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**BACKZONE**<sup>TM</sup>  
*Plus* By Reston  
**USER'S MANUAL**  
**PARKING SENSOR SYSTEM**



*Please read this manual thoroughly before installation and use*

## CONTENT

<b>INTRODUCTION</b> .....	1	INSTALLATION TOOLS .....	8
MODEL NUMBER .....	1	WHERE TO INSTALL .....	9
FEATURES .....	1	INSTALLATION PROCEDURE .....	9
TECHNICAL DATA .....	2	SENSOR INSTALLATION .....	10
<b>PRODUCT COMPOSITION</b> .....	3	POWERING UP .....	12
<b>HOW TO USE</b>		PRECAUTIONS .....	13
SYSTEM STARTUP .....	3	<b>TEST THE SYSTEM</b>	
DIAGNOSTICS .....	3	TEST SUBJECTS .....	13
WARNING MODE .....	4	TEST METHODS .....	13
WARNING UNIT .....	6	SENSITIVITY ADJUSTMENT .....	14
ABOUT DETECTION .....	6	<b>DISCLAIMER</b> .....	15
PRECAUTIONS .....	8	<b>TROUBLESHOOTING</b> .....	15
<b>INSTALLATION</b>		<b>WARRANTY CARD</b> .....	18

## ● INTRODUCTION

*The BackZone™ Plus is a superior reverse parking system that provides a visual and audible alarm when close to large objects to aid the driver while parking in reverse.*

- Read this manual thoroughly before installation and operation of the system. Please pay attention to all of the precautions and instructions listed in this manual.
- Installation by trained professionals is recommended.
- This manual describes the functions, installation, use and precautions of the reverse parking system.
- Designs and specifications are subject to change without prior notice and the diagrams or figures in this manual may differ slightly in appearance from the actual product.
- This device is only a parking aid and should never be solely relied upon for safely backing up a vehicle. The use of this system should never replace normal operational and safety precautions needed for reversing a vehicle. Always use

caution during any vehicle operation.

### ➤ **Model number**

The model number and system description/features are listed on the box.

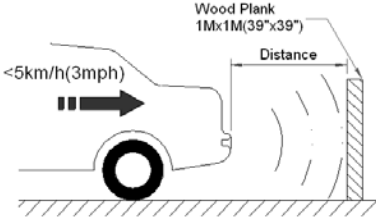
### ➤ **Features**

- ◆ High sensitivity: Able to quickly detect large obstacles (car, wall, pole, etc.) up to 2.5M (98") behind the vehicle. Sensitivity can be adjusted.
- ◆ Min. display distance: 28cm (approx. 11"). Minimum distance can be adjusted.
- ◆ Wide detection angle with minimal blind area.
- ◆ Optional truck adaptor accessory kit containing a sensor extension harness and under-bumper mounting brackets may be purchased separately.
- ◆ Adjustable alarm volume: high, low and off. Audible alarm generated by the 2 rear inner sensors starts approximately 1.7M (67") behind the vehicle. For the 2 rear side sensors, the audible alarm starts 1M (39") behind the vehicle.

- ◆ Diagnostic functions monitor and alert you of inoperable sensors.
- ◆ Attractive and ergonomic display unit.

- ◆ Small, unobtrusive sensor design and shape.
- ◆ Reliable performance, design and use of high-quality components ensure consistent operation.

**Diagram-1: TECHNICAL DATA OF REVERSE PARKING SYSTEM**

NO	ITEM	LED	REMARKS
1	Working Voltage (VDC)	10.5~16 (Rated Voltage=12)	1. Display distance is the detected distance from sensor to obstacle during operation at 25C.  2. The display distance results from detecting a square wood plank of 1m x 1m (39"x39").
2	Rated Current (max.)	200mA	
3	Display Distance: m (in.)	0.28 (11")~2.5 (98")	
4	Blind Area: m (in.) at 25C	<0.28 (11")	
5	Detection Tolerance: m (in.) at 25C	±0.03 (1")	
6	Warning Mode	Sound	<input checked="" type="checkbox"/>
		Distance	<input checked="" type="checkbox"/>
		Zone	<input checked="" type="checkbox"/>
		Direction	<input checked="" type="checkbox"/>
		Video	-
7	Display Type	LED	
8	Working Temperature(C)	-40~+75	
9	Storage Temperature(C)	-40~+90	

## ● PRODUCT COMPOSITION

The system consists of 3 basic components (see Figure 1):

- ➔ **Electronic Control Unit (ECU)**
- ➔ **Ultrasonic Sensors**
- ➔ **Warning Display**

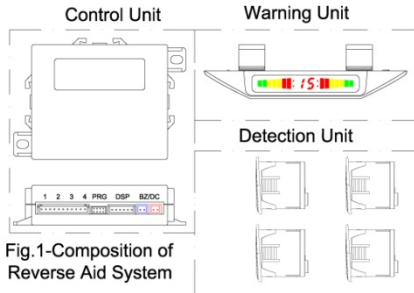


Fig.1-Composition of Reverse Aid System

When the vehicle is placed in reverse, the display warns drivers of obstacles in different ways: sound, display of warning zones, distance to and direction of obstacles.

Note: The display has a high-low-off switch for audible warning volume control. The display may be mounted on the visor (upside down) or on the dash (right side up). The display has a switch to rotate the display during installation.

## ● HOW TO USE

### ➔ System Startup

#### ☞ Reverse Parking System

- ◆ The system is fully automatic. It is active only when the vehicle is placed in reverse.
- ◆ At system power-up (Vehicle ignition on, in reverse), you will hear a short half-second 'beep'.

### ➔ Diagnostics

- ◆ After the system is turned on, the Back Zone Plus will go into a self diagnostic mode for three seconds.
- ◆ If after three seconds a sensor malfunction is detected, the display will warn you of a fault. The system will still

operate, but **may not function normally**. (See troubleshooting section for explanation of diagnostics function.)

*Note: Sensors must be installed in order of serial number. If not, the diagnostic function may reference the wrong sensor. See Figure 2.*

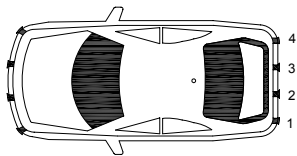


Fig.2 - Definition of Sensor's Serial Numbers

### ➔ Warning Mode

See Figure 3 for the three detection zones.

- ☞ Audible Warning: System beeps when an obstacle appears within the Warning zones, shown in Diagram 2.

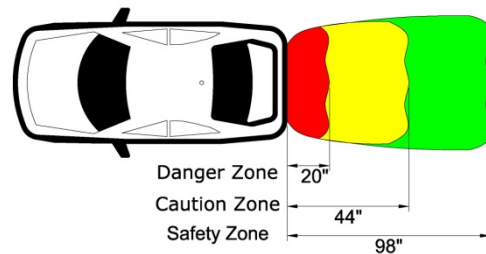


Fig.3-Warning Zone

**Diagram-2****AUDIBLE WARNING MODE FOR REAR DETECTION**

WARNING ZONE	DISTANCE (D)	AUDIBLE WARNING MODE
Danger Zone M(in.)	$00" < D \leq 11"$	Beep(Bi)
	$11" < D \leq 12"$	Bi.Bi.Bi
	$12" < D \leq 20"$	Bi..Bi..Bi
Caution Zone M(in.)	$20" < D \leq 28"$	Bi...Bi...Bi
	$28" < D \leq 36"$	Bi....Bi....Bi
	$36" < D \leq 44"$	Bi.....Bi.....Bi
Safety Zone M(in.)	$44" < D \leq 68"$	Bi.....Bi.....Bi
	$68" < D \leq 76"$	Bi.....Bi.....Bi
	$76" < D \leq 98"$	Bi.....Bi.....Bi
Outside	$98" < D$	-

*Remark: When obstacles appear behind the 2 rear side sensors (serial numbers 1 and 4), system doesn't beep unless the obstacles are within the Caution and Danger zones.*

**Diagram-3 : INDICATION OF DISTANCE AND ZONE FOR REAR DETECTION**

WARNING ZONE	DISTANCE(D) M(in.)	DISTANCE DISPLAY
Blind Zone	$D < 0.28(11")$	-P- (STOP)
Danger Zone	$0.28(11") \leq D \leq 0.5(20")$	(Inches)
Caution Zone	$0.5(20") < D \leq 1.1(44")$	Digits
Safety Zone	$1.1(44") < D \leq 2.5(98")$	Digits
Outside	$98" < D$	-

- The display shows distance only when an obstacle is detected within the range of 2.5m (98") from the sensor.
- When an obstacle enters the Danger Zone, be prepared to brake immediately. When the obstacle enters the Blind Zone ("-P-" will appear in the display), you should apply your brake immediately.

➔ **Warning Unit**

This unit warns you with a tricolor LED display with a built-in buzzer, enabling you to know the warning zone, direction (left, right) and distance to the obstacle.

See Fig.4 and Fig. 5

- Indication of direction - The left and right wave bands show drivers if the obstacle is on the left or right behind the vehicle.
- Indication of zone - The wave bands are green, yellow and red. Color changes as the vehicle moves closer to the obstacle, telling drivers the warning zone where the obstacle is located.

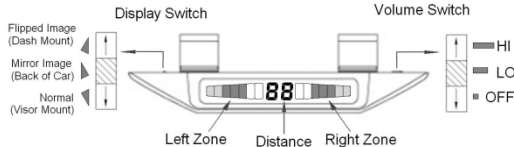


Fig.4 - LED Display for Reverse Parking System

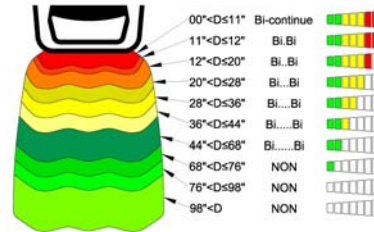


Fig.5-Warning Mode of PS-LE Series

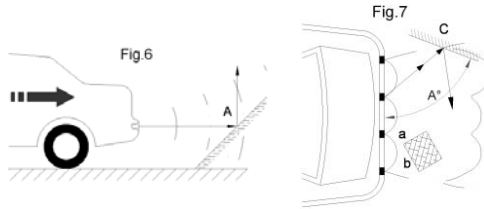
➔ **About detection**

Obstacle detection may vary due to object size, shape, density and environmental conditions. It is recommended to thoroughly check the system sensitivity before use.

⊕ An unusual reflection angle of obstacles may cause an incorrect or unusual detection warning.

Refer to Fig.6 below: Point A may not be detected due to unsatisfactory reflection angle.

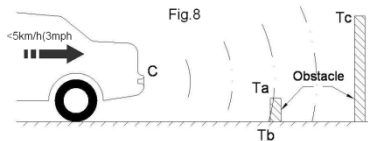




In Fig.7, detection may be variable due to object size, height and density. Angled surfaces may give false distance measurements. Various surface angles may be detected at varying distances on the display.

➤ Low obstacle standing before a tall one

As shown in Fig.8, although Obstacle  $T_{a-b}$  is lower than the sensors, Part  $T_b$  will be detected and warned first. As you approach these obstacles, the warnings may vary in intensity.

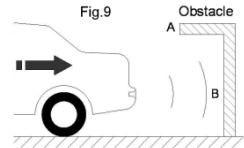


➤ Unusual condition of obstacle

Due to varying height, size, clothing type (absorption of signal), etc., **A PERSON MAY NOT BE DETECTED**. This device is only a parking aid and should never be solely relied upon for safely backing up a vehicle. Always use caution during any vehicle operation.

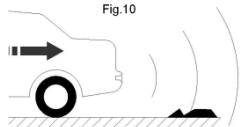
➤ Obstacles outside the detecting range

In Fig.9, Surface B will be detected, while Surface A may never be detected.



➤ Unusual road surface condition

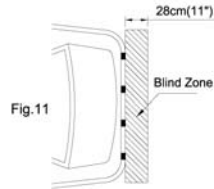
When road surfaces are rough, the system may output a warning signal. See Fig.10.



➤ Obstacles in blind zone

The blind zone covers a range of 28cm (11") behind the vehicle.

Obstacles in the blind zone will never be detected. Therefore, it is normal if the warning unit provides incorrect detection results. See Fig.11.



### ➔ Precaution

- 🔔 When this system is working, the reverse speed must be under 5km/h (3 mph).
- 🔔 Keep sensors clean. Remove dirt, ice or snow for proper operation.
- 🔔 Make sure that sensors are mounted securely in the correct position.
- 🔔 When sensors are found defective, they should be replaced immediately.
- 🔔 After installation, testing should be conducted to verify proper operation before use.

### ● INSTALLATION

It is recommended this system be installed by a trained installation professional.

### ➔ Installation Tools

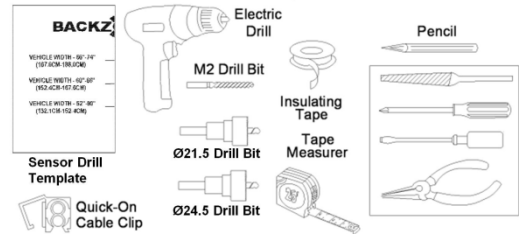


Fig. 12 - List of Installation Tools

The tools listed in Fig.12 are required for installation.

- The kit includes two drill bits, electrical connectors, double-sided adhesive tape and sensor locating template. In addition a file, flat head screwdriver, Philips head screwdriver and a pair of pliers will be required.

### ➔ Where to Install

Fig.13 gives a general layout showing where to install the components of the reverse parking system.

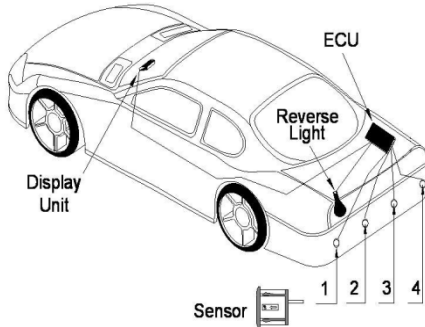
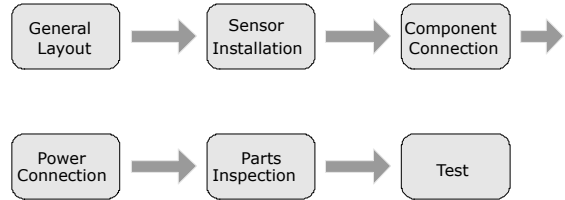


Fig.13 - Installation Diagram

Note: A truck adaptor accessory kit containing a sensor extension harness and under-bumper mounting brackets may be purchased separately.

### ➔ Installation Procedure



#### ➤ General layout

Determine where to install the ECU and warning unit according to the layout of your vehicle. Make sure the power cable of the ECU can be easily connected.

#### ➤ Sensor installation

For details, refer to "Tips on Sensor Installation" on page 10.

#### ➤ Component Connection

◆ See Fig.14 for the connection between components of reverse parking system.

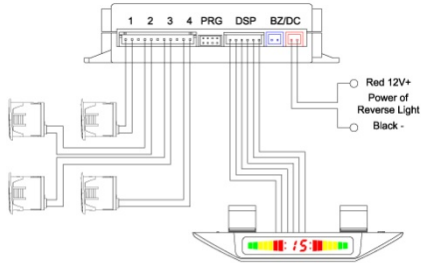


Fig.14-Connection between each unit of Reverse Parking System

- Control unit
  - ◆ The reverse parking system has 1 ECU that should be installed near the back-up lamp in the trunk.
- Warning unit
  - ◆ Install the LED display on the visor using supplied clamps, or, a flat spot on the dashboard using supplied adhesive strip.

➤ Powering up

For details, refer to "Powering up" on page 12.

➤ Test

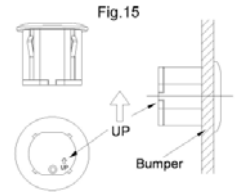
For details, refer to "Test the System" on page 13.

Note: Sensors and trunk harness connectors are serialized and must be connected in position and order as shown in Figure 2; otherwise the display will indicate improper location of object.

➤ **Tips on Sensor Installation (please see bumper drill guide/template included in kit).**

➤ Width of different vehicle models varies; it is very important to choose the correct locations to install sensors.

- ◆ Sensors need to be installed with the "Up" mark facing up as shown in Fig. 15.
- ◆ Sensor must be fully inserted and fit flush to bumper face.
- ◆ Area behind sensor must be



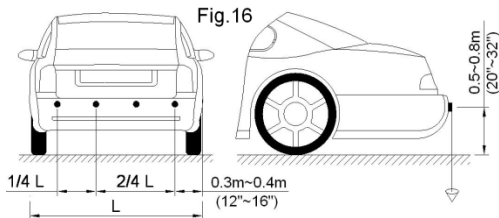
open and not contact sensor body (bumper, mounting brackets, foam...etc.).

◆ The face of the sensor should be perpendicular to the ground. If the bumper surface is angled, use the supplied angled bezels to compensate.

Note: To use angled bezels, first, carefully remove bezel from sensor. Snap correct angled bezel on sensor with bezel angle in proper orientation.

◆ Horizontal and vertical positioning

See Fig.16, "L" is the width of vehicle( $L=16'' \pm 2''$ ). The horizontal distance between sensors is decided by the width



of vehicle. For a wider detection angle, locate side sensors closer to the lateral sides of the vehicle.

◆ Installation steps

- Mark the positions of each sensor on bumper with a marker to ensure proper location.
- Drill holes using the included hole saw. (An M2/.079" drill bit can be used to drill pilot holes to aid in this process.)
- Remove the burrs from the hole edge with a file.
- Insert the sensor cables into the holes made in bumper according to serial number. Refer to Figure 2

#### IMPORTANT

- Use correct hole saw. Sensors may not function properly with holes that are too small or too large in diameter.
- Plastic bumpers require the 21.5mm hole saw. Plastic bumpers do not require the rubber sleeves included in kit.

- Metal bumpers require the 24.5mm drill. Metal bumpers require rubber sleeves installed before installing sensors. (Note: The rubber sleeves must be oriented with "UP" notation mounted up).
- Sensors can be re-painted to match the color of your vehicle. Note: The painting layer must be symmetrical and less than 0.1mm (.004 in.) thick.

#### ◆ Under-Bumper Installation Steps

- Mark the positions of each sensor below the bumper with a marker to ensure proper location.
- Mount brackets using the supplied hardware.

Note: Brackets must be mounted to ensure the center axis of the sensor is parallel to the center line of the vehicle and perpendicular to the ground.

- Insert the rubber sleeves into the brackets.
- Insert the sensor cables into the holes made in

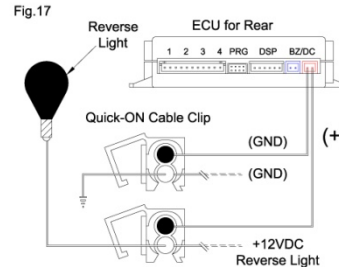
bumper according to serial number. Refer to Figure 2

#### ➔ Powering Up

##### ☞ Power connections of reverse parking system

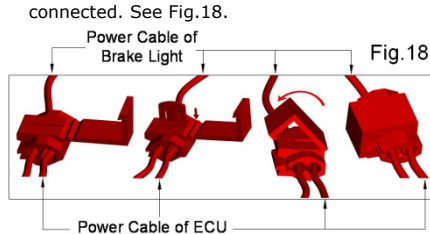
The control module gets power from the reverse light circuit of the vehicle. Refer to Fig.17.

- ◆ It is recommended to solder all connections. If it is not



possible to solder the connections, use the supplied electrical connectors.

- Press the metal part tightly to ensure cables are well



➤ Power connection steps:

- ◆ Securely connect the power cable of ECU to the +12V wire of the reverse light;
- ◆ Securely connect the ground cable of ECU to a vehicle ground point.

#### ➤ **Precautions**

- ◆ Vehicle engine must be off when installing the system.
- ◆ The ECU must not be installed near any potential sources of interference, e.g. exhaust pipe, other cables or groups of cables.

- ◆ Detection results may be affected if sensors are installed in steel bumpers without rubber sleeves.
- ◆ Ultrasonic and electromagnetic waves from other sources near the system may affect detection results.

#### ● **TEST THE SYSTEM**

##### ➤ **Test Subjects**

- Audible warning

*Refer to Fig 3 and 5*

- Distance, direction and warning zones

*Refer to Fig 4 and 5*

- Turning on reverse parking system

Once reverse is engaged, system is automatically activated; when vehicle is shifted out of reverse gear, system stops working.

##### ➤ **Test Methods**

- Test tools

Conduct tests by using obstacles behind the vehicle.

- ◆ Prepare a PVC tube of  $\varnothing 75\text{mm} \times 1000\text{mm}$  ( $\varnothing 3'' \times 39''$  L) for short distance test.

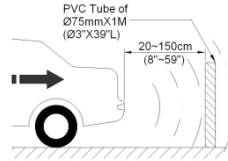


Fig.19

- ◆ Prepare a wood plank of  $500 \times 500 \times 10\text{mm}$  ( $20'' \times 20'' \times 4''$ ) for long distance test:  $> 1.2\text{M}$  ( $47''$ )

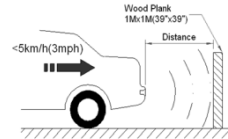


Fig.20

⇒ Tests of rear detection

- ◆ Turn the vehicle key to "ON" position, don't start the vehicle engine.
- ◆ Put vehicle in reverse gear, move the 2 obstacles forward and backward  $20 \sim 200\text{cm}$  ( $8'' \sim 79''$ ) behind vehicle. System should beep and/or visually show the warning zones, distance to and direction of the obstacles.

- ◆ Check the sensors one by one. Refer to Fig.19 & 20.

### ➔ Sensitivity Adjustments

The system comes with a programming cable with 3 wires corresponding to 3 different functions.

- ◆ The blue wire loop extends the distance of each zone 7-9" when cut. Minimum distance detection is approximately 20" with this adjustment.
- ◆ When cut, the brown wire loop extends the distance of each zone 14-18". The minimum distance detection is approximately 27" with this adjustment.
- ◆ When connected to ground, the yellow wire decreases the vertical angle of sensor by 20%. This should only be used if ground noise is detected after testing the system. Figure 21

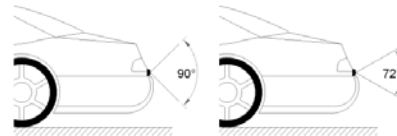





Fig.21




## ● DISCLAIMER

 The system is designed and intended as a warning aid for parking only.

 The supplier of this product accepts no responsibility for any accidents and/or damage caused during the use of this system.

 Detection results may be affected by environmental conditions: i.e. rain, fog, snow, extreme temperature. Due to obstacle variability and road conditions, warning levels may vary or obstacles may be undetected.

 Ultrasonic and electromagnetic waves from other sources near the system may affect detection results.

## ● TROUBLESHOOTING

➔ **Fault-Warning mode** The following chart shows what will be displayed during a diagnostic-fault:

**Diagram 4: AUDIBLE & VISUAL WARNING MODE  
OF DIAGNOSTICS**

Serial No. of Defective Sensors	Audible Warning	Display
1	Bi	E1
2	Bi.Bi	E2
3	Bi.Bi.Bi	E3
4	Bi.Bi.Bi.Bi	E4
Note: Multiple sensor faults may be displayed in succession		

### ◆ Audible warning of diagnostics

If a sensor is found defective during diagnostics, the system will tell you its serial number by beeping per Diagram 4. If all sensors are defective, the system will beep a solid tone for 1.5 seconds.

*Ex. 1: in case sensor No. 3 is abnormal*

*When powered on, system beeps once for 0.5 second (signal for diagnostics), then rapidly beeps 3 times (signal of sensor No. 3 that is abnormal). This alert will continue each time the system is started until the problem with sensor No. 3 is resolved.*

*Ex. 2: in case both sensors No. 2 and 4 are abnormal*

*When powered on, the system beeps once for 0.5 second, and then rapidly beeps 2 times, you should power off the system and solve the problem of sensor No.2. When you re-start the system, after the beep of 0.5 second, the system will beep rapidly 4 times, indicating a problem with sensor No. 4.*

◆ Visual warning of diagnostics

- When diagnostics are over, the display shows you the serial number of abnormal sensor. Refer to Diagram 4.
- Display mode

If a sensor is found abnormal, "EX" will be displayed for less than 3 seconds, "X" is the serial number (1 through 4) of the abnormal sensor.

*Ex 1: If "E4" is displayed, it tells you sensor No. 4 is operating abnormally.*

*Ex 2: If neither sensor No. 2 nor No. 4 works, "E2" and "E4" will appear in the display successively.*

If none of the sensors works, "EE" will be displayed, and the

system will beep continuously for 1.5 seconds.

➤ The following chart provides you with solutions to a few simple problems

PROBLEM	REASON	SOLUTION
System doesn't react when reverse is engaged.	<ol style="list-style-type: none"> <li>1. System is not powered up or wrong connection of power cable.</li> <li>2. Invalid connection between display and ECU.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the power and ground connections.</li> <li>2. Check the connection between display and ECU.</li> </ol>
After activation, system continuously beeps for 3 seconds.	<ol style="list-style-type: none"> <li>1. Invalid connection between sensors and ECU.</li> <li>2. All sensors are defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the connection between sensors and ECU.</li> <li>2. Replace the defective sensors.</li> </ol>
The display distance remains the same while distance to obstacle varies.	<ol style="list-style-type: none"> <li>1. Incorrect installation direction of sensors.</li> <li>2. Incorrect installation angle of sensors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Follow the "UP" mark and re-install sensors.</li> <li>2. Adjust the position of detecting angle to avoid downward detection.</li> </ol>
In case no obstacle is found in the detection range, display always shows "-P-" and system beeps.	<ol style="list-style-type: none"> <li>1. Sensor(s) is loose.</li> <li>2. System is detecting vehicle itself or its spare parts, for example the spare tire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ensure sensor is fixed tightly in bumper.</li> <li>2. Adjust the position of sensors and the detection angle.</li> </ol>
Wrong indication of direction.	The serial number of the sensor plug is different from that of the ECU socket.	Re-connect sensor plugs to ECU sockets by matching serial numbers. (See Fig. 2, page 4)
The display refuses to work when vehicle's other lights are on.	Wrong connection of ECU's ground cable.	Correctly reconnect the ground cable of ECU.

## 36,000 MILE/36 MONTH LIMITED WARRANTY

Rostra Precision Controls, Inc. (the Company) warrants to the original retail purchaser of this Product that should this product or any part thereof, under normal use and conditions, be proven defective material or workmanship within 36 months of the original purchase, such defect(s) will be repaired or replaced (at the Company's option) without charge for the parts.

To obtain repair or replacement within the terms of this Warranty, the product is to be delivered with proof of warranty coverage (e.g. dated bill of sale), specification of defect(s), transportation prepaid, to the installing dealer and/or retailer.

This Warranty does not cover costs incurred for removal or reinstallation of the product, or damage to vehicle electrical systems.

This Warranty does not apply to any product or part thereof which in the opinion of the Company has been damaged through alteration, improper installation, mishandling, misuse, neglect, or accident.

This Warranty is in lieu of all other express warranties or liabilities. ANY IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, SHALL BE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. ANY ACTION FOR BREACH OF ANY WARRANTY HEREUNDER INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY MUST BE BROUGHT WITHIN A PERIOD OF 42 MONTHS FROM DATE OF ORIGINAL PURCHASE. IN NO CASE SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WHATSOEVER. No person or representative is authorized to assume for the Company any liability other than expressed herein in connection with the sale of this product.

THE EXTENT OF THE COMPANY'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT PROVIDED ABOVE AND, IN NO EVENT, SHALL THE COMPANY'S LIABILITY EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER FOR THE PRODUCT.

Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damage so the above limitations or exclusions may not apply to you. This Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

### OWNER'S WARRANTY RECORD

To be completed by installer and retained by customer

Customer's Name \_\_\_\_\_ Part # \_\_\_\_\_

Dealer Name \_\_\_\_\_

Dealer Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone # \_\_\_\_\_ Fax # \_\_\_\_\_

Email \_\_\_\_\_

Date Purchased \_\_\_\_\_ Mileage \_\_\_\_\_ Date Installed \_\_\_\_\_

Make \_\_\_\_\_ Model \_\_\_\_\_ Year \_\_\_\_\_

Vin # \_\_\_\_\_

Customer Complaint \_\_\_\_\_

Description of Defect/Repair \_\_\_\_\_

**Notice to Installer:** Contact your distributor for technical assistance or return authorization. **THIS CARD MUST BE COMPLETE AND ACCOMPANY THE RETURNED PRODUCT.** Any alteration to product, damage caused by installation or use with any product not manufactured or recommended by Rostra Precision Controls, Inc. voids the warranty & parts will be returned.

