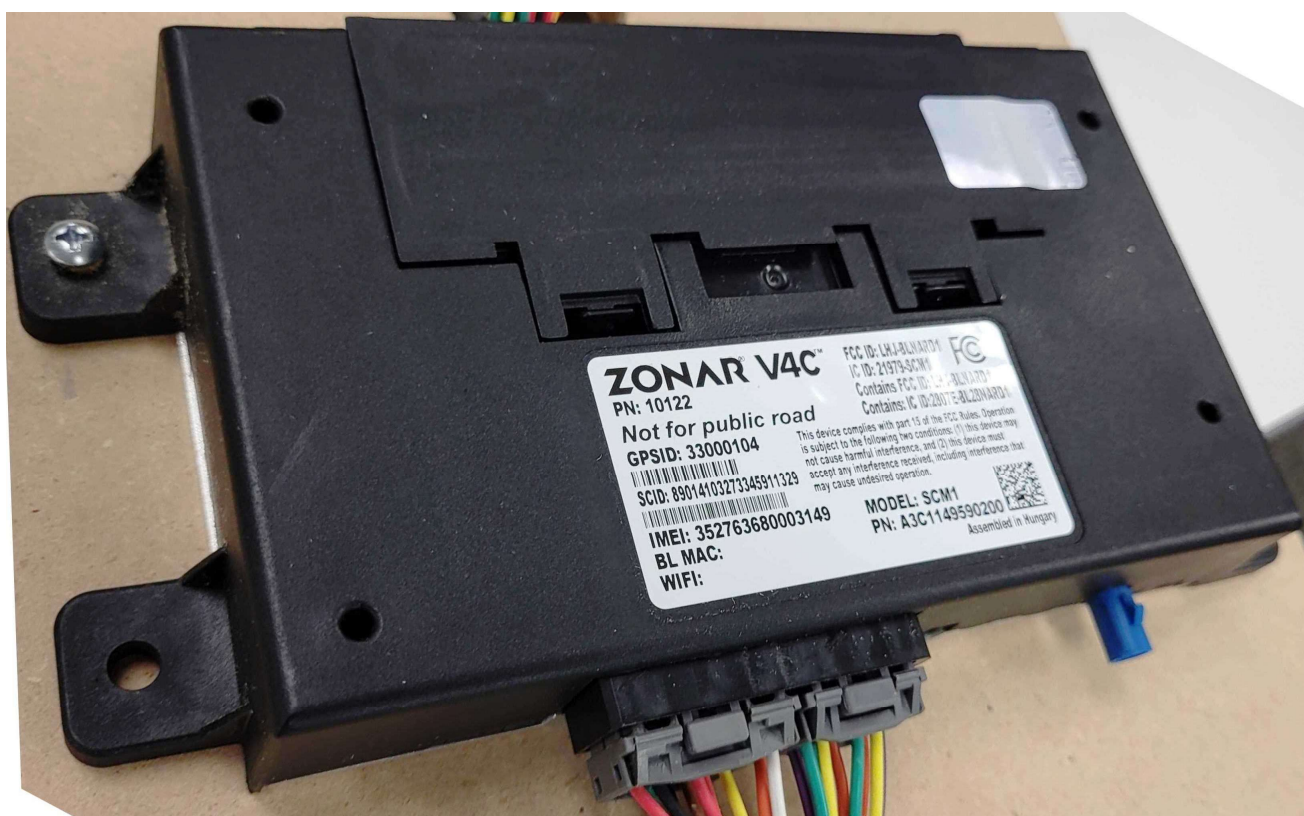




# V4C™ Installation/User Guide








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## 1. Introduction

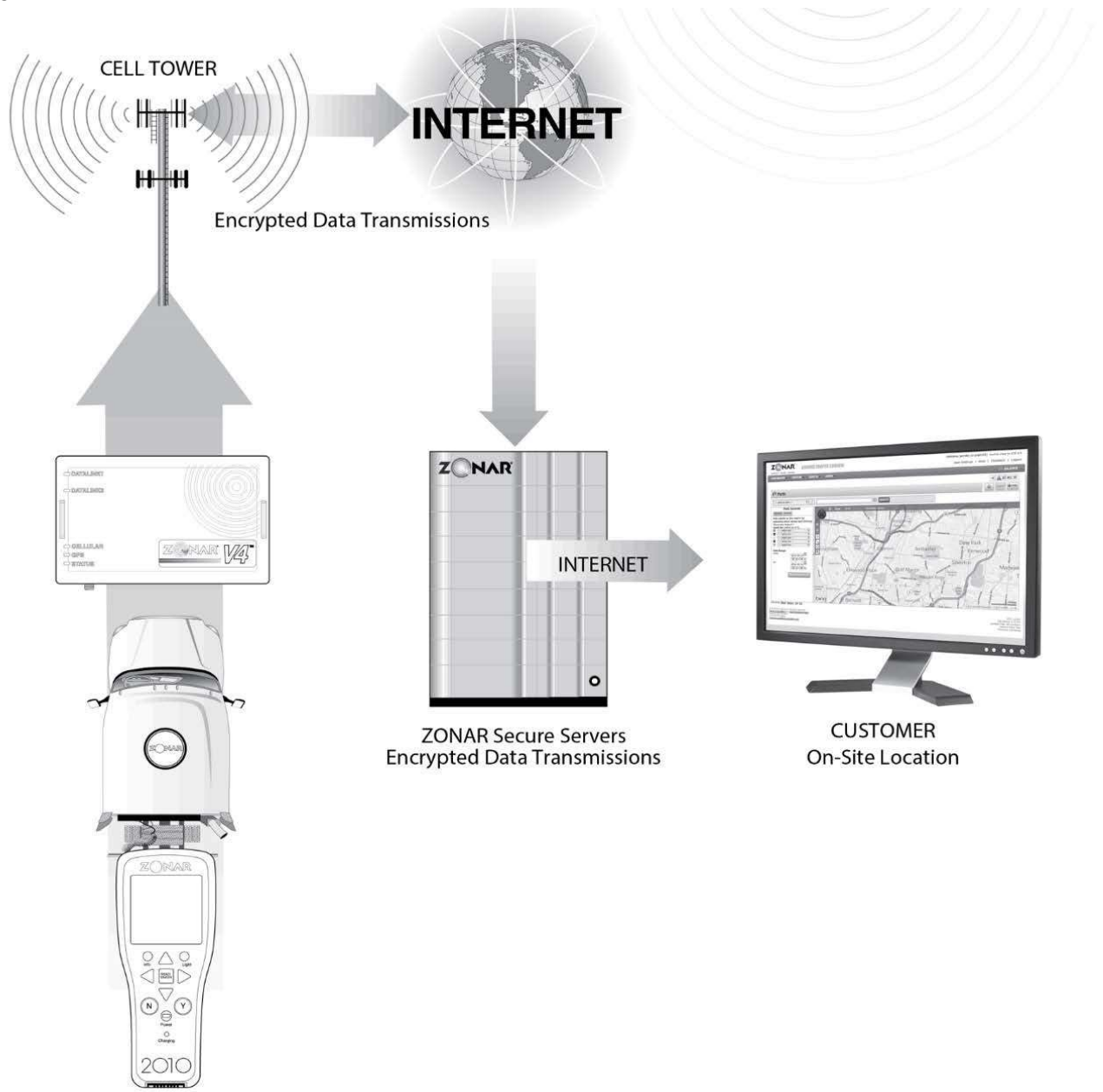
Zonar equipment will provide years of reliable service if properly installed and maintained. Zonar equipment is typically installed in heavy vehicle applications and is often subjected to extreme temperatures, dust, dirt, vibration, and shock. Proper installation is the critical first step to equipment longevity and optimal performance. This guide is meant to be a general guideline for the professional installer and technician. While we attempt to point out the most common installation questions and issues, common sense, good housekeeping procedures, attention to detail, safety adherence, and technical competence of the professional installer are critical for a successful installation.

Please refer to your specific vehicle manufacturer guidelines for the installation of electrical components and wiring.

Details on operating the V4C and its built-in applications and software are given in this guide.

A professional team of Zonar support technicians and engineers are available to answer your installation questions. Contact Zonar at 1-877-843-3847 or by email at [customercare@zonarsystems.com](mailto:customercare@zonarsystems.com).

## 2. System Overview



Real-Time Delivery of Engine Condition and Performance Data, Driver Performance and Location



### 3. Installation Checklist

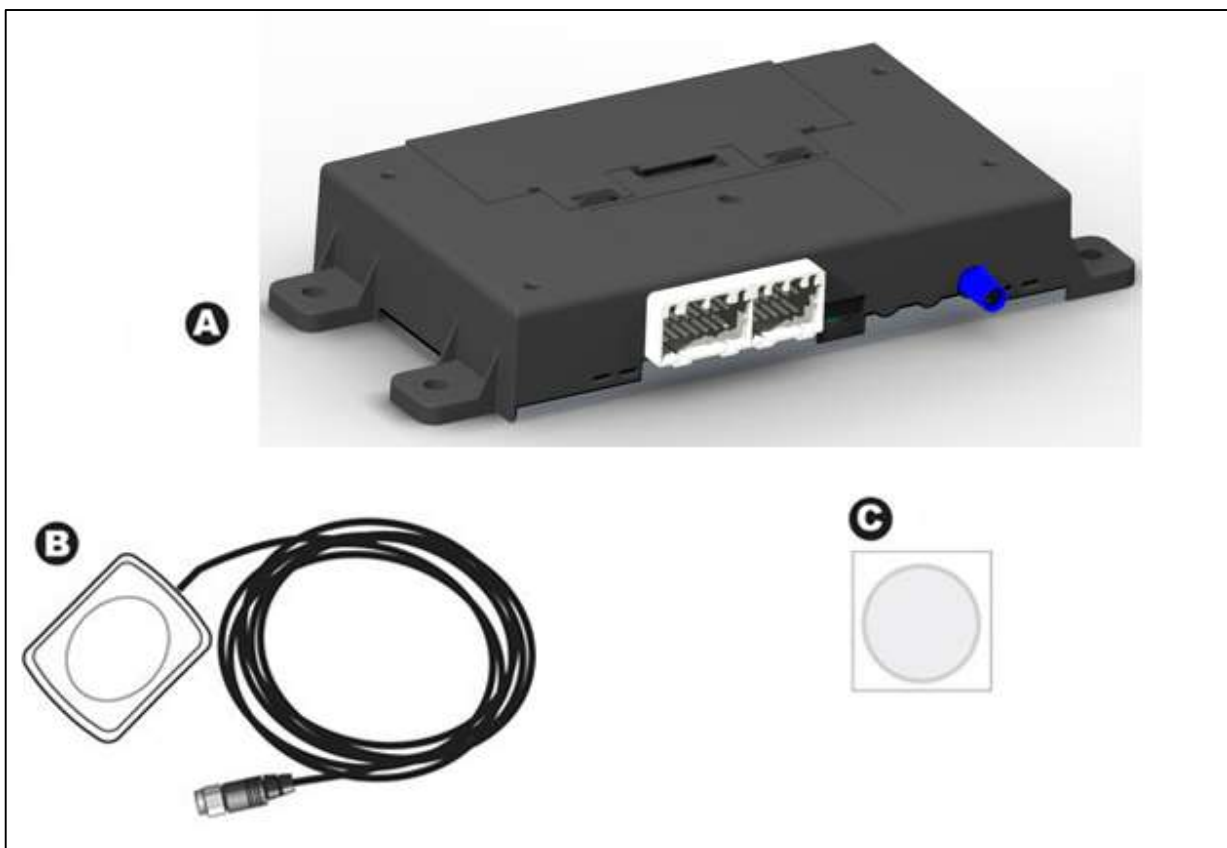
The following is an installation checklist broken down by task.

Task #	Task	Required?	Page #	Complete?
1	Inventory all V4C <a href="#">equipment</a>	Required		
2	Layout all cables and accessories according to:	Required		
3	- <a href="#">General guidelines</a>	Required		
4	-V4C <a href="#">device and mounting plate instructions</a>	Required		
5	- <a href="#">Power / Data cables instructions</a>	Required		
6	- <a href="#">External GPS Antenna guidelines</a>	If used		
7	- <a href="#">Discrete input system instructions</a>	If used		
8	Disconnect vehicle battery ground cable	Suggested		
9	<a href="#">Install V4C Power / Data cable</a> . Do not connect 4 Pin connector to V4C at this time. Do not connect OBDII connector to vehicle at this time (If used)	Required		
10	<a href="#">Install Discrete Input cable</a>	If used		
11	<a href="#">Install external GPS antenna</a>	If used		
12	<a href="#">Install V4C</a>	Required		
13	Interconnect all cables & wires to V4C (except 4 pin power)	Required		
14	Reconnect vehicle battery ground cable	Suggested		
15	<a href="#">Connect 4 pin power cable to V4C</a>	Required		
16	Start engine	Required		
17	<a href="#">Connect OBDII connector to vehicle</a> (if used)	Required		
18	Complete V4C <a href="#">System functional checkout &amp; checklist</a>	Required		
19	Shutdown engine	Required		

## 4. V4C Equipment

- A. V4C Device
- B. GPS Antenna (Optional)
- C. GPS Antenna Adhesive Tag (Optional - used for non-magnetic rooftop GPS Antenna installs)

**Note:** See [External GPS](#) for detailed information on GPS antenna requirements and recommendations.



## 5. Cables

The V4C has the following primary Types of cables for connecting to the vehicle electrical and data system:

- Power Cable
- Diagnostics (vehicle databus) Cables

Additionally, there is a fifth, uncommon cable specifically used to wire around battery disconnect systems:

- Power Cable with Chassis Ground

See [General Guidelines](#) before you begin. Do not connect power input until all other V4C cables have been connected.

### 5.1. Power Cable

Use this cable for equipment that does not have OBDII, SAE J1708/J1587 or SAE J1939 data buses. For wiring procedures see 4 Pin Testing and Cable Management.

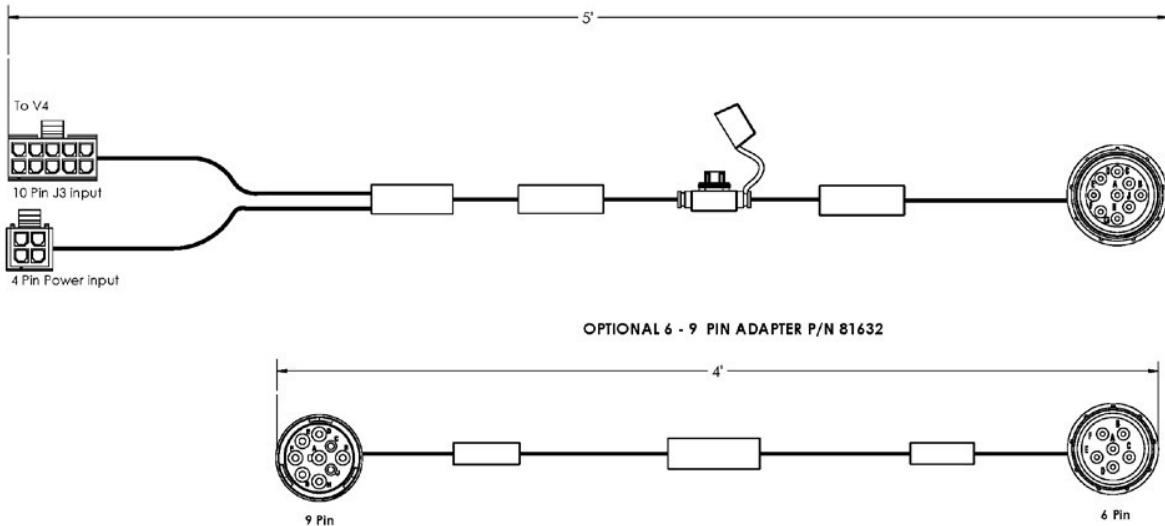


This cable requires the vehicle to physically move at least 5 MPH for at least 100 feet to properly complete new installation checkout. If this is not performed, GPS and discrete input data will not be present in Ground Traffic Control until those thresholds are met.



## 5.2. Diagnostic Connector Cable

Use this cable on heavy duty vehicles with SAE J1939 data buses. The cable connects to the 9 Pin Deutsch diagnostic port. The optional 6 - 9 pin adapter (Part# 81632) is available for J1708 connections.

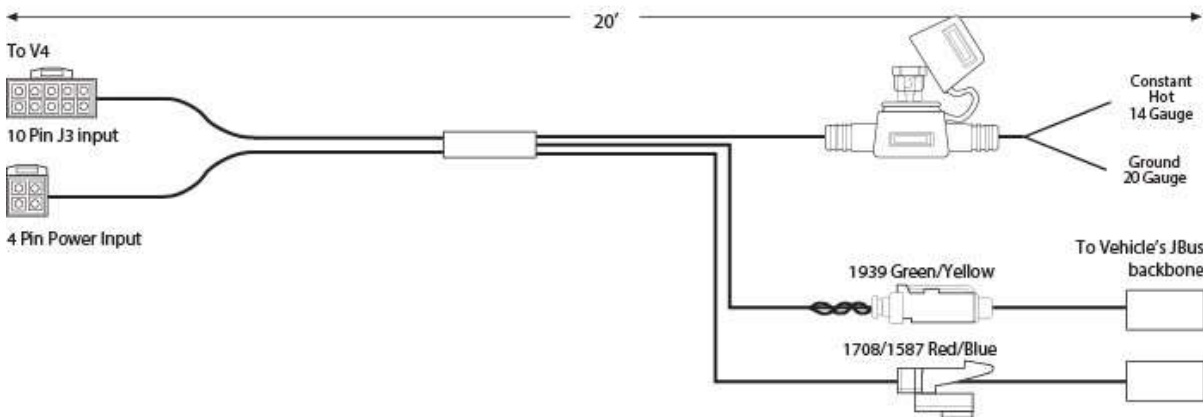


## 5.3. Vehicle Backbone Cable (Diagnostics)

Use this cable on heavy duty vehicles with SAE J1708/J1587 (older) or SAE J1939 (newer) data buses. The cable connects to the data network backbone.

**Note:** This cable requires specific adapters dependent on vehicle make/model/year and engine manufacturer. Contact Zonar Customer Care for additional information.

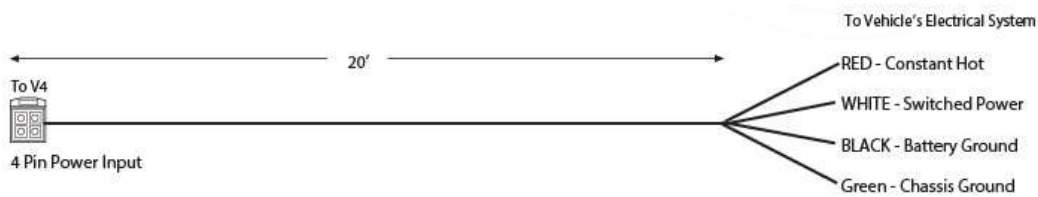
See [4 Pin Testing and Cable Management](#) and [Wiring Guidelines](#) for procedures.



## 5.4. Power Cable with Chassis Ground

This cable is similar to the standard Power Cable, but it adds a green chassis ground wire. This power cable is only needed for vehicles equipped with negative side battery disconnect switches (typically construction equipment).

This cable requires the vehicle to physically move at least 5 MPH for at least 100 feet to properly complete the new installation checkout. If this is not performed, GPS and discrete input data will not be present in Ground Traffic Control until those thresholds are met.



## 6. Power Wiring and Cable Management

The Basic Power Cable is used on Non-J1708/J1939 and non-OBDII installs. It is also used on J1708/J1939 installs with switched power issues (as indicated by flashing “Status” LED with engine running). See [General Guidelines](#) and the following requirements.



- 1) All power leads must be connected to the vehicles protected circuitry (for example, the fuse panel and circuit breaker panel protected circuits). Never electrically connect Zonar equipment to unprotected circuits (for example, directly to the battery).
- 2) All power leads (red and white) must be protected with a 3 - 5 Amp fuse and inline fuse holder (included) for optimal system protection.
- 3) Electrical fuses should be installed as close as possible to the source of power.
- 4) For vehicles equipped with “noise kill” switches (late model school buses) – **Do not** wire any Zonar equipment to the “noise kill” circuitry.

### 6.1. Power Cable Wires

- Red – Constant DC (+8 VDC to +32 VDC), dependent on system type
- Black – Battery Ground
- Green - Chassis ground
- White - Switched Power
  - Engine running (+8 VDC to +32 VDC)
  - Engine not running (0 VDC)
  - Engine not running (key position ACC or Accessory Mode) (0 VDC)



The white wire must be connected to a power source that is active only when the engine is running or the system will not track idle time properly.

Note: Please contact the vehicle manufacturer for any specific electrical questions.

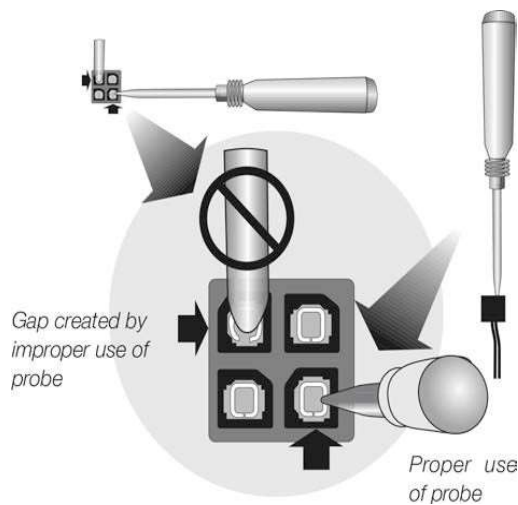


If power cabling is not connected and powered as described in the Power Bundle Wiring section, one or more of the following conditions may occur. Contact Zonar Customer Care for additional information.

- Cold Start flags (an indicator that a unit lost and regained constant power)
- Inaccurate idle and stop times
- Inaccurate hour meter data
- Inaccurate mileage data
- Missing path data or straight line path segments

## 6.2. Testing Power Cable with Multimeter

A digital multimeter (DMM) is a test tool that is used to measure two or more electrical values and is a standard diagnostic tool for technicians in the electrical industry. Improper use of the DMM probe may damage the cable pins causing an intermittent connection. Be sure the probe only contacts with the outside edge of the female contact. If the probe is inserted into the contact, it may distort the pin and ruin the connection.



## 6.3. Wiring Guidelines

The wiring guidelines in this section are for unterminated power and ground leads. The authorized method for power termination on the Zonar V4C system is the use of Add-a-Circuit fuse taps. Whenever possible, use fuse taps for power termination. If, due to the particular make/model/year of the vehicle being installed, fuse taps cannot be used then the poke and weave method of termination can be utilized.

Note: All wiring terminations MUST be fused regardless of Add-a-Fuse tap or poke and weave method of installation.

## 6.4. Fuse Tap/Add-A-Circuit Installation

- 1) Ensure that the fuse tap seats fully in the correct location.
- 2) If another fuse, a relay, or any other object in the fuse panel prevents the fuse tap from seating fully, relocate the fuse tap. *It is not permissible for the fuse tap to rub or make contact with other items in the fuse panel.*
- 3) In addition, you must be able to re-secure the fuse panel cover or door once the fuse tap is installed.
- 4) Whenever possible, use an empty location in the fuse panel that does not have an existing fuse. If it is not possible to use an empty location, ensure that the existing fuse is placed in the correct location on the fuse tap. See below for an example.



**CAUTION:** Zonar has approved two types of fuse taps. Use of other brands is not authorized. Do not install these fuse kits in fuse panel locations greater than 10 amps.

- **LitteFuse brand: Add-a-Circuit**
- **Bussman brand: Add-a-Fuse**

## 6.5. Poke and Wrap Installation

If it is not possible to use Add-a-Circuit fuse taps, then the poke and weave method can be used.

- 1) Locate the proper wire where the poke and weave method is to be installed. Strip 3/4" to 1" of insulation from the wire in the vehicle to be installed. Spread the wire strands apart as shown below.



- 2) Strip 1" to 1 1/2" of insulation from the wire in the fused link to be installed.



- 3) Insert the wire from the fused link into the spread wire in the vehicle. Wrap around the wire several times.



- 4) Cover the exposed wires with several wraps of electrical tape or mastic. Place one wire tie over the electric tape over the exact location where the wires are 'wrapped' together. Place another wire tie 1 – 2 inches from the first wire tie to secure the two wires together and as stress relief.



## 7. General Guidelines

The following is list of general guidelines for the installation process. It is important to read these before starting.

### 7.1. Layout

- V4C unit must be located a minimum of 25 cm (10 inches) from any person.
- Do not place Zonar RFID tags, cables, or other equipment in any location or position which may compromise human or equipment safety.
- Verify placement acceptability with State DOT/Law enforcement prior to installation.
- V4C has a temperature range of -40°C (-40°F) to +85°C (+185°F). Do not mount V4C in hot engine compartments or near hot exhaust components.
- Lay all components out prior to installation to check for proper cable length and interference issues.
- Avoid mounting Zonar equipment, antennas and wiring near other radio equipment (for example, two-way radios), PA equipment and high energy electrical sources (for example, cables, relays, amplifiers, etc.).

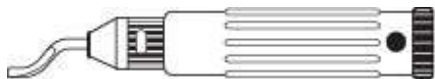
### 7.2. Electrical



- **Consult the vehicle's manufacturer for specific installation guidelines. (HIGHLY RECOMMENDED for Multiplex electrical systems)**
- All power leads (red and white) must be connected to the vehicle's protected circuitry (for example, fuse panel, circuit breaker panel, protected circuits). Never electrically connect Zonar equipment to unprotected circuits (for example, directly to battery).
- It is also required that all power leads (red and white) be protected with a 3 to 5 Amp fuse and inline fuse holder (included) for optimal system protection.
- Electrical fuses should be installed as close as possible to the source of power.
- Do not connect to the power input until all other V4C cables have been connected.

### 7.3. Drill Holes

- Do not drill into the V4C unit. This will void the warranty.
- Capture all drill chips during drilling operations. Do not allow chips to fall onto equipment, furnishings, etc.
- Deburr all drill holes on both sides of drilled surface. The following is an example of a deburr tool:



- All drill holes must have a rubber grommet or similar anti-chaffing system installed to protect cable assemblies (e.g., plastic conduit).
- Seal all penetration drill holes which may pass rainwater.

## 7.4. Cable Management

- Strain relieve and support all cable installations.
- Avoid sharp bends and tight radius installations of cables.
- Avoid moving components (for example, doors, steering shafts, handles, fans, etc.).
- Provide enough cable slack to allow for servicing of equipment (adequate service loop)
- Avoid routing cables through doors, windows, and other pinch points.
- Avoid routing cables in high personnel traffic areas.
- Avoid routing antenna cables near radio and PA equipment.

### CORRECT



- Bend radius is adequate.
- Hole has grommet.

### INCORRECT



- Bend radius is too tight.
- Hole has sharp edges.
- Hole has no grommet

## 7.5. General Housekeeping

- Capture all drill chips during drilling operations. Do not allow drill chips to fall onto electrical equipment, furnishings, heating ducts, etc. Magnets, sticky tape, vacuums, physical barriers, etc. may all be used to accomplish this task.
- Remove excess sealant. Sealant should be debris and contaminant free (for example, no drill chips), consistent, and uniform in appearance.
- Clip excess wire tie protrusions.

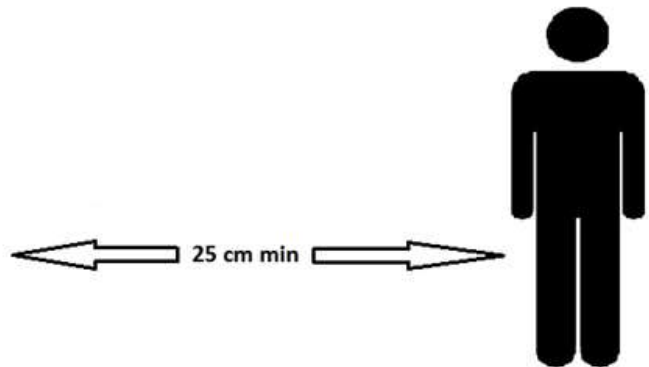




## 8. V4C Mounting

### 8.1. Proximity to Persons

To comply with FCC RF exposure requirements for mobile transmitting devices, this device must be installed to provide a separation distance of at least 25 cm (10 inches) from all persons. See [General Guidelines](#).



### 8.2. Device and Asset Information

The installation technician must record which V4C unit is being installed in each vehicle.

- Find the GPS ID # on the device information label
- Record the asset (vehicle name) and the GPS being installed—this is important information for Zonar Customer Care or the Ground Traffic Control Administrator.

<b>ZONAR® V4C™</b>	FCC ID: 2AJW5-SCM1	FC
PN: 10122	IC ID: 21979-SCM1	
<i>Not for public road</i>	Contains FCC ID: LHJ-BLNARD1	
	Contains IC ID: 2807E-BL28NARD1	
GPSID: 33XXXXXXXX	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.	
SCID: XXXXXXXXXXXXXXXXXXXXXXXX		
IMEI: XXXXXXXXXXXXXXXX	MODEL: SCM1	
BL MAC: XXXXXXXXXXXXXXXX	PN: A3C1149590200	
WiFi: XXXXXXXXXXXXXXXX		Assembled in Hungary



### 8.3. Mounting Surface

Mount onto an interior flat surface that is large enough to accommodate the footprint.

Suggested mounting areas include the following:

- Horizontal mount on dashboard under an angled windshield free of metallic obstructions
- Overhead compartment mount with a clear non-metallic view of the sky (for example, under a fiberglass roof or fairing).

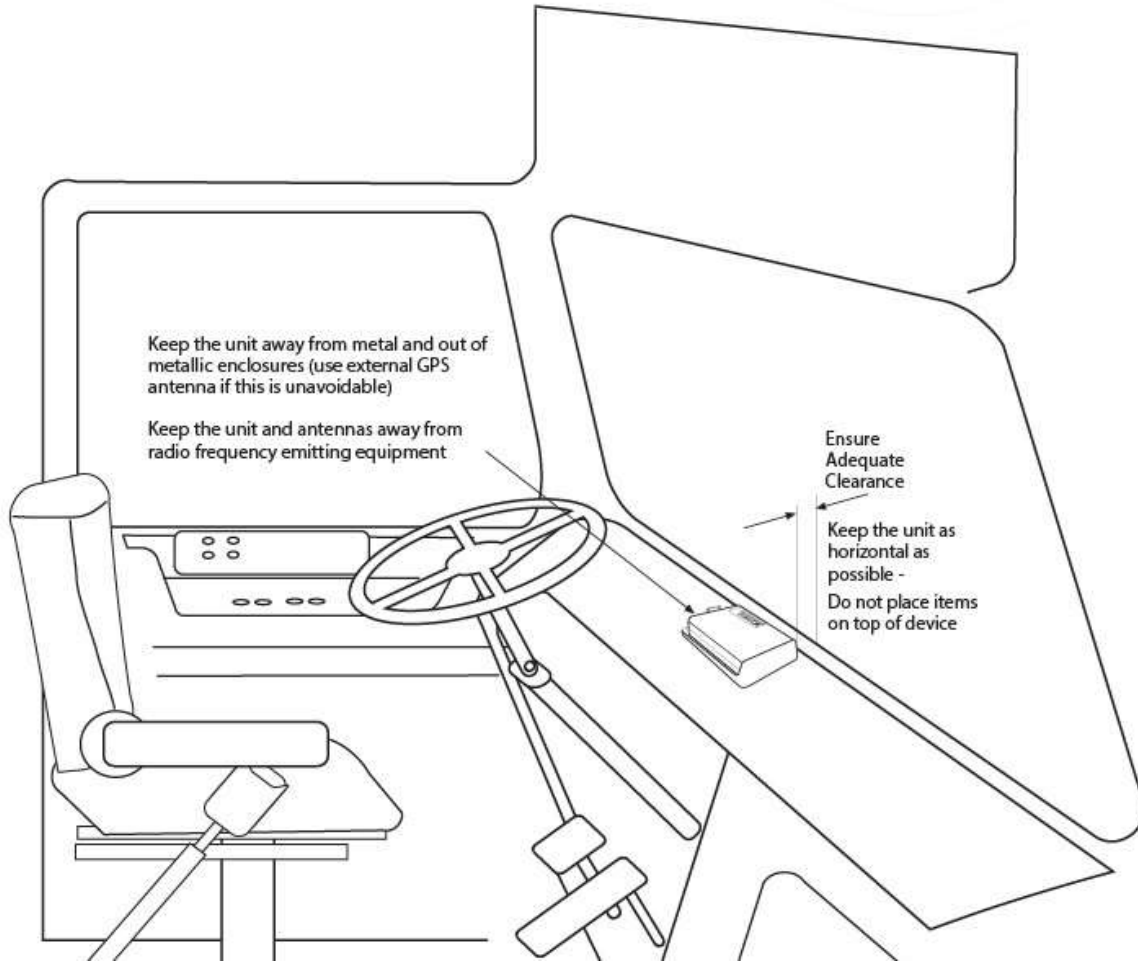
**Note:** Verify placement acceptability with state DOT/law enforcement prior to installation. Enclosed areas require an external GPS.

### 8.4. Mounting Considerations

- Avoid mount areas with difficult access or areas that do not allow for direct diagnostic LED viewing.
- Do not mount near other radio equipment such as two-way radios, PA equipment and high energy electrical sources (e.g., cables, relays, amplifiers, etc.).
- Avoid dirty, dusty, or damp mount areas (for example, near floors and entry ways).
- To prevent water damage, do not install below windows or doors that open to the vehicle's exterior.

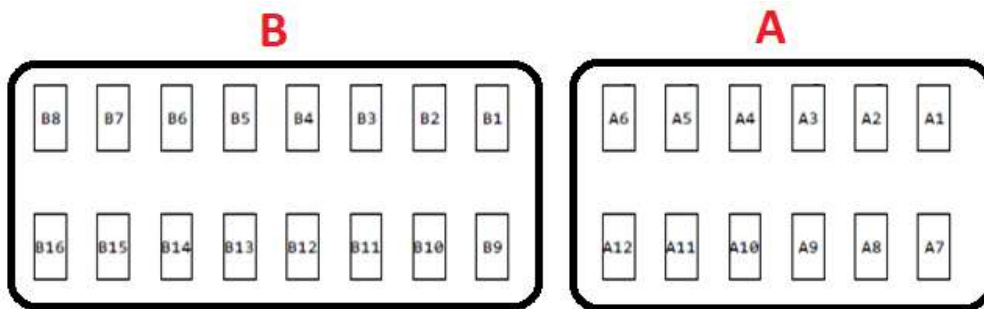
**Note:** If enclosing in a radio-shielded area (for example, metallic enclosure) an external GPS antenna may be necessary for proper operation and performance.

## 8.5. Typical Installation Location



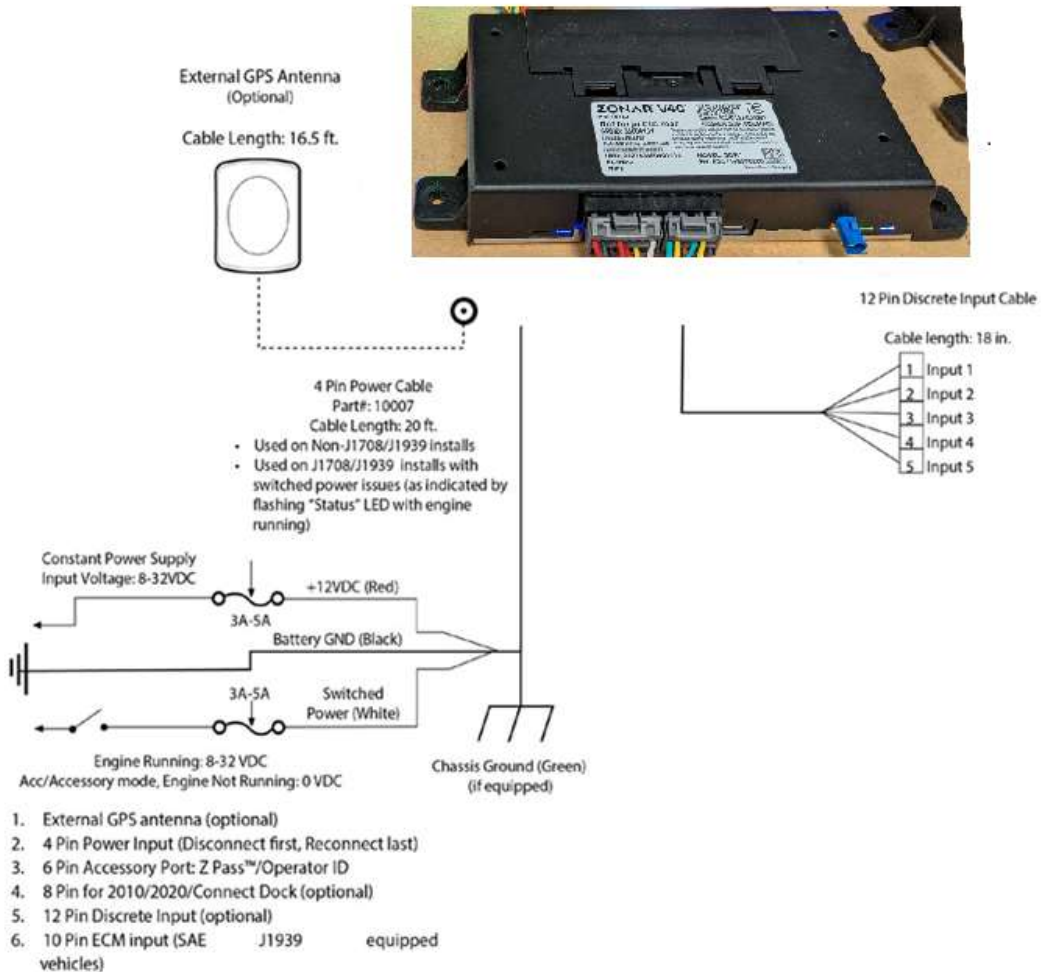
## 9. Reference Information and Optional Items

### 9.1. V4C Pinout



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	5 Volt Out	A7	RS232_2_RXD_IN	B1	Ignition	B9	INPUT_3
A2	CAN_1_H	A8	RS232_2_TXD_OUT	B2	N/A	B10	N/A
A3	CAN_1_L	A9	N/A	B3	N/A	B11	INPUT_4
A4	N/A	A10	RS232_1_TX_OUT	B4	N/A	B12	INPUT_5
A5	CAN_2_H	A11	DSR_IN_INV	B5	VBATT_Out_1	B13	INPUT_2
A6	CAN_2_L	A12	RS232_1_RX_IN	B6	N/A	B14	INPUT_1
				B7	GND	B15	MULTI_USE
				B8	VBATT	B16	N/A

## 9.2. System Connectivity



### 9.3. Zonar Discrete Input System Connectivity

## Zonar Discrete Input System

The purpose of this schematic is to tap onto an existing switched control circuit



#### WARNING:

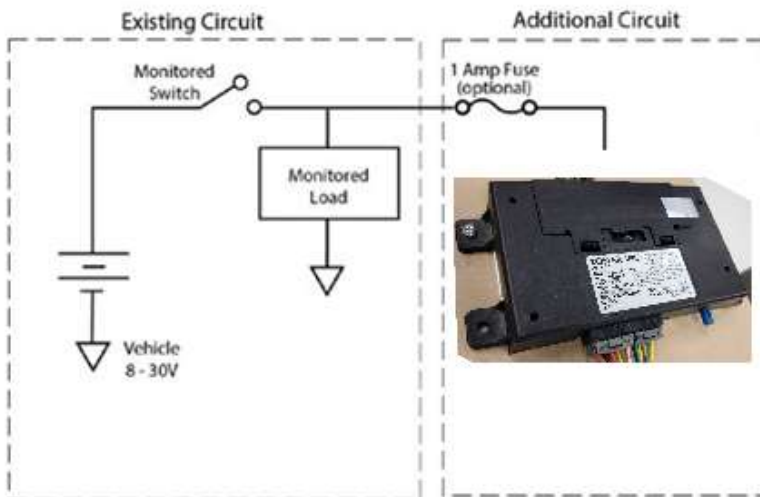
Observe all general and specific warnings in regards to electrical installations at the beginning of this guide.

When in doubt consult the specific vehicles manufacturer for electrical installation instructions.

Do not connect to multiplex wiring.

#### Zonar Discrete Input Wiring Details

- 5 Inputs (depending on application, all inputs may not be used)
- 20 AWG wire gauge



Note: Monitored Switch could be a physical switch or the load side of a relay. A relay may be required if the desired control signal is not of an appropriate voltage level. Monitored Load could be a lamp or the control side of a relay. Load is not required (for example: driver pushbutton for input trigger only or door ajar sensor).

#### Optional Fuse (Not Supplied)

Note: The monitored vehicle circuit should always be electrically protected. In the event this circuit is not properly electrically protected, install 1 Amp fuse as indicated to the left. Electrical fuses should be installed as close as possible to the source of power.

#### Notes:

- 1) Suggested uses -  
Door: Open/Closed  
Plow: Up/Down  
PTO: On/Off  
Sweeper: On/Off  
Light: On/Off  
Arm: In/Out
- 2) Do not connect to pulsing, flashing, or high cycle circuits (e.g., Flashers, Foot Brake, Turn Signals). Doing so may result in higher data rate fees.
- 3) Do not connect to sub-3 second cycling circuits.
- 4) Activity States  
Low = battery ground  
High = battery voltage
- 5) Route all cables and wiring away from high voltage and RFI circuits. These may induce false signals.
- 6) Contact Zonar if other I/O configurations are required, such as swapping load and switch or using non-standard voltage thresholds.



## 4. System Specifications

### ○ Power

- DC Input Range: 8 – 32 Volts DC
- Operating Current: 100 mA @12V typ. w/o peripherals; 500 mA with
- Key off (sleep) Current: < 1 mA @ 12V

### ○ Environmental

- Operating/storage Temp: -40 - 85
- Humidity: 95% R.H. non-condensing
- Test Standards: ISO 16750

### ○ Electrical/EMC:

ISO 16750, CISPR 25

### ○ GNSS

- GPS/GLONASS: SBAS: EGNOS/MSAS/QZSS/WAAS/GAGAN

### ○ Cellular

- LTE Cat 4: Bands 2, 4, 5, 12, 13
- 3G/2G fallback: Bands 2, 4, 5

### ○ Wi-Fi:

802.11ac

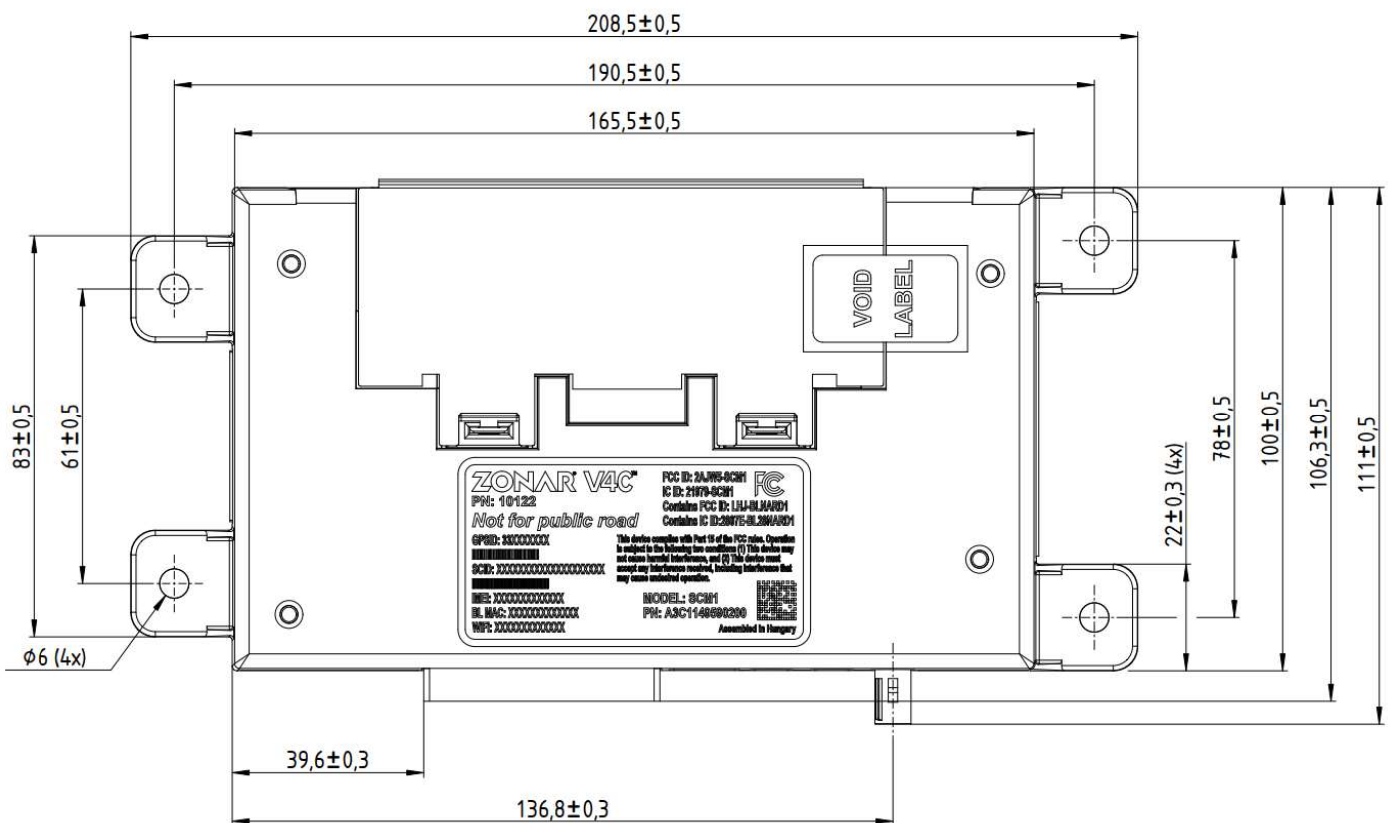
### ○ Bluetooth:

5.0/BLE

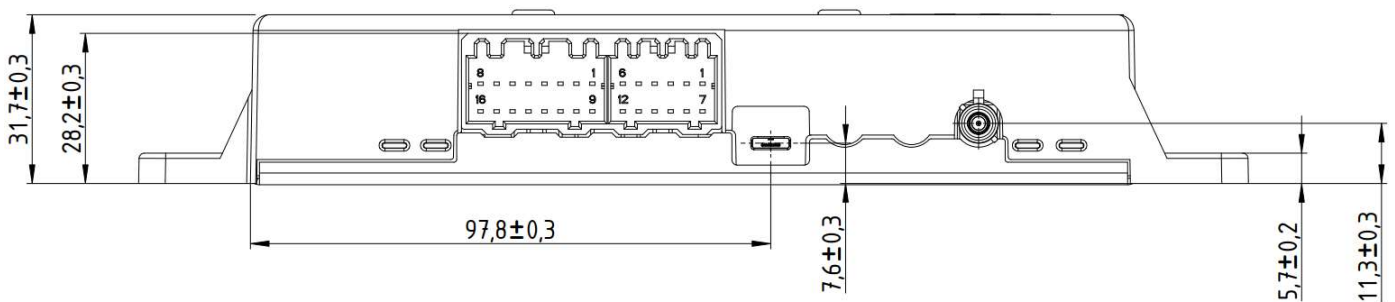
### ○ Back-up battery:

LiFePO4, 1000mAh,

## 9.5. Dimensions





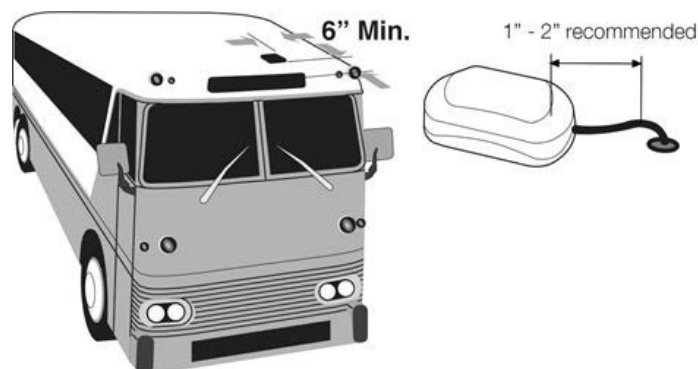


## 9.6. External GPS Antenna (Optional)

External antennas are generally only necessary if the V4C GPS unit is enclosed in a radio signal interfering area (e.g. metallic box, under seats, on dashboards with flat windshields, and in cabs or cockpits constructed primarily from metallic material).



The suggested installation point is the centerline of the vehicle roof, with minimal cable run to prevent wind and car wash damage. Ensure that there is a clear antenna view of the open sky and maintain a minimum of 6 inches from any rooftop edge or ledge. See below.



Drill, deburr, grommet, weather seal, and cable thru hole as required. Drill hole size -  $1/2"$  ( $.500"$ ); grommet size -  $3/8"$  ( $.375"$ ).



- **Optional GPS Antenna Adhesive Tag (for non-magnetic mounting surfaces)**
  - Whenever possible, avoid installing adhesive in cold, wet, or damp conditions. Ideal application range is: 70°F to 100°F (21°C to 38°C).
  - Clean and dry the surface prior to placement to obtain optimum adhesion. The best surface cleaning solvent is an isopropyl alcohol/water mixture (rubbing alcohol).
  - Remove the backing from the peel and stick to the surface.
  - Press and hold mounting position for 10 seconds to assure good adhesion.

## 10. System Check

At a minimum, the installer must perform a system check to verify proper installation. If possible, a full and complete checkout using Zonar's Ground Traffic Control® website should be performed. Not all installers will have access to this area; check with a Zonar Customer Service representative if in doubt. This procedure covers the minimum requirements for a system installer.

### 10.1. System Checklist





The above warranty periods run from the date of shipment. Provided that the Hardware is used and handled as intended, Zonar will replace any failed or functionally impaired Hardware with equivalent Hardware in terms of performance and functionality.

This warranty does not apply to any Hardware that has been misused, altered, willfully abused or that has been damaged due to improper installation by the customer. Hardware installations must follow Zonar's equipment specific installation guidelines. If product returned is determined to be damaged due to any of the aforementioned circumstances, the Customer will be charged the price of a refurbished unit plus shipping and handling.

CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND ZONAR'S ENTIRE OBLIGATION UNDER THESE LIMITED WARRANTIES for defective equipment is the repair and replacement of the equipment free of charge by Zonar. Zonar shall not be liable to Customer or any third party for any general, special, punitive, incidental, indirect or consequential damages, or any lost profits or business, arising out of Zonar's Subscription Agreement.

## 12. Notices

It is the Owner's sole responsibility to install and use the Zonar products in a manner that will not cause accidents, personal injury, or property damage. For the purposes of this notice, "Owner", "you" and "your" means the party (including any person authorized by that party to use and/or install the Product) that has either: (a) purchased the Product; or (b) leased the Product from Zonar Systems, Inc or its related companies. The Owner of this product is solely responsible for observing safe driving practices. The choice, location, and installation of all components of the Product is critical. If installation is not correct, the Product may not perform at its designed potential or specifications. If in doubt, consult your vehicle's manufacturer.



### **Warning: (Part 15.21)**

Changes or modifications not expressly approved by Zonar Systems could void the user's authority to operate the equipment.



### **Caution: RF Exposure (OET Bulletin 65)**

To comply with FCC RF exposure requirements for mobile transmitting devices, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 25 cm (10 inches) from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Use only supplied and approved antennas. Use of unauthorized antennas or modifications could impair signal quality, void your warranty and/or result in violation of FCC regulations.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 25 cm de distance entre la source de rayonnement et votre corps.

Ce transmetteur ne doit pas être placé au même endroit ou utilisé simultanément avec un autre transmetteur ou antenne.



### **FCC Compliance Statement (Part 15.19), IC Compliance Statement (RSS-210)**

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada (IC). 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.

Cet appareil est conforme aux normes CNR exemptes de licence d'Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes:

- 1) cet appareil ne doit pas provoquer d'interférences et
- 2) cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité de l'appareil.

## The hint for usage of CE sign



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*Hungary*

*Approval owner of V4C*

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