



ECCO®

Installation and Operation Instructions Smartspot™ Collision Avoidance System

IMPORTANT! Read all instructions before installing and using. Installer: This manual must be delivered to the end user.



WARNING!

Failure to install or use this product according to manufacturer's recommendations may result in property damage, serious bodily/personal injury, and/or death to you and those you are seeking to protect!



Do not install and/or operate this safety product unless you have read and understand the safety information contained in this manual.

1. Proper installation combined with operator training in the use, care, and maintenance of emergency safety devices are essential to ensure the safety of you and those you are seeking to protect.
2. Exercise caution when working with live electrical connections.
3. This product must be properly grounded. Inadequate grounding and/or shorting of electrical connections can cause high current arcing, which can cause personal injury and/or severe vehicle damage, including fire.
4. Proper placement and installation are vital to the performance of this safety device. Install this product so that output performance of the system is maximized and the controls are placed within convenient reach of the operator so that s/he can operate the system without losing eye contact with the roadway.
5. Do not install this product or route any wires in the deployment area of an air bag. Equipment mounted or located in an air bag deployment area may reduce the effectiveness of the air bag or become a projectile that could cause serious personal injury or death. Refer to the vehicle owner's manual for the air bag deployment area. It is the responsibility of the user/operator to determine a suitable mounting location ensuring the safety of all passengers inside the vehicle particularly avoiding areas of potential head impact.
6. It is the responsibility of the vehicle operator to ensure during use that all features of this product work correctly. In use, the vehicle operator should ensure the projection of the safety signal is not blocked by vehicle components (i.e., open trunks or compartment doors), people, vehicles or other obstructions.
7. The use of this or any other safety device does not ensure all drivers can or will observe or react to a warning signal. Never take the right-of way for granted. It is your responsibility to be sure you can proceed safely before entering an intersection, driving against traffic, responding at a high rate of speed, or walking on or around traffic lanes.
8. This equipment is intended for use by authorized personnel only. The user is responsible for understanding and obeying all laws regarding warning signal devices. Therefore, the user should check all applicable city, state, and federal laws and regulations. The manufacturer assumes no liability for any loss resulting from the use of this safety device.



CAUTION!

When drilling into any vehicle surface, make sure that the area is free from any electrical wires, fuel lines, vehicle upholstery, etc. that could be damaged.

Storage:

1. Do not expose the device to excessive hot or cold temperatures. The storage temperature of this device is -30 to +80°C and the operating temperature is -20 to +70°C. The humidity is RH90%.
2. Never use this device in environments with excessive moisture, dust, or smoke.
3. Avoid dropping or striking this device.
4. Never puncture, scratch, or use abrasive cleaning material on this device.
5. Do not place cables where they may be pinched or stepped on.

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1. Operating Precautions:

1. The device may be powered by a 12 or 24 volt automotive battery or vehicle electrical system.
2. Improper connection of the system or power supply will damage the sensor and control box.
3. The system should be tested properly for daily operations before the vehicle or equipment is used.
4. The radar detection system is intended for use on commercial vehicles and equipment. Proper installation requires a good understanding of vehicle or equipment's electrical system and procedures.



WARNING:

1. Do not open the product. This can cause damage, short-circuiting or electrical shock that could lead to serious injury or death.
2. The equipment is not an alternative to safe driving practices.
3. Install a plug sealer on any control box port that is not use.
4. Yellow wire (alarm output) must be isolated to prevent short-circuiting if not in use.

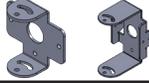
2. Product Features:

1. Advanced microwave sensing technology.
2. Automatically activated when the driver shifts vehicle into reverse.
3. Customizable detection zones and alarm trigger with computer interface.
4. The device is capable of visualizing the radar zones on the display. As soon as an object enters the detection zone it will activate a transparent colored visualization alert on the display to make the driver aware of the potential danger. (Green - Far, Yellow - Middle, Red - Close).
5. Detects moving objects including any transportation vehicles, motorcycles, bicycles, pedestrians, etc.
6. Works effectively in harsh environments and in poor visibility including darkness, smoke, fog and dust.
7. Within 1 meter: 85.5db, 0.1 meter: 96db, this alarm box includes buzzer and detection zone overlay for viewing on the camera monitor. If driver disconnects the buzzer, the detection zone overlay will flash when approaching an object.

3. Technical Specifications:

1. Radar sensor frequency: 73.00 to 79.00 GHz
2. Transmitter Type: FMCW.
3. Power Supply: 12 to 24 VDC.
4. Detection Range: 0.1-20m, up to 5 detection zones (distance of each zone can be configured).
5. Detection Zone Visualization: Green (furthest), Yellow(middle), Red (closest).
6. Detection Tolerance: +/-30cm.
7. Antenna Beam Angle: 100° (Horizontal), 40° (Vertical).
8. Trigger Input ×1 : Trigger from vehicle, high active
Range above +10 VDC, up to supply voltage.
9. Alarm Output ×1: Switched to Ground when activated
Capacity up to 1.0A.
10. Video format: standard CVBS compatible with worldwide NTSC, PAL
11. Operating Temperature: -20 to +70°C.
12. Storage Temperature: -30 to +80°C.
13. IP Rating: IP66 (sensor)
14. Vibration Rating: 5.9G
15. Dimensions: Sensor: 106.6(W) ×72.9(H) ×34.5(D) mm.
Control Box: 152.6(W) ×89.2(H) ×53.8(D) mm.
16. Weight: 154.6Grams (sensor) 240Grams (control box)
17. Mounting: Two (4.5mm) diameter mounting holes (sensor)
Four (6mm) diameter mounting holes (control box)
18. Buzzer: within 1m: 75.8db, 0.1m: 91.5db
19. Monitor: within 1m: 83.3db, 0.1m: 91.5db
20. Thumb drive provided with required drivers for Windows 10 and MAC and firmware for configuration of system.

4. Accessories & Replacement Parts:

ECCO PART NUMBER	DESCRIPTION	
ER1012	3ft/0.9m USB to UART Cable	
EZ1010	Silicone Pad	
EZ1011	Sensor Mounting Bracket, adjustable horizontal additional 15° & 30°	
EZ1012	Universal Mounting Bracket, adjustable horizontal and vertical additional 5-30°	
ECTC5-4	10ft/3m Monitor Transmission Cable (4 pin aviation interface, female to female)	
ECTC10-4	33ft/10m Sensor Transmission Extension Cable	
ECTC20-4	66ft/20m Sensor Transmission Extension Cable	
ER1013	10ft/3m Sensor Transmission Cable (4 pin aviation interface, female to male)	

5. Parts Identification:

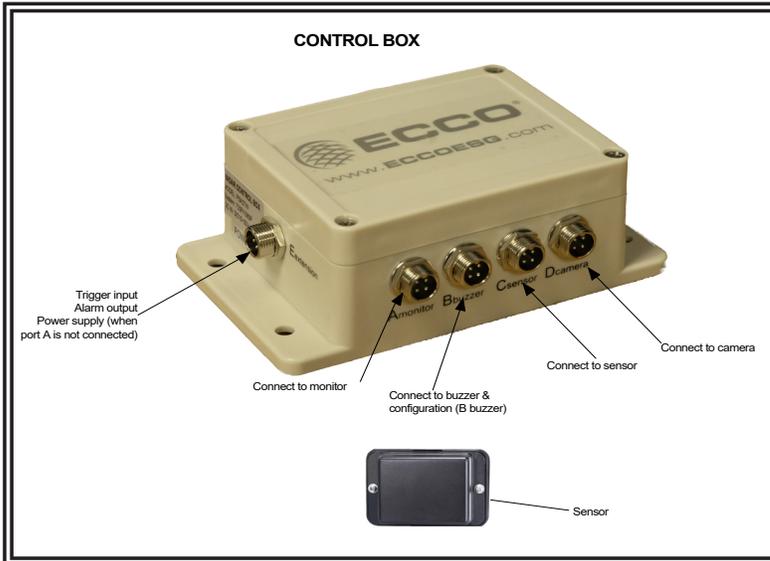


Figure 1

Important!

Waterproof all connections whether inside or outside the vehicle by using sealant and wrapping with insulation tape. Wrap tape tightly, overlapping by one-half widths so there are no gaps.

Notes:

1. Larger wires and tight connections will provide longer service life for components. For high current wires it is recommended that terminal blocks or soldered connections be used with shrink tubing to protect the connections. Do not use insulation displacement connectors (e.g., 3M Scotchlock type connectors).
2. Route wiring using grommets and sealant when passing through compartment walls. Minimize the number of splices to reduce voltage drop. High ambient temperatures (e.g., under-hood) will significantly reduce the current carrying capacity of wires, fuses, and circuit breakers. All wiring should conform to the minimum wire size and other recommendations of the manufacturer and be protected from moving parts and hot surfaces. Looms, grommets, cable ties, and similar installation hardware should be used to anchor and protect all wiring.
3. Fuses or circuit breakers should be located as close to the power takeoff points as possible and properly sized to protect the wiring and devices.
4. Particular attention should be paid to the location and method of making electrical connections and splices to protect these points from corrosion and loss of conductivity.
5. Ground termination should be only be made to substantial chassis components, preferably directly to the vehicle battery.
6. Circuit breakers are very sensitive to high temperatures and will "false trip" when mounted in hot environments or operated close to their capacity.

6. Installation:

Check the contents of the shipping package and make sure the following items are included:

- 1 (or 2) Sensor(s)
- 1 Control Box
- 1 Buzzer (within 1m: 75.8db, 0.1m: 91.5db)
- 1 3m Monitor Transmission Cable
- 1 (or 2) 3m Sensor Transmission Cable(s)
- 1 0.9m USB to UART Cable
- 1 (or 2) Sensor Bracket(s)
- 1 USB Thumbdrive Camera Cable (included with camera kit, sold separately)

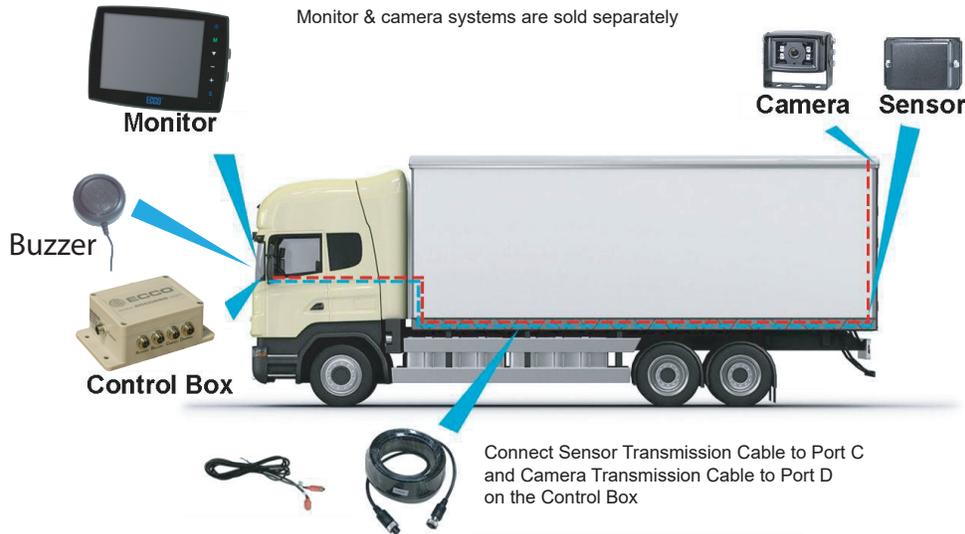


Figure 2

6.1 Sensor Installation:

The radar sensor mounting location is important for proper installation. Ideally, the sensor should be mounted on the rear center of the vehicle at roughly 3ft +/- 0.1ft (1m +/- 0.03m) above the ground and angled up 5° using the Silicone Pad. The sensor can be adjusted horizontally with the mounting bracket.



Figure 3

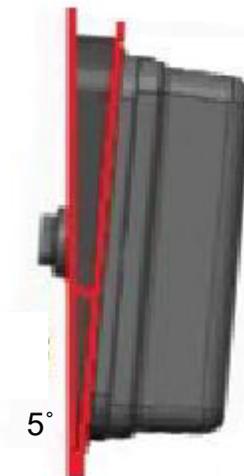


Figure 4

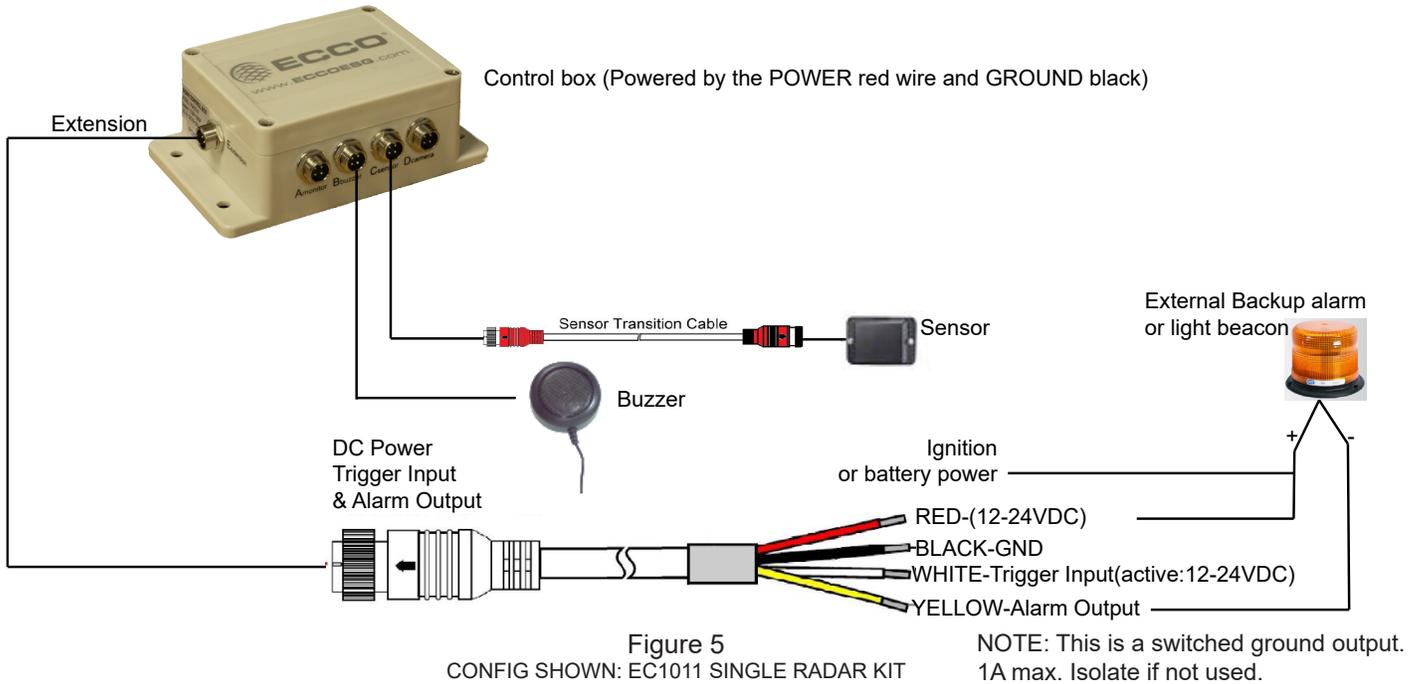
(When mounted higher than 3ft/1m)

IMPORTANT!

Before the Radar Detection System is permanently installed to the vehicle, verify that the 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 (ex: rear of the vehicle).

6.2 System Detection Diagram:

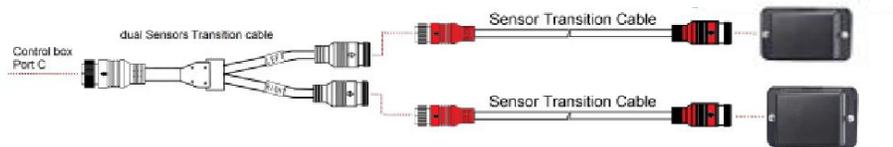
6.2.1 Radar System without Camera System:



Port A for monitor (use a plug sealer for IP protection)

Port B for buzzer (Buzzer/Configuration)

Port C for radar sensor (through 3m Sensor Transition Cable for one sensor. Use an additional 0.25m Dual Sensor Transition Cable for two sensor (optional)).



Port D for camera (use a plug sealer for IP protection)

Port E for power and trigger cable (through 1.5m power cable and trigger cable)

Red wire: connect to power of the system's power supply

Black wire: ground

White wire: trigger input

Yellow wire: alarm output.

Trigger Input:

The system provides an auxiliary input that allows an external signal input to change the sensor status between standby and active. The input is wired to the reverse circuit of the vehicle.

Alarm Output:

The system provides an auxiliary output that triggers an external device whenever the sensor detects an object. This output can be used to activate an external backup alarm, light or beacon. The output is switched from a high impedance state to ground when activated and is protected against over-current or short-circuit. The maximum operating current is approximately 1 amp. The power supply for alarm cannot exceed 24V.

6.2.2 Radar System with Camera System:

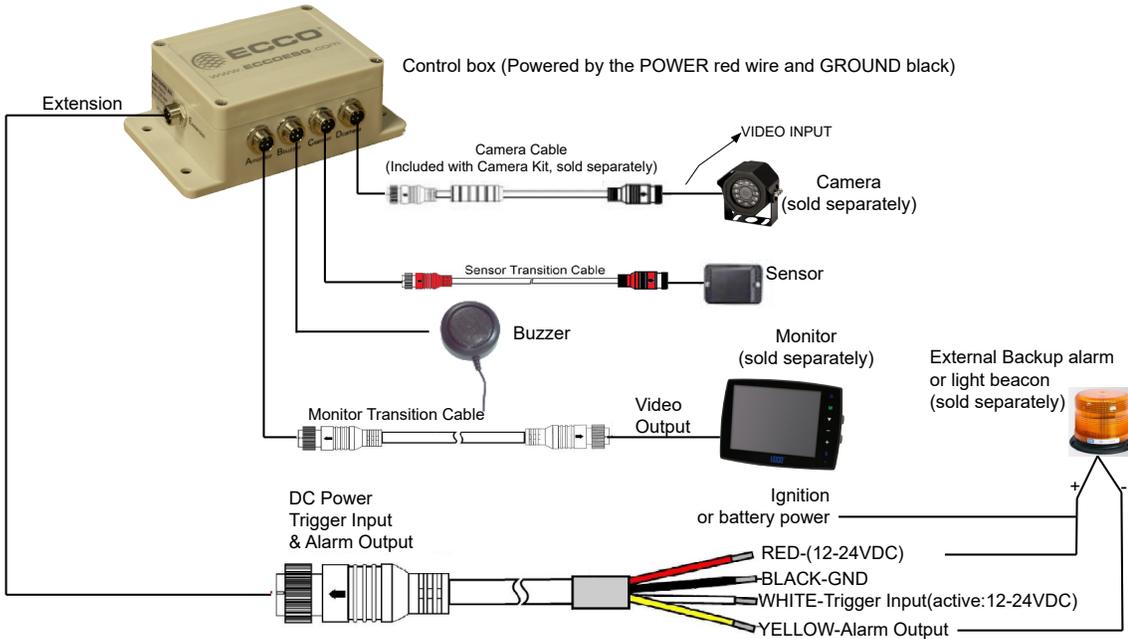


Figure 7
CONFIG SHOWN: EC1011 SINGLE RADAR KIT W/ CAMERA & MONITOR

NOTE: This is a switched ground output. 1A max. Isolate if not used.

Port A for monitor (use a plug sealer for IP protection)

Port B for buzzer (Buzzer/Configuration)

Port C for radar sensor (through 3m Sensor Transition Cable for one sensor. Use an additional 0.25m Dual Sensor Transition Cable for two sensor (optional).

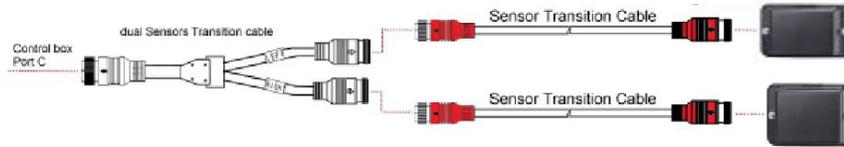


Figure 8
Connecting two sensors (EC1012 Dual Radar Kit)

Port D for camera (through camera cable that comes with the camera, sold separately)

Port E for power and trigger cable (through 1.5m power cable and trigger cable)

Red wire: connect to power of the system's power supply

Black wire: connect to ground of the system's power supply

White wire: trigger input

Yellow wire: alarm output

Trigger Input:

The system provides an auxiliary input that allows an external signal input to change the sensor status between standby and active. The input is wired to the reverse circuit of the vehicle.

Alarm Input:

The system provides an auxiliary output that triggers an external device whenever the sensor detects an object. This output can be used to activate an external backup alarm or a light beacon. The output is switched from a high impedance state to ground when activated and is protected against over-current or short-circuit. The maximum operating current is approximately 1 amp. The power supply for alarm cannot exceed 24V.

7. Object Detection Capability:

7.1 Detection Pattern:

7.1.1 Horizontal Pattern:

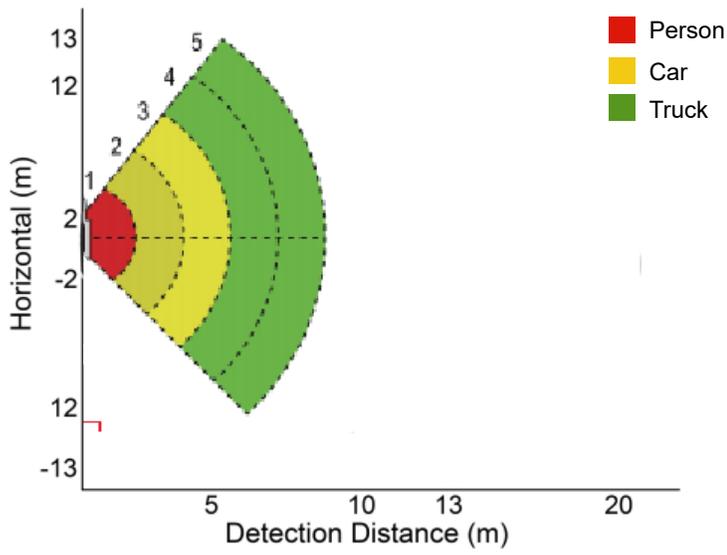


Figure 9

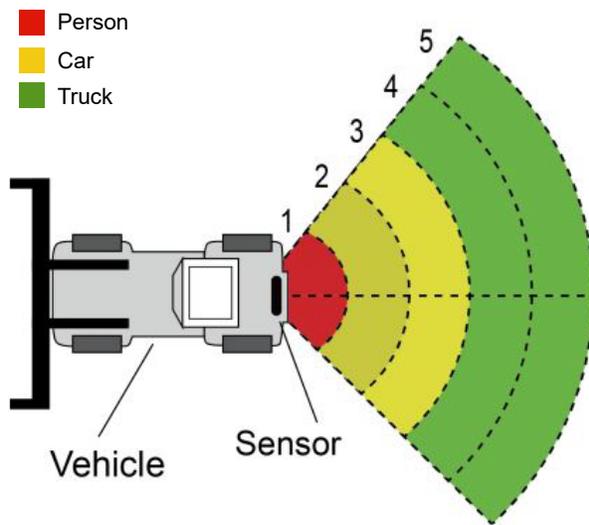


Figure 10

7.2 Tips for Users:

Radar works on the principle of line of sight and relies on some of the electromagnetic energy transmitted by the sensor being reflected back from the object to the sensor. If an object does not reflect enough electromagnetic energy back to the sensor it will not be detected. In the case where there are multiple objects in the detection area at various distances and/or angles, the sensor detects the closest object, which is the most important one for collision avoidance. The object nature, location and direction are key influences in determining if an object is detected or not. The influencing factors are listed below.

Size: Larger surfaces are detected better than smaller surfaces.

Material: Metal is detected better than non-metal materials, e.g. wood, plastic.

Surface: A smooth and solid surface is detected better than rough, uneven, porous, fragmented or liquid surfaces, e.g. bushes, gravel, water.

Shape: A flat object is better detected than a complex shape.

Angle: An object facing directly towards the sensor is detected better than an object that is located towards the edges of the detection area or at an angle.

Distance: An object closer to the sensor is better detected than one which is farther away.

7.3 Alerts Description:

This system provides the operator both visual and audible indications of a detected object. As soon as an object enters the zones it will alert the operator to be aware of the potential danger. Distance to the detected object is displayed with five zones on the monitor. Distance of each zone and detection range can be customized.

Single Sensor System

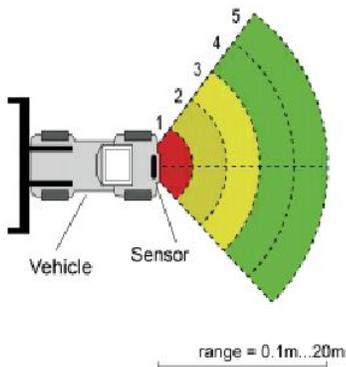


Figure 11

Two Sensor System

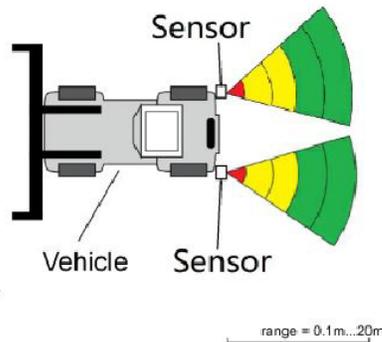


Figure 12

The buzzer can provide an audible alert that will increase in rate as an object becomes closer, alerting the operator that an object is being detected. The monitor's internal buzzer can provide an audible alert too.

8. PC Configuration Tool:

8.1 PC System Requirements:

The system requires a PC with a USB connector and the software environment with .NET Framework 4.6.2 (or newer) and Microsoft Visual C++ Redistributable package. Thumb drive included with system.

8.2 PC Software Installation:

The software installation requires two steps. First, the installation of a USB to serial port driver and second, the installation of the Configuration Tool itself. The Configuration Tool files can be found in the supplied thumb drive.

8.2.1 USB to Serial Port Driver Installation:

A USB to serial port driver is required to communicate between the PC and the Control Box. Use USB Thumbdrive included in product box.

The driver should be installed before the USB to serial port connection is made to a PC.

1. Double click "CP210xVCPInstaller_x64.exe"(64-bits system) or "CP210xVCPInstaller_x86.exe" file(32-bits system), then it starts installing the USB driver. Click next.

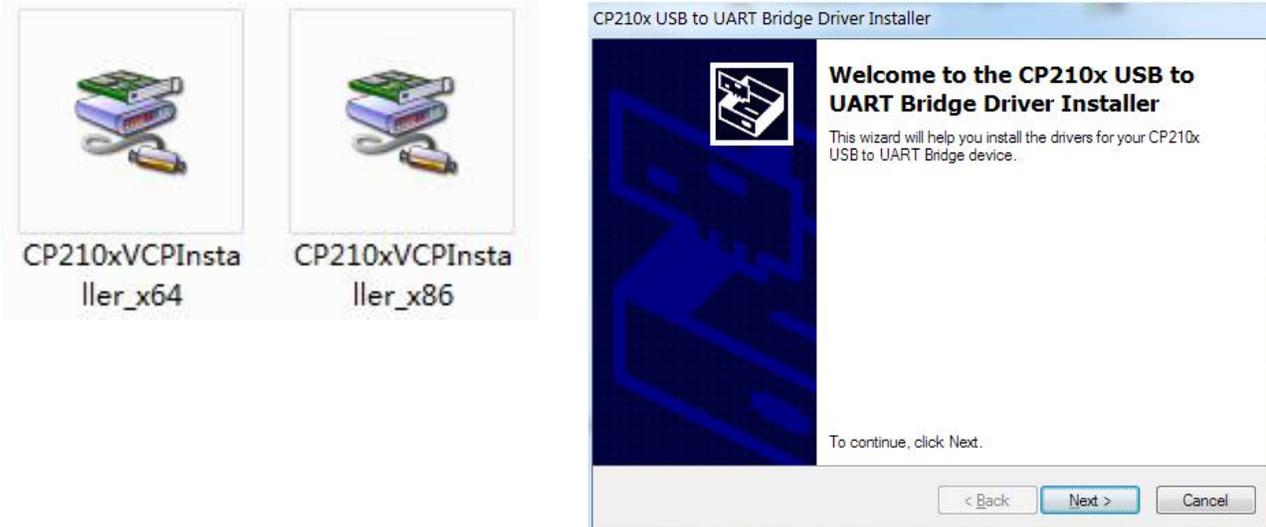


Figure 13

2. Accept the license agreements. Click next.



Figure 14

3. Click on Finish when installation has been completed.



Figure 15

If the cable is plugged into the PC while running the setup installation, unplug and re-plug the cable for the system to detect the device.

8.2.2 Configuration Tool Software Installation using ECCO Thumb Drive :

Run Radar Tool.exe from the thumb drive included with the radar kit to start configuration tool.

8.3 Using the Configuration Tool Software :

Connect the Control Box Port B to the PC with the USB serial port cable.



Figure 16

WARNING! Ensure that the Control Box is powered and there is NO VOLTAGE on the trigger input line before connection.

8.3.1 User Interface Overview :

The interface of the Configuration Tool is outlined below.

1. Click the "setup" button on the top bar to show settings interface. The bottom bar is a status bar, which is used to show the connection state and application state.

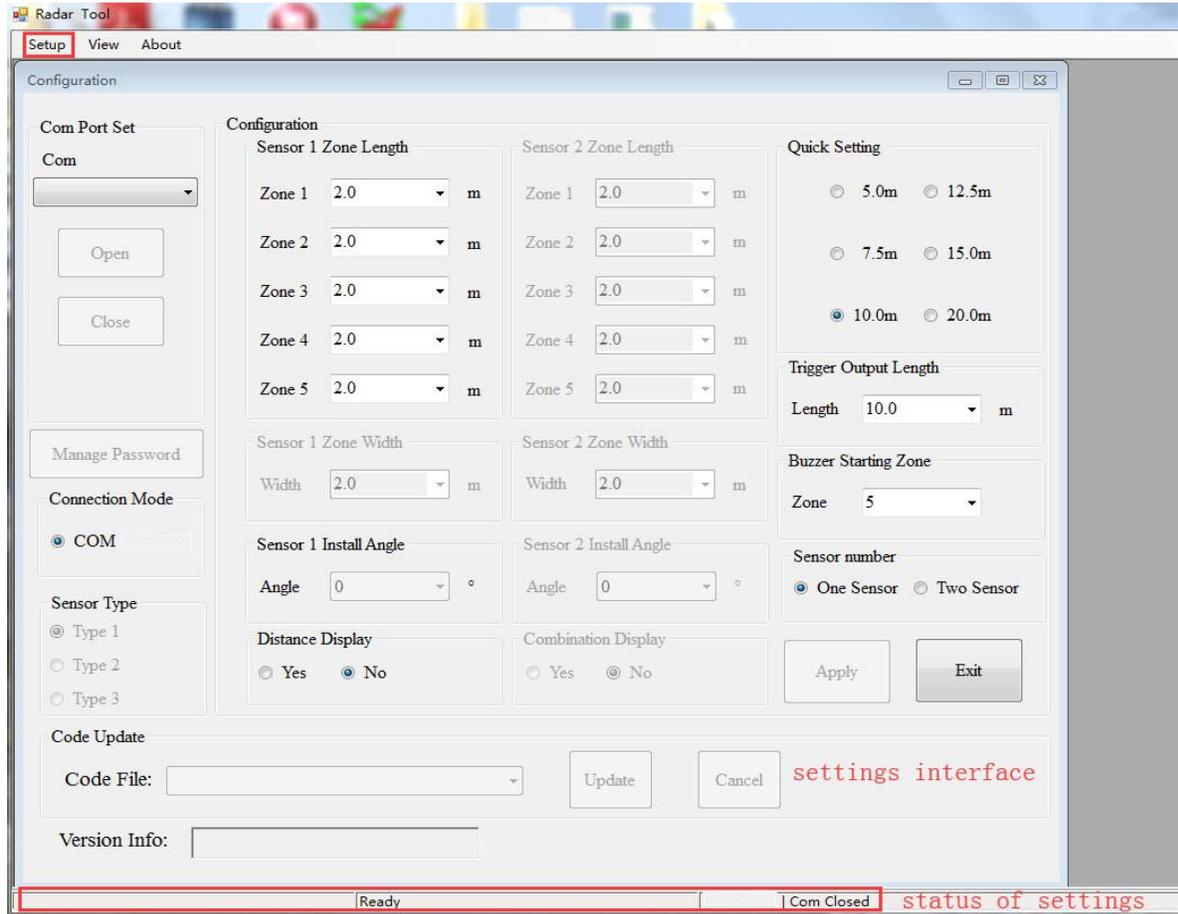


Figure 17

2. The settings interface is divided into several parts:

- Part A is connection setup. COM port is used to select the COM port number for connection when you select COM mode.
- Part B is Control Box configuration, which is used to set up the detection zone length, width (Type 1 sensor cannot be set), trigger output length and buzzer starting zone.
- Part C is showing the install angle of sensor.
- Part D is to select the number of sensors to use with the control box for the desired application (one or two)
- Part E combination display is selected only if two sensors are being used.
- Part F is updating function.
- Part G is version info that shows the current version of the firmware (information only)

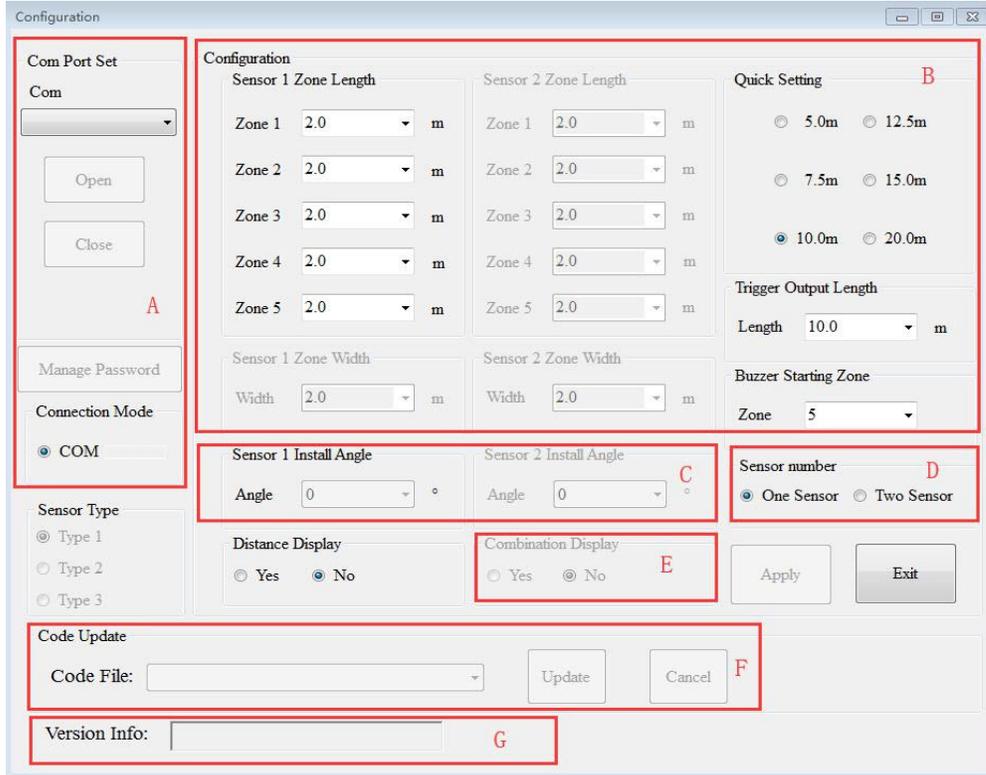
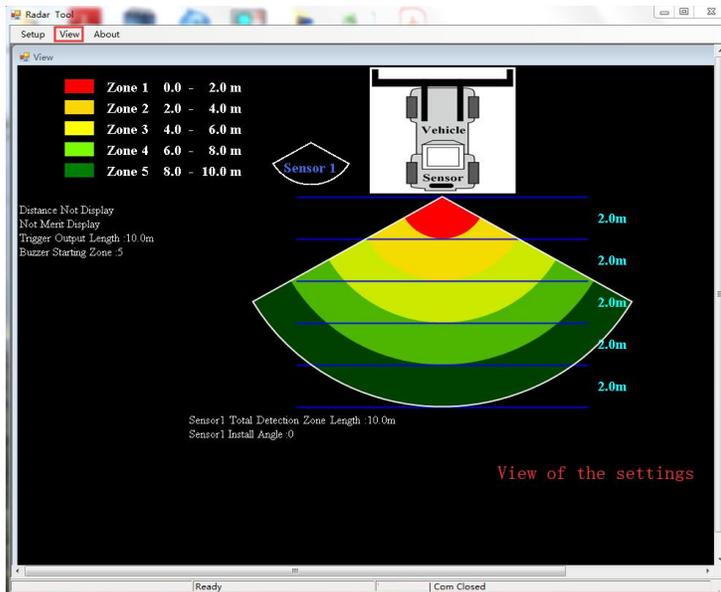
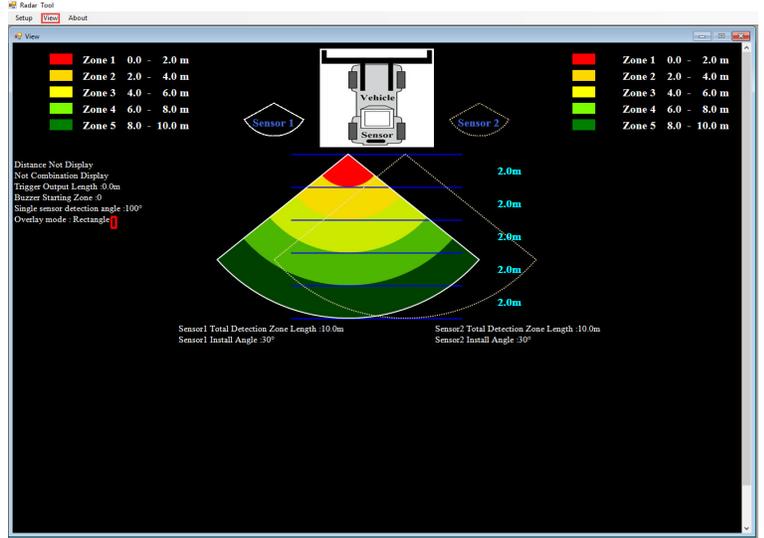


Figure 18



View of the settings when set-up is complete on a single sensor system

Figure 19



View of the settings when set-up is complete on a single sensor system

Figure 20

8.3.2 Connecting Control Box:

8.3.2.1 Connecting via USB to UART Cable :

Select the COM Mode. To check the COM port number you are using for the connected Control Box on the PC you will need to open Windows “Device Manager”.

In the Device Manager window click “Ports (COM & LPT)” and check “Silicon Labs CP210x USB to UART Bridge (COM###)”. The “###” represents the number of the port through which the display is currently connected to the PC.

The “###” represents the number of the port through which the display is currently connected to the PC. The COM port identified before should be used by selecting it from the drop down list and then click “Open”. When the connection is successful, “Com Closed” will change into “Com Opened” at the bottom status bar.

Com Port setup needs to be run every time the Configuration Tool is opened.

NOTE: “Query Success OK” will show once the sensor(s) has been detected.

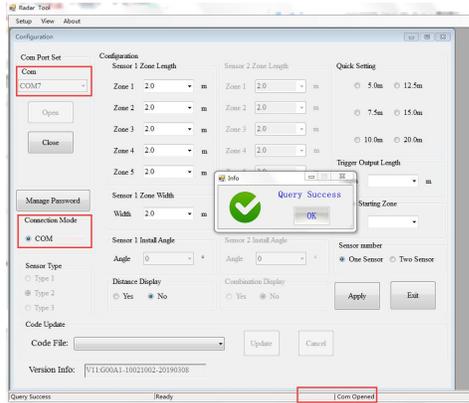


Figure 21

8.3.3 Reading Configuration from the Control Box:

By clicking the “Open” button via COM, the Configuration Tool will send a query instruction to the Control Box and read configuration data from the Control Box. Once the configuration has been read successfully, the latest configuration data is displayed in part B, the firmware version information is displayed in part C and connection status is displayed in part D.

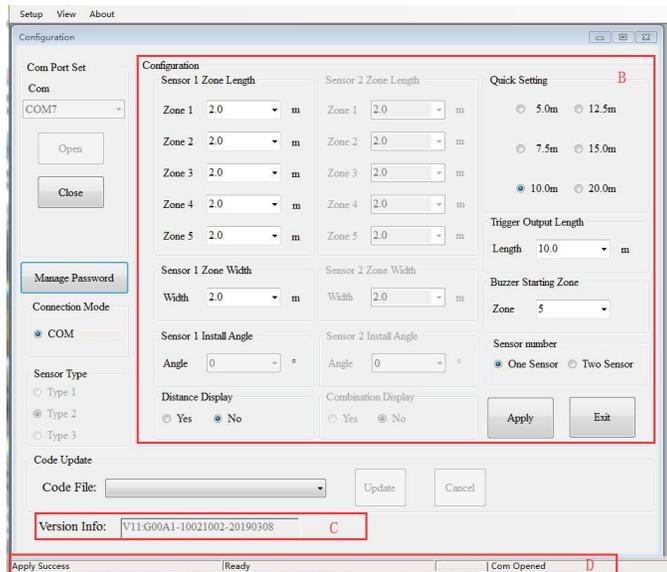


Figure 22

WARNING! Connection between the control box and the PC must be maintained while using the configuration tool.

8.3.4 Reading Configuration from the Control Box:

The part B is a configuration group box. This is used to configure “Sensor Zone Length Configuration”, “Quick Setting”, “Sensor Zone Width”, “Combination Display”, “Trigger Output Length” and “Buzzer Starting Zone”.

8.3.4.1 Sensor Zone Length :

The detection area length can be set in two ways;

- 1: Setting each zone individually via the “Sensor 1 Detection Zone Length”. “Sensor 1 Detection Zone Length” can be set when you choose sensor number as two sensors.
- 2: Setting each zone quickly via the “Quick Setting”.

8.3.4.2 Sensor 1 Detection Zone Length Setup :

This is used to set up each of the five zones individually. Zone 1 has a range from 1m to 20m and others have a range from 0m to 20m selectable via the pull down menus. The combined total length will not exceed 20m. This will be the same for Zone 2 in a 2 sensor system.

Note: The Trigger Output Length and Buzzer Starting Zone will reset when the Sensor 1 Detection Zones Length is changed. Set the Trigger Output Length and Buzzer Starting Zone manually as required.

8.3.4.3 Quick Setting:

Not recommended for use

8.3.4.4 Trigger Output Length:

The Trigger Output Length is set at the point where you want the trigger output to start in the detection area. Select the appropriate Trigger Output Length from the drop down box.

8.3.4.5 Buzzer Starting Zone:

Select the required buzzer starting zone from the drop down box.

8.3.4.6 Sensor 1 Install Angle / Sensor 2 Install Angle:

Horizontal angle cannot be adjusted in the software. Refer to set-up requirements.

8.3.4.7 Distance Display:

If selected, it will display the distance to the object being detected on the monitor. The distance tolerance is +/- 0.03m.

8.3.4.8 Combination Display Setting:

If selected, two sensors will combine to read as one sensor covering a larger area. They must be mounted so they are facing 25° from each other. If this position is not selected, two sensors will detect independently and will show alarm zones for each sensor.

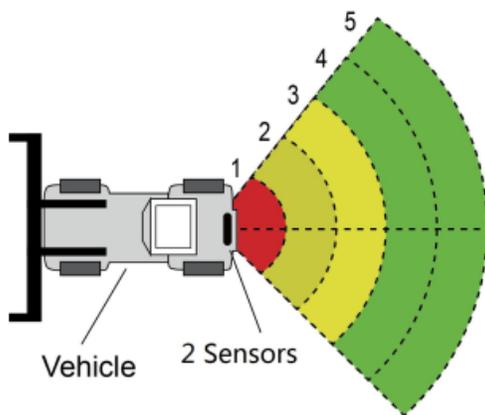


Figure 23

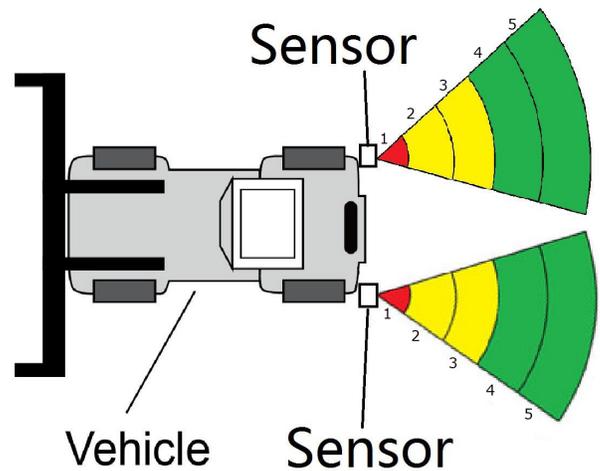


Figure 24

8.3.5 Download Configuration Data to the Control Box:

Make sure the Configuration Tool is in connected state. Once all the required configurations are selected, all the settings can be programmed into the Control Box. The “view” interface will also display the status you set.

Click the “Apply” button and it will download the configuration data to the Control Box. Once configuration is downloaded, a popup window prompts “Config Success” and “Apply Success” will be displayed at the Part D as shown on Figure 22.

9. Pre-Trip Inspection and Maintenance:

9.1 Inspection:

A walk-around pre-trip inspection/test should be performed every day to verify proper function of the system and to familiarize the operator with the zones 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 inspection/test should be performed with two people, one who remains in the cab (the operator), and one who walks through the sensor detection field (the assistant).

9.2 Maintenance:

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 and not damaged. Inspect the Radar Sensor and control box 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. The area to the rear of the vehicle should be clear of obstacles for a distance greater than the sensor range. If the monitor shows any overlay or buzzer sounds, 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.
5. The assistant should move to just behind the rear corner of the vehicle in sight of the operator's mirrors. They should then walk toward the center line of the vehicle parallel to the rear, while the operator notes when the monitor shows an overlay and buzzer sounds, signifying the sensor has detected the object.
6. The assistant should continue walking through the area at the rear of the vehicle while the operator notes the area where detection occurs.
7. Next, walk from the center of the rear of the vehicle straight back, away from the vehicle. When the buzzer quits sounding or overlay disappears, the detection limit has been reached.
8. The assistant should walk the complete rear of the vehicle while the operator notes the detection edges of the entire coverage area.

10. Troubleshooting:

The symptoms described below do not necessarily mean a failure within the system. Please check the following items before you initiate request for repair.

Symptoms	Causes	Solutions
No reaction from the system while the gear is switched to reverse.	No power input or no trigger input.	Check all connections and ensure that unit is properly grounded and getting proper voltage. See Section 6.2.
No reaction on display while there are obstacles within the detecting area.	Improper connection of the sensor or monitor or sensor is adjusted improperly.	Check all connection and sensor adjustment.
No audible alert while there are obstacles within the detecting area.	The monitor sound volume is turned off or set too low.	Check the volume level on the monitor. Also, ensure the speaker is connected securely to the control box.
Monitor shows "No Sensor Detected".	Improper connection of the sensor or the sensor is faulty.	Check all connections between the control box and sensor, or replace transmission cable.
No obstacle within the detecting area, but constant warning occurs.	The ground is detected.	Adjust the angle of the sensor and re-push the configuration through the software tool. Depending on the environment this vehicle is being used in, it may be necessary to zero out the green zone.
Cannot configure with USB TO UART cable.	The control box is not powered or the trigger input line has power applied to it.	Make sure the control box is powered and the trigger input is not connected. Try unplugging the USB from your laptop and re-plug in.

Electronics Controls Company "ECCO" (Manufacturer)

ECCO warrants that on the date of purchase, this product will conform to ECCO's specifications for this product (which are available from ECCO upon request). This Limited Warranty extends for twelve (12) months from the date of purchase.

DAMAGE TO PARTS OR PRODUCTS RESULTING FROM TAMPERING, ACCIDENT, ABUSE, MISUSE, NEGLIGENCE, UNAPPROVED MODIFICATIONS, FIRE OR OTHER HAZARD; IMPROPER INSTALLATION OR OPERATION; OR NOT BEING MAINTAINED IN ACCORDANCE WITH THE MAINTENANCE PROCEDURES SET FORTH IN ECCO'S INSTALLATION AND OPERATING INSTRUCTIONS VOIDS THIS LIMITED WARRANTY.

Exclusion of Other Warranties:

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