Communications Interface	
J1939 CAN Bus:	250 Kbits/sec, not terminated
Auxiliary Output	Active - Switch to ground, sink up to 1 A, over current protected
	Inactive – High Impedance

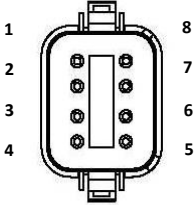
Maintenance	
Daily:	Follow test and maintenance procedure

PRODUCT MANUFACTURED IN THE USA

# Sensor Pinout

## CONNECTOR END VIEW

### DEUTSCH DT06-08SA-



CONNECTOR PIN OUT	
PIN	SIGNAL NAME
1	BATTERY PWR (+)
2	GROUND
3	CAN HIGH
4	CAN LOW
5	DISPLAY PWR (+)
6	DISPLAY GROUND
7	N/C
8	TURN SIGNAL INPUT

Figure 9 - Deutsch Connector Pin Out

# Warranty Information

## MANUFACTURER STANDARD LIMITED WARRANTY AND LIMITATION OF LIABILITY

Manufacturer warrants that on the Date of Purchase this Product will conform to Manufacturer's published specifications for the product, which are available from Manufacturer on request, and Manufacturer warrants that the product is free from defects in materials and workmanship. This Limited Warranty for the sensor extends for sixty (60) months from the date of shipment. Manufacturer will, at its option, repair or replace any product found by Manufacturer to be defective and subject to this Limited Warranty.

This Limited Warranty does not apply to parts or products that are misused; abused; modified; damaged by accident, fire or other hazard; improperly installed or operated; or not maintained in accordance with the maintenance procedures set forth in Manufacturer's Installation and Operating Instructions.

To obtain warranty service, you must ship the product(s) to the specified Manufacturer location within thirty (30) days from expiration of the warranty period. To obtain warranty service, call Customer Service at +1.866.977.7236 or +1.208.323.1000, or fax your request to +1.208.323.1034. Customer Service will issue warranty authorization and further instructions. You must prepay shipping charges and use the original shipping container or equivalent.

**EXCLUSION OF OTHER WARRANTIES:** MANUFACTURER MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY. THE IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXCLUDED AND SHALL NOT APPLY TO THE PRODUCT. BUYER'S SOLE AND EXCLUSIVE REMEDY IN CONTRACT, TORT OR UNDER ANY OTHER THEORY AGAINST MANUFACTURER RESPECTING THE PRODUCT AND ITS USE SHALL BE THE REPLACEMENT OR REPAIR OF THE PRODUCT AS DESCRIBED ABOVE.

**LIMITATION OF LIABILITY:** IN THE EVENT OF LIABILITY FOR DAMAGES ARISING OUT OF THIS LIMITED WARRANTY OR ANY OTHER CLAIM RELATED TO MANUFACTURER'S PRODUCTS, MANUFACTURER'S LIABILITY FOR DAMAGES SHALL BE LIMITED TO THE AMOUNT PAID FOR THE PRODUCT AT THE TIME OF ORIGINAL PURCHASE. IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR LOST PROFITS, THE COST OF SUBSTITUTE EQUIPMENT OR LABOR, PROPERTY DAMAGE, OR OTHER SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES BASED UPON ANY CLAIM FOR BREACH OF CONTRACT, NEGLIGENCE OR OTHER CLAIM, EVEN IF MANUFACTURER OR A MANUFACTURER'S REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Manufacturer shall have no further obligation or liability with respect to the product or its sale, operation and use, and Manufacturer neither assumes nor authorizes the assumption of any other obligation or liability in connection with such product.

This Limited Warranty gives you specific legal rights, and you may also have other legal rights, which vary, from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.

Any oral statements or representations about the product, which may have been made by salesmen or Manufacturer representatives, do not constitute warranties. This Limited Warranty may not be amended, modified or enlarged, except by a written agreement signed by an authorized official of Manufacturer that expressly refers to this Limited Warranty.

## More PRECO Electronics® Safety Products

### PreView® Radar Blind Spot Monitoring

- **Sentry®** - 150° fully adjustable detection zone. Detects distance, relative velocity, and angle of up to 16 objects simultaneously from 0 to 30 m (98') away.
- **Side Defender®II** - 150° intelligent side object detection radar with VRU Protection. Ignores stationary objects while warning of bicycles, vehicles and people in your side blind spots.
- **Xtreme** – Designed for equipment used in extreme mining conditions. Variable detection ranges up to 10 m (32') available.
- **WorkSight®** – Dual antennas for broad detection zones. Designed for crowded urban environments. Variable detection ranges up to 6 m (20') available.
- **Wireless** – WorkSight® sensor with wireless connection to a touch screen in-cab display. Customizable detection range up to 6 m (20').
- **WorkZone** – Designed for equipment that operates on the worksite and narrow neighborhood streets. Available with 3 m (10') or 4.5 m (15') detection range.

### PreView® Camera Monitor Solutions

- **PreView® Plus** – 7" IP67 monitor supports 1 to 4 cameras with 1 to 24 radar sensors providing combined camera and radar technologies to deliver the most complete active blind spot monitoring solution available.
- **Monitor 5HD** – 5" heavy-duty IP67 monitor supports up to 3 cameras.
- **Monitor 5 LD** – 5" monitor for closed cabs. Supports a single camera.
- **Mini Cam** – Compact cameras with 120°, 150°, or 180° field of view.
- **Heavy-Duty Cam** – IP67 Heavy- Duty camera with 118° field of view, IR LEDs, and built-in heater.

**PreView® VideoLink** – Make your existing camera system an active safety resource by adding visual and audible alerts from a PreView® Radar sensor to your in-cab monitor.





Proudly developed by

**PRECO**<sup>®</sup>  
*ELECTRONICS*

10335 W. Emerald St.

Boise, Idaho 83704

[www.precos.com](http://www.precos.com)

+1.866.977.7326

**3702203A**