PRECO™ ELECTRONICS

PreView® RADAR SYSTEMS

WorkSight® PreView®
WS6010/WS6015/WS6020
Operating Manual

APS LIGHTING & SAFETY
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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.

PATENTS

Patented under one or more of the following U.S. Patents:

5345471, 5523760, 5457394, 5465094, 5512834, 5521600, 5682164, 5630216, 5510800, 5661490, 5609059, 5774091, 5757320, 5581256, 5832772, 5519400, 5767953, 5767627, 5589838, 5563605, 5661385, 5517198, 5610611, 5883591, 5805110, 5754144, 7088284, and 7215278.

Other patents have been applied for.

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.

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CONTENTS

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Product Description

The WorkSight® PreView® is a solid-state, pulsed radar object detection system designed to alert vehicle operators to the presence of obstacles. The system detects both moving and stationary objects in a pre-defined coverage area and reports the distance of the closest object via visual range indicators and an audible signal to the vehicle operator.

Figure 1. WorkSight® PreView®

The WorkSight PreView models consist of three major components: an environmentally sealed sensor, an operator display mounted in the cab of the vehicle, and an interconnect cable. The WorkSight PreView system does not require cleaning and is not affected by harsh weather conditions, including temperature extremes, rain, sleet, snow, or fog. The WorkSight PreView Model WS6020 has a twenty foot (six meters) detection range, the WS6015 has a 15 foot detection range (4.5 meters), and the WS6010 has a 10 foot detection range (3 meters).

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Sensor / Antenna Description

The antenna assembly transmits and receives low power 5.8GHz radar signals. It then processes the returned signals to determine if an object has reflected any energy back to the sensor and reports this to the operator display. The sensor is designed to process and report detections within ½ of a second allowing the vehicle operator to quickly respond to any object within the detection zone. All connections to a vehicle are accomplished at the sensor. Power is typically obtained from the vehicle reverse lights. The connection to the display unit is through a watertight connector eliminating any potential problems with pin corrosion. Power to the operator display is provided through the sensor interface to the display.

The WorkSight PreView sensor has a continuous Built In Self Test which notifies the operator of sensor failure within a fraction of a second.

Operator Display Description

The operator display provides the vehicle operator with a visual indication of a detected object. The display unit also contains a buzzer* to provide an audible alert that will increase in rate as an object becomes closer, providing the operator with another cue that an object is being detected.

The operator display continuously monitors communication from the WorkSight PreView sensor and in the event of a system failure or malfunction, will notify the operator with a fault indication.

A switch* is provided on the front panel of the display allowing the vehicle operator the ability to adjust the buzzer volume to three different levels or to provide an alarm acknowledge and silence the buzzer.

*OC models do not include the buzzer or switch. Switch functionality is disabled on NVC models.

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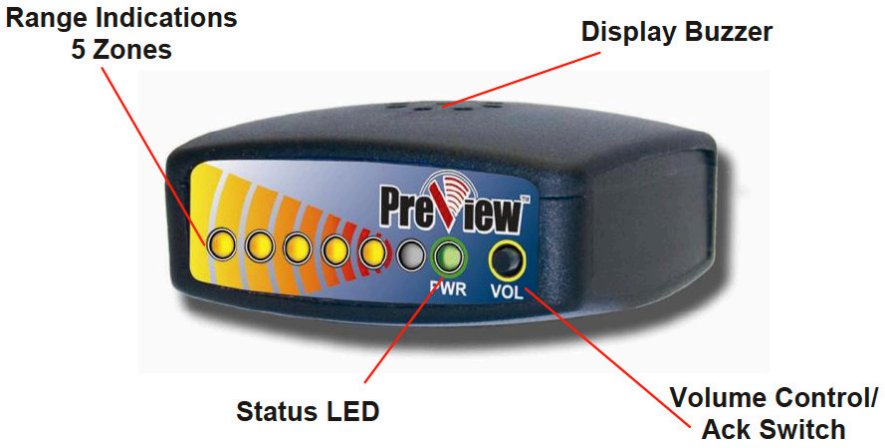

Figure 2. Operator Display

Item	Description
Status LED	Illuminates green continuously after power is applied to the system. The status will change from green to red if a system malfunction occurs.
Range Indications	Illuminate to give operator a relative distance measurement to the closest detected object. LED's operate from the left to right, with a closer object resulting in more LED's illuminated.
Display Buzzer*	Sounds audible tones to alert operator of obstacles. The speaker pulse rate will increase as the vehicle gets closer to an object.
Volume Control/Ack Switch*	This momentary push button switch allows three different buzzer volume levels to be selected. It can also be configured as an acknowledge switch to silence the buzzer using the Service Tool.

Table 1. Operator Display Description

*OC models do not include the buzzer or switch. Switch functionality is disabled on NVC models.

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Object Detection Capability

The PreView® system is designed to supplement other safety practices and/or devices, and is not to be the sole method of collision avoidance. The machine operator is always the first line of defense when safely operating a vehicle.

The WorkSight PreView system can detect most objects within the detection zone. However, there are some instances where objects can go undetected. Obstacle size, shape, relative location, and composition are all factors determining if, when and where an object is detected. The PreView system operates by transmitting a pulse of very low power electromagnetic energy. Any energy that strikes an object reflects a certain amount of this energy back to the PreView sensor. If the returned energy is of sufficient magnitude, it is used to indicate object presence and determine the object's distance. While the PreView system can resolve multiple objects, only the object closest to the vehicle is reported to 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. A metallic object at the edge of the maximum detection zone might be detected, whereas a wood object may not.
Scattering – a solid object reflects more energy that 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. Very 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 below for an example of how angle can affect return energy.

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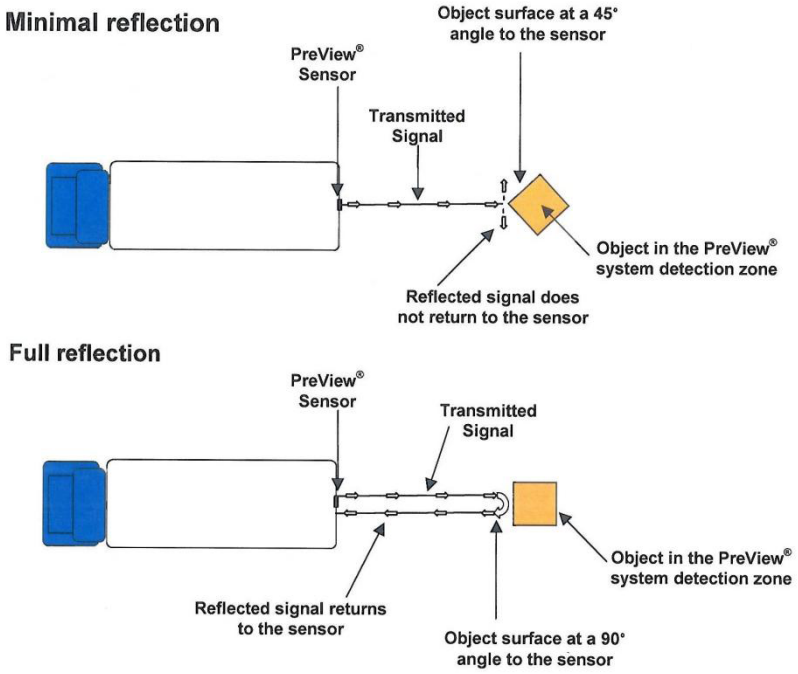

Figure 3. Object Reflection

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Installation Instructions

Before you Start

Prior to installing the WorkSight PreView Object Detection System take time to familiarize yourself with the installation instructions, theory of operation, and system components. Check the contents of the shipping package and verify the following items are included:

Antenna Sensor (1)
Display Unit (1)
Interconnect Cable (1)
User Manual/Operating Instructions and drill template
Sensor Stainless Steel Mounting Hardware
1-1/4" x 10-24 Bolts, Hex Locking Nuts, and Washers (4)
Display Hardware Kit
Mounting Bracket (1)
Mounting Hardware (1)

Sensor / Antenna Location

The WorkSight PreView sensor mounting location is integral to proper system operation. Ideally the sensor should be mounted on the rear center of the vehicle at roughly 36" (1M) +/- 12" (0.3M) above the ground. The sensor face should be perpendicular to the ground with the "PreView" graphic in normal position. Select a location that will provide some protection from impact and debris while allowing an unobstructed view of the target hazard area.

Important!

Before the WorkSight PreView system is permanently installed to the vehicle, verify that the selected sensor mounting location provides a clear detection zone. Temporarily attach the sensor in the proposed mounting location, apply power to the system, and verify that nothing is being detected.

Sensor / Antenna Mounting

1. Select the appropriate sensor mounting location.
2. The correct mounting configuration is with the sensor's text in normal reading position.
3. Using the drill template, scribe position marks through the holes. Drill 1/4" (6mm) holes centered at the marks.
4. A 1-1/2" diameter clearance hole is required for the sensor connector and mating cable connector.
5. Secure the sensor to the vehicle with the four supplied 10-24 UNC button head screws, washers and nuts or equivalent. Apply a maximum torque of 22 inch pounds when securing the sensor.

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Sensor Power Connection
Locate the vehicle's reverse light power wire and connect to the red wire on the sensor harness using 18AWG wire minimum. Connect the black wire of the sensor harness to vehicle ground.

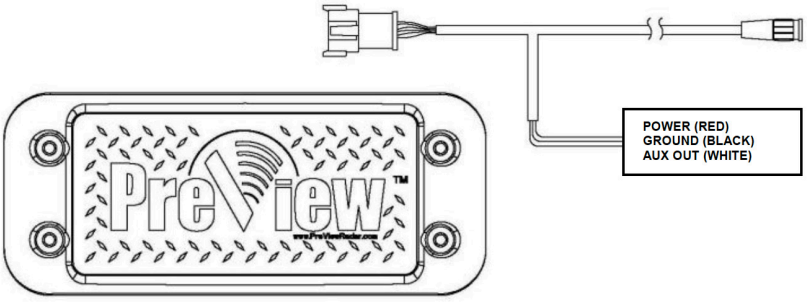

Figure 4. Sensor Power Connection

Aux. Output Electrical Connection
This sensor provides an auxiliary output that can be used to activate an external backup alarm or other device (white wire). **Depending on the system ordered, the cable provided may or may not have provisions to access this output**. The aux. output is activated whenever an object is detected. The output is switched from a high impedance state to ground when active and is protected against an over current condition. The maximum operating current is approximately 1 amp, this includes any inrush current. For alarms or other devices that meet the 1 amp maximum current, connect the aux. output wire on the interconnect harness to the ground wire of the alarm or device. For alarms or devices that exceed the 1 amp current limit an intermediary relay must be used.

Display Unit Installation
The display unit should be mounted where the vehicle operator can easily view it while backing. The ideal location for this is on the dash positioned by either windshield pillar. This will allow the operator view of the display while also looking out one of the side mirrors.

The WorkSight PreView display unit comes equipped with a mounting bracket and hardware. If desired, the display unit can be mounted to the display bracket with the supplied hardware. This bracket can then be mounted in the vehicle cab as desired.

Cable Installation
The standard interconnect cable between the sensor and display is 30 feet (9.1M) in length. If the distance between the sensor and display is greater than 30 feet, contact Preco for a longer interconnect cable.

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Routing of the cable should start at the sensor. Allow for a small service loop in the cable at the sensor and secure the cable every few feet (~1M) with tie wraps. When ready to enter the cab, drill a 1" (24mm) hole and feed the display connector through. The remaining length of cable is then routed to the display unit and the connectors are latched together. Care should be taken to not route the cable next to heat sources such as the engine and exhausts and areas that may see abrasion or rock damage.

Initial System Power Up and Test

Once the sensor and display are installed, wired, and connected, power should be applied to test correct system operation. When the system is operating correctly in an open field with no obstructions, the status LED indicating green will be the only light illuminated. If any of the detection (yellow) LED's are lit, check for any vehicle obstruction which may be detected by the sensor. If possible move the sensor so it is not detecting the object(s). If it is not possible to relocate the sensor then consult Preco Customer Service.

If for some reason the system is malfunctioning, one of the yellow LED's will be illuminated, the status LED will turn from green to red, and the buzzer will make a short stutter sound. Refer to the Error Indications and Troubleshooting sections below to determine the error and solution.

Once the system has been installed, the detection zone should be tested. This test should be performed with two people, one who remains in the cab (the operator), and one who walks through the sensor field at the rear of the vehicle (the assistant). The operator engages the parking brake, depresses the vehicle brake, and places the vehicle in reverse. The assistant then walks through the detection zone while the operator in the vehicle cab notes where the display buzzer activates. By moving about the rear of the vehicle and noting when the display buzzer activates, an accurate detection zone can be mapped.

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PreView® Daily Maintenance

Detach this page and place with daily operator maintenance procedures.

Safety Message to Operators of Vehicles with PreView Systems

1. 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 vehicle. It should be used in conjunction with established safety programs and procedures to augment the safe operation of the vehicle, ground personnel, and adjacent property. Should the system become inoperative, it could jeopardize the safety or lives of those who depend on the system for safety.
2. Testing and inspection of the system in accordance with these instructions and record of the results should be listed on the daily maintenance report. The units on operating vehicles must be tested each day prior to the vehicle's operation. Results of this test must be recorded in the maintenance log.
3. People operating this equipment **MUST** check for proper operation at the beginning of every shift or safety inspection period.
4. People's lives depend on the proper installation of this product in conformance with these instructions. It is necessary to read, understand and follow all instructions shipped with the product.
5. Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death.
6. The PreView Object Detection System is intended for commercial use. Proper installation of a back-up aid requires a good understanding of truck electrical systems and procedures, along with proficiency in the installation.
7. Store these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.

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 vehicle 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, one who remains in the cab (the operator), and one who walks through the sensor field at the rear of the vehicle (the assistant).

1. Clean the sensor face of any accumulation of dirt, mud, snow, ice, or debris.
2. 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 Radar Sensor and Operator Display Module and verify that they are securely attached to the vehicle.
3. Set the park brakes, start the vehicle, depress and hold the vehicle brake and place the vehicle in reverse.
4. Verify the green "POWER" light is illuminated on the in-cab display.
5. The area to the rear of the vehicle should be clear of obstacles for a distance of 8 meters. If the display shows any indicator other than the green light then there are objects to the rear of the vehicle that will interfere with the test. Move the vehicle to a clear area and proceed.
6. The assistant should move to just behind the rear corner of the vehicle in sight of the operator's mirrors. He should then walk toward the centerline of the vehicle parallel to the rear, while the operator notes when the display buzzer sounds, signifying the sensor has detected the object.

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7. The assistant should continue walking through the area at the rear of the vehicle while the operator notes the area that detection occurs.
8. Next, walk from the center of the rear of the vehicle straight back, away from the vehicle. When the display quits sounding the detection limit has been reached.
9. Move halfway back and remain still for a few seconds, the display should continue to sound, demonstrating the system's ability to detect a still object.
10. The assistant should walk the complete rear of the vehicle while the operator notes the detection edges of the entire coverage area.
11. After the test the operator and the assistant need to communicate the details on the detection zone.

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Troubleshooting

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 Status LED is RED

- Check connection between display and sensor.

Display Status LED is RED and one Yellow LED is illuminated:

LED Error Code	Possible Reason
LED #5 on	No communication with any sensor(s)
LED #4 on	Built in Self Test Error – Contact Factory
LED #3 on	Missing sensor(s)

All the display LED's are 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 rear of the vehicle. If the display LED's are not active when moved away from the vehicle, but are active when mounted, then the sensors mounting position will have to be moved.

Sensor is detecting the ground, indicated by a few of the display LED's being lit:

- In an open field, either move the sensor up higher or slightly angle the sensor upward 5 to 10 degrees. The minimum recommended mounting height is 24 inches.

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Specifications

SENSOR SPECIFICATIONS (Typical)

Transmitter:	Pulsed RF transmitter at 5.8GHz operating under FCC Part 15.249
Electronics:	Solid state
Connector:	Deutsch DT06-08SA-E008
Sealing:	Encapsulated to protect from dust and moisture, designed to meet IP67.
Housing Material:	Polycarbonate radome
Dimensions:	4.4”H x 10.5”W x 1.4”D (11.2cm x 26.7cm x 3.6cm)
Weight:	2.3 lb. (1.04 kg)
Operating Temperature:	-40oF to +185oF (-40oC to +85oC)
Vibration:	25G RMS all three axes
Shock:	25G all three axes
Mounting:	Four 0.25” (6.4mm) diameter holes on 8.54” horizontal centers and 2.00” vertical centers. Unit is supplied with #10 SS screws for mounting purposes. Recommended torque is 22 inch-lbs.

DISPLAY SPECIFICATIONS (Typical)

Housing Material:	Polycarbonate/ABS alloy
Dimensions:	1.00”H x 2.25”W x 2.00”D (2.5cm x 5.7cm x 5.1cm)
Weight:	0.25 lb. (0.11 kg)
Mounting:	User dependent

ELECTRICAL SPECIFICATIONS

Input Voltage:	9-33VDC, over voltage protected to 150V
Input current:	0.2 amp maximum, inrush current limited to 1A
Polarity:	Negative ground, Polarity protected to 150V
Power Connection:	Two 20 AWG wires, connect to reverse signal lamp circuit
Auxiliary Output:	Single 20 AWG wire, +150V tolerant Active State: switched to ground, over current protected to 1 amp sink maximum. Inactive State: high impedance

OPERATING CHARACTERISTICS

Detection Range:	20 feet (6M), 15 feet (4.5M), 10 feet (3M)
Warning Ranges:	5 zones

COMMUNICATION

Physical Layer:	CAN 2.0B, 250 KB/s
Protocol Layer:	SAE J1939 Extended
Data Update Rate:	70 ms

MAINTENANCE

Daily: Follow test and maintenance procedure.

REGULATORY COMPLIANCE

Compliant with FCC Part 15.249 (5725-5875MHz).
FCC ID: OXZWZPV2009
‘CE’ ‘E’ mark E11 10R-035418

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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 sensor and display 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 you must call Preco Customer Service at 866-977-7326 or 208-323-1000, or fax your request to 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.

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PreView® Configuration Options

PreView® Plus Camera/Monitor System – Ultimate safety and object detection system configurable with up to 4 cameras and 24 sensors.

PreView® Safety Alert System – The PreView Radar Sensor detects an object in the blind spot. Once the object is detected, PreView triggers the back-up alarm to either increase the sound of the alarm OR change the beep rate to alert pedestrians outside of the vehicle of the danger.

Custom System Configurations – Thanks to the advanced engineering by the Preco Engineers, the technology behind PreView Sensors can easily integrate or control your vehicles existing or new safety systems.

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