

INTRODUCTION

This Installation Manual provides a description of the Digital Car Kit package components, power connection and installation procedure for the Hands-free Digital Car Kit (GMLN4687).

Full duplex operation permits two-way audio to occur in Phone and Direct modes when a Personal Hands-Free Kit is plugged into the jack on the side of the TETRA Handportable Terminal.

This Digital Car Kit is comprised of the following parts (see Figure 1):

1. TETRA Handportable Terminal cradle and cable that includes RS-422 interface (GMLN4688)
2. Mounting Bracket (FTN6376)
3. Junction Box (FLN3120)
4. Passive Remote Speaker (SSN4020)
5. Remote Directional Microphone (SMN4095)
6. Remote PTT (FLN9571)
7. Power Cable (FKN4919)
8. Installation Manual (6866535D12)
9. User Guide (6866535D13)
10. Also required, but not supplied with this kit, is an external antenna kit.

Please refer to price pages for available antenna kits by frequency band. Alternatively, a comprehensive list of antennas along with technical and installation specifications can be seen on the following website:

For Motorola Online account holders

<https://moleurope.mot.com>



Figure 1. Digital Car Kit Components

SAFETY AND GENERAL INFORMATION

A properly installed car kit will minimise service calls. When mounting the components of the Digital Car Kit, consider the following factors:

- The mounting surface must have sufficient strength to support the item being mounted to prevent it from becoming loose over time.
- Do not attach components to any part of the vehicle that is subject to excessive vibration.
- The proposed location of the item being mounted or wires/cables attached must not interfere with driver/passenger seating or leg space.
- Use the supplied mounting hardware.
- Ensure that the cables are not stretched, and not subject to heat from the engine, transmission housing or heating ducts.
- Crimp connectors securely.
- Do not run cables over sharp edges that may cause excessive wear or chaffing of the cable insulation.
- Do not install components in locations where they may cause interference to the operation of the vehicle's controls.
- Installation of communications equipment should be performed by qualified personnel only.

Check the required mounting locations. Modern cars are equipped with power supply connections for mobile phone inside the passengers cabin. It is preferable to connect the power cable to these connections. On some vehicles, it is necessary to penetrate the bulkhead to reach the battery. Ensure that there is cable clearance on the opposite side of the bulkhead and that vehicle's Electronic Control Modules (ECM's) are not installed on the opposite side of the bulkhead before drilling commences. Protect the cable where it passes through the bulkhead by using a grommet or similar protective measures.

POTENTIAL SELF QUIETING FREQUENCIES:

If the Hands Free Digital Car Kit will be used in a system that utilizes any of the following frequencies, care must be taken to properly mount the antenna and the junction box to avoid/minimize the possibility of self quieting. See antenna and junction box installation notes.

Model	Freq (MHz)
MTP850 - 350MHz w/ DCK	356.3875
	356.4000
	368.6750
	368.6875
MTP850 - 380MHz w/ DCK	393.2625
	393.2750
	417.8375
	417.8500
MTP850 - 800MHz w/ DCK	860.2500
	860.2625



WARNING

VEHICLES EQUIPPED WITH AIR BAGS

An air bag inflates with great force. DO NOT place objects, including communications equipment, in the area over the air bag or in the air bag deployment area. If the communication equipment is improperly installed and the air bag inflates, this could cause serious injury.

If necessary, contact the vehicle manufacturer for air bag information specific to the vehicle.



WARNING

Verify that none of the vehicle's systems are affected by use of the TETRA Handportable Terminal, e.g. cruise control, ABS breaking, traction control, engine management, direction indicators, lights, etc.

**WARNING**

Use existing openings through the bulkhead to avoid drilling. If drilling is a must, verify not to damage the Vehicle Electronic Control Modules (ECM's), fuel pipes, brake pipes, and/or cable looms.

**WARNING**

Before using this product, read the operating instructions for safe usage contained in the Product Safety and RF Exposure booklet for Mobile TETRA Radios, Motorola Publication part number 6866537D37 supplied with your Hands-free Digital Car Kit.

INSTALLATION PROCEDURES

Install the Digital Car Kit components in the following suggested order:

1. Antenna
2. Junction Box
3. TETRA Handportable Terminal Cradle
4. Power cable
5. Remote Directional Microphone
6. Remote Speaker
7. Remote PTT

ANTENNA KIT INSTALLATION

Use only a Motorola approved roof antenna and refer to the antenna installation instruction provided in the antenna kit.

Avoid visual or physical obstruction, route the antenna cable down inside the door moulding and beneath the carpets and seat(s). Allow sufficient slack at the connector end of the cable to reach the cradle's FME connector.

If any of the potential self quieting frequencies will be used (see Safety and General Information), the best antenna mounting location is on the metal roof top towards the rear 1/3 of the vehicle.

Note: Antennas with a gain exceeding 6db do not comply with ETSI RF exposures and are not allowed to be used with this product.

ROOFTOP COMBINED GPS/TETRA ANTENNA KIT

To install a combined GPS/TETRA antenna kit, refer to the installation manual provided in the antenna kit and to the explanations below.

KIT COMPONENTS

See Figure 2.

1. Combined GPS/TETRA typical antenna
2. 5 m RG58 FME to FME cable
3. 5 m RG174 MFME to FME cable
4. Duplexer (GMAE4264)
5. 2.4m DC Adapter Cable (FTN6790)
6. 1m FME cable

Installation procedures

Install the kit components in the following suggested order:

1. Antenna
2. 5 m MFME to FME RG174 GPS cable
3. 5 m FME to FME RG58 RF cable
4. Duplexer
5. 2.4m DC Adapter Cable
6. 1 m FME cable



Figure 2. Combined GPS/TETRA Typical Antenna Kit

CABLING

To avoid visual or physical obstruction, route the cables down inside the door moulding and beneath the carpets and seat(s). Allow sufficient slack at the connector ends of the cables to reach the duplexer, junction box or cradle connectors.

See Figure 3 before routing or connecting the cables.

1. Connect the 5 m **MFME** RG174 cable to the antenna GPS connection.
2. Connect the 5 m **FME** RG58 cable to the antenna TETRA connection.
3. Connect the 5 m **FME** RG174 cable to the duplexer "GPS" input.
4. Connect the 5 m **FME** RG58 cable to the duplexer "**COMMS ANTENNA**" input.
5. **Connect one end of the DC adapter cable (FTN6790) to the 26 pin connector on the junction box, and the other end to the "DC INPUT" on the duplexer.**
6. Activate the ignition switch and make sure to measure 5 V DC between the centre pin and the connector shield.
7. **Connect the 1 m FME cable from the duplexer "CAR KIT" input to the cradle's RF cable.**

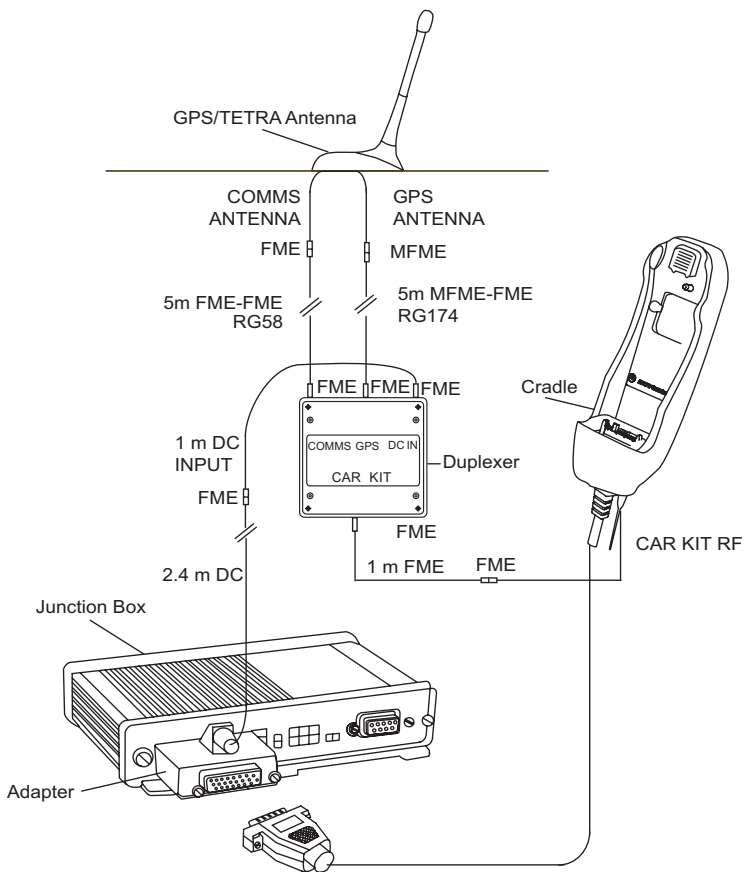


Figure 3. Combined GPS/TETRA Typical Antenna Kit Connection Diagram

ROOFTOP GPS ANTENNA ONLY

To install a GPS only antenna kit, refer to the installation manual provided in the antenna kit and to the explanations below.

KIT COMPONENTS

See Figure 4.

1. Typical GPS antenna
2. 5 m RG58 FME to FME cable
3. 5 m RG174 MFME to FME cable
4. Duplexer
5. 2.4 m DC Adapter Cable (FTN6790)
6. 1m FME cable

Installation procedures

Install the kit components in the following suggested order:

1. Antenna
2. 5 m MFME to FME RG174 GPS cable
3. 5 m FME to FME RG58 RF cable
4. Duplexer
5. 2.4 m DC Adapter Cable
6. 1 m FME cable



Figure 4. GPS Only Typical Antenna Kit

CABLING

To avoid visual or physical obstruction, route the cables down inside the door moulding and beneath the carpets and seat(s). Allow sufficient slack at the connector ends of the cables to reach the duplexer, junction box or cradle connectors.

See Figure 5 before routing or connecting the cables.

1. Connect the 5 m **MFME RG174** cable to the antenna GPS connection.
2. Connect the 5 m **FME RG58** cable to the customer's existing TETRA antenna.
3. Connect the 5 m FME RG174 cable to the duplexer "GPS" input.

4. Connect the 5 m **FME RG58** cable to the duplexer “**COMMS ANTENNA**” input.
5. Connect one end of the DC adapter cable (FTN6790) to the 26 pin connector on the junction box, and the other end to the “**DC INPUT**” on the duplexer.
6. Activate the ignition switch and make sure to measure 5 V DC between the centre pin and the connector shield.
7. Connect the 1 m FME cable from the duplexer “**CAR KIT**” to the cradle's RF cable.

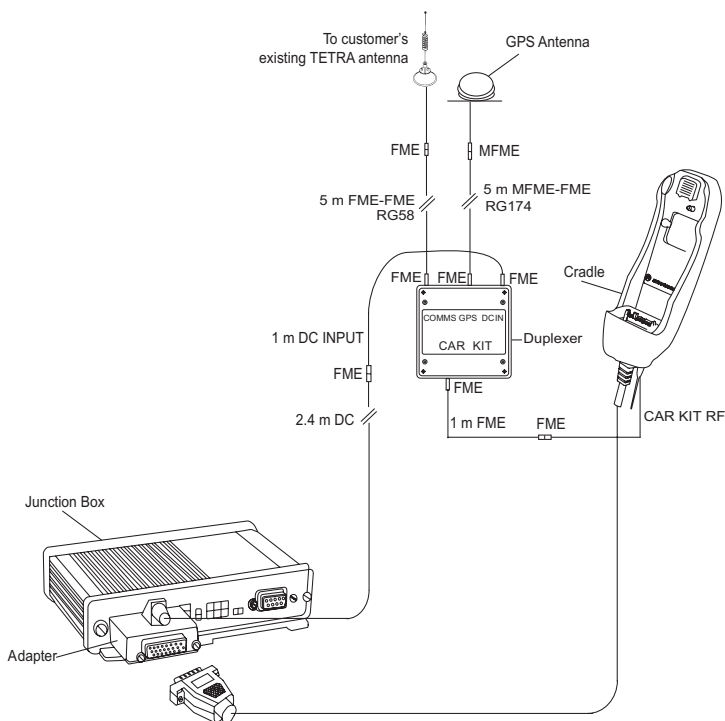


Figure 5. GPS Only Antenna Kit Connection Diagram

JUNCTION BOX INSTALLATION

In most vehicles, the best location for mounting the junction box is under the dash. It must be protected from dirt and moisture, and must be afforded adequate space for cooling. There must be sufficient space to allow for the connection of the cables.

If any of the potential self quieting frequencies will be used (see Safety and General Information), the best junction box mounting location is under the dash as close to the center of the vehicle (away from the door) as possible.

Mount the junction box using the four screws provided. Fasten screws after installation.

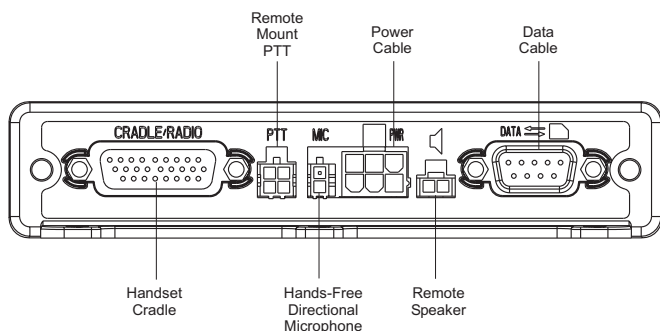


Figure 6. Junction Box - Accessories Connection Diagram

TETRA HANDPORTABLE TERMINAL CRADLE INSTALLATION

(See Figure 7)

Note: Always use the supplied fastening hardware to rigidly secure the cradle. An unsecured cradle could cause a unit to move and interfere with the proper operation of the vehicle and the Digital Car Kit.

Cradle must be mounted such that the TETRA Handportable Terminal is within easy reach of the driver during normal operation of the vehicle.

The junction box can be installed both horizontally or vertically. Always ensure that the connectors faces upwards when installing

the junction box vertically (upright position).

Sufficient room should be allowed to permit the insertion of the TETRA Handportable Terminal and provide easy access to the release mechanism of the TETRA Handportable Terminal from the cradle.

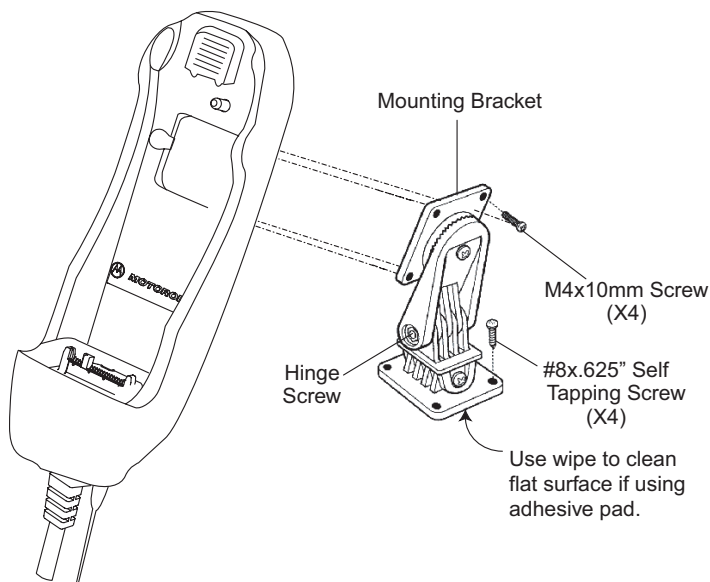


Figure 7. Cradle Unit Installation Detail

When installing the cradle, use the following procedure or modify to suit the particular vehicle:

1. Open the hinge screw and separate the two halves of the mounting bracket.
2. Using the lower half of the bracket as a template, position it so that the pivot end of the bracket is toward the bottom of the cradle.
3. Using an awl or similar device, make four holes in the carpet at marked locations. This must be done prior to drilling to avoid damaging the carpet.
4. Mark and drill holes and securely mount the bracket half using the four #8x.625" self tapping screws (supplied with the mounting bracket).
5. Secure the cradle to the other half of the bracket using the

- four M4x10mm screws (supplied with the mounting bracket).
6. Connect the two parts of the mounting bracket and secure the hinge screw.
 7. Route the cradle cable toward the junction box, leaving a slack of approximately 10cm between the cradle connector and the first attachment. This will enable easy TETRA Handportable Terminal installation in the cradle.
 8. Connect the cradle's cable to the junction box.

POWER CABLE INSTALLATION

Note: The Digital Car Kit supports 12 V DC and 24 V DC vehicle batteries.

The Digital Car Kit power cable is equipped with 5-Ampere fuses. Verify that the vehicle electrical system can support current values larger than that.

The fuse in the red wire should be connected to the power source using the shortest practical length.

The Digital Car Kit is only for use with a negative ground system.

See Figure 8 and Figure 9 before routing or connecting the power cable and use the following procedure:



Caution

Remove the 5-Ampere fuse from the power cable's red, black and green (ignition) wires before proceeding and tape them to their respective fuse holders before making any connection. DO NOT insert fuses until all connections have been made and carefully inspected.

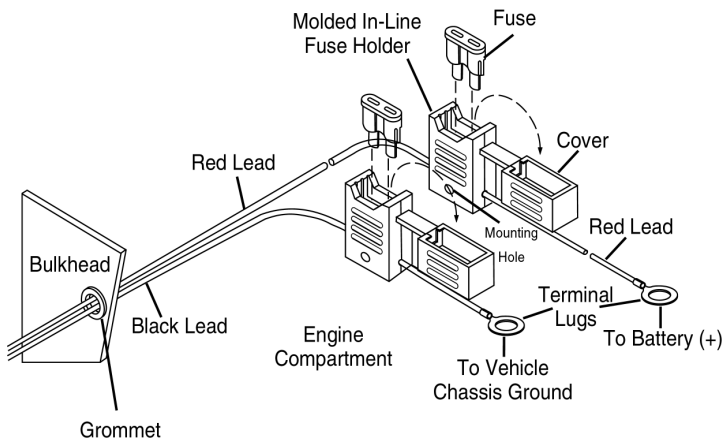


Figure 8. Power Cable Routing Into Engine Compartment

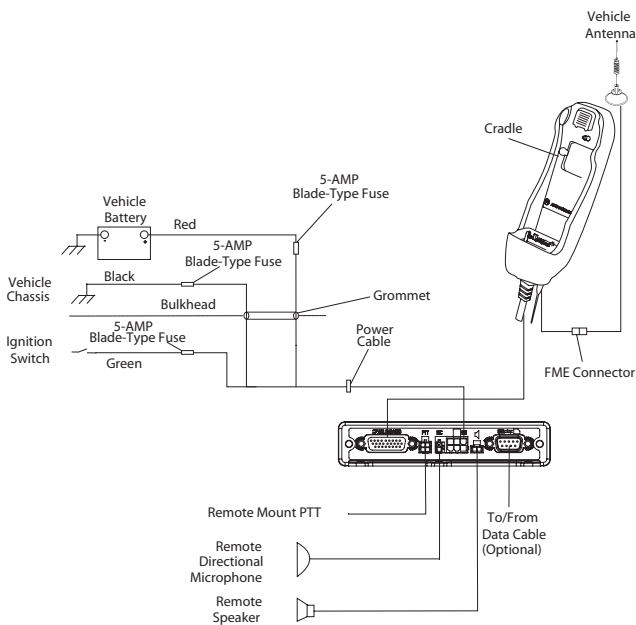


Figure 9. Digital Car Kit Interconnection Diagram (only showing typical rooftop TETRA antenna kit)

1. If the car is not equipped with an internal power supply connection, route the main power cable's red and black leads through the bulkhead and into the engine compartment. Use

- an existing opening or, if necessary, drill a 2 cm (26/32 inch) diameter hole through the bulkhead. Insert a grommet into the hole to prevent damage to the power cable. The red and black leads should be inserted one by one into the hole.
2. Cut the black lead to the desired length and connect it to the chassis of the vehicle. Verify that the fuse is at a distance of 20-30 cm away from the connection point.
 3. On the engine side of the bulkhead, connect the red (A+) lead to the vehicle's battery as follows:
 - a. Cut the long red lead to the desired length, strip the edge and crimp a terminal lug (not included) to the lead. Verify that the fuse is at a distance of 20-30 cm away from the connection point.
 - b. Connect the red lead to the positive (+) terminal on the vehicle's battery. Cable tie the wire every 4" (10 cm) along its length, do not tie to existing vehicle systems.
 4. Verify that the cables in the engine compartment do not obstruct any of the vehicle controls or touch hot or moveable parts of the engine.
 5. For ignition installation, perform the following steps:
 - a. Cut the long green lead to the desired length, strip the edge and crimp a terminal lug (not included) to the lead. Verify that the fuse is at a distance of 20-30 cm away from the connection point. It is not good practice to connect the leads to the battery pillars; use the closest battery connection provided. The Digital Car Kit could be damaged if there was a malfunction in the vehicle's electrical system.
 - b. Connect the green lead to the ignition switch. Verify that the voltage is high with ignition on, during cranking and while vehicle is running. When ignition is off, the voltage is low.

REMOTE SPEAKER INSTALLATION

Note: Optimum audio performance will be achieved by installing the speaker underneath the dashboard on the passenger side with the grill facing down towards the floor.

The speaker should be located not less than **0.9 m (3 feet)** from

the directional microphone. Do not mount the speaker so that it faces the microphone directly - it should be at an angle of 90° away (see Figure 10).

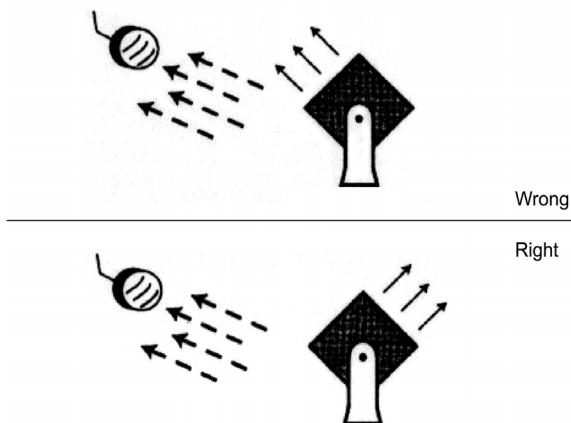


Figure 10. Remote Speaker and Microphone Relative Locations

Place the speaker and speaker cable at least 30 cm (12 inches) away from any part of the phone's antenna.

1. Using the trunnion bracket as a template, drill the necessary mounting holes and secure the bracket with the provided self-tapping screws.
2. Position the speaker on the trunnion bracket and secure it using the provided thumbscrews.
3. Route the speaker cable to the junction box ensuring that it does not affect the operation of any of the vehicle's controls.

DIRECTIONAL MICROPHONE INSTALLATION

Note: The microphone should not be installed in a spot where road and ambient background noise will be substantially high. The microphone should not be exposed to direct air flow from an open window or vehicle fan.

The directional microphone is designed to be pointed directly at the driver's mouth at a distance of approximately 40cm (15 inches) and secured with a Velcro™ fastener. The recommended

attachment location for the least noise pick-up is the center of the vehicle above the front windshield (position 1 in Figure 11). If this location is not feasible or is too close to the speaker for good echo canceling performance, the microphone can be placed on the vehicle's A pillar between the front windshield and the driver's door (position 2 in Figure 11).

To install the directional microphone, see Figure 11.

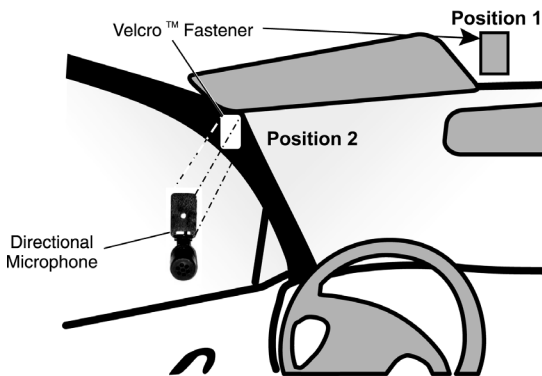


Figure 11. Installing the Microphone

1. Attach the microphone to **position 1 or position 2** in Figure 11 using a Velcro™ fastener. Verify that the microphone is facing the **driver's lips at a distance of approximately 40cm and out of any possible air flow.**
2. To avoid visual or physical obstruction, route the microphone cable behind the trim.
3. Connect the cable into the junction box (see Figure 6).

REMOTE PTT BUTTON INSTALLATION


1. Attach the PTT button to the gear lever or other convenient place.
2. Route the cable in such a way to avoid physical obstruction and allowing sufficient slack to ensure that the vehicle's controls are not obstructed in any way.
3. Connect the cable to the junction box (see Figure 6).

Your Digital Car Kit is now ready for use. Install the 5-Ampere fuses (on the red, black and green wires).

POST INSTALLATION CHECKS

Perform the following post installation checks to verify installation integrity:

Table 1: Post Installation Checks

No.	Procedure	Expected Result
1	Insert the TETRA Handportable Terminal into the cradle.	
2	Turn ignition key to On.	The TETRA Handportable Terminal is turned ON, display backlight illuminates and a message “car-kit connected” appears on the TETRA Handportable Terminal screen for few seconds. Identification tone is heard from the remote speaker. The battery icon change its shape to  .
3	Verify that the received signal strength is OK (checked by comparing it to the signal strength of the TETRA Handportable Terminal outside the Digital Car Kit).	Signal strength icon shows the same value as if the unit was outside the cradle, or higher.
4	Make a dispatch call.	Both call parties hear each other without background echo.
5	Make a phone call.	Both call parties hear each other without background echo.
6	Using the rotary knob, increase and decrease volume settings.	Audio level coming from the remote speaker follows changes in the volume settings.

TROUBLESHOOTING

This paragraph provides typical malfunctions that can occur during the first operation of the Digital Car Kit. The paragraph also suggests corrective actions.

Prior to troubleshooting the malfunction, verify the following:

1. Your TETRA Handportable Terminal functions properly outside the cradle.
2. All cables to the junction box are connected and fastened properly.

Identify the malfunction in accordance to Table 2 below.

Follow Table 2 steps after inserting the TETRA Handportable Terminal into the cradle and turning the ignition switch to ON.

Table 2: Troubleshooting Procedures

No.	Malfunction	Corrective Action
1	Display message "car kit connected" does not exist.	<ol style="list-style-type: none"> 1. Remove the TETRA Handportable Terminal from the cradle and install it again. 2. Check the cradle accessory connector. If the connector is damaged, replace the cradle assembly. <p>Note: <i>The cradle assembly includes the cable between the junction box and the cradle.</i></p> <ol style="list-style-type: none"> 3. Replace the junction box.
2	Charging Indication does not exist.	<ol style="list-style-type: none"> 1. Verify that the ignition switch is in ON position. 2. Check the power cable. Verify that the red wire is connected to the positive (+) terminal on the vehicle's battery, the black wire is connected to the vehicles chassis and the green wire is connected to the ignition line. 3. Check the fuses installed on the red, black and green wires, verify their serviceability, replace if required. 4. Replace the power cable. 5. Replace the cradle assembly. 6. Replace the junction box.

Table 2: Troubleshooting Procedures (Continued)

No.	Malfunction	Corrective Action
3	No sound is heard from the remote speaker.	<ol style="list-style-type: none">1. Verify that the ignition switch is in ON position, the TETRA Handportable Terminal is ON and an active call is present.2. Turn the rotary knob on the TETRA Handportable Terminal top clockwise to increase the volume.3. Verify that the remote speaker is properly connected to the junction box.4. Replace the remote speaker.5. Replace the cradle assembly.6. Replace the junction box.
4	The other party to a phone call (TETRA Handportable Terminal in phone mode) does not hear your voice, or, you do not get a response after a few trials.	<ol style="list-style-type: none">1. Verify that the ignition switch is in ON position, the TETRA Handportable Terminal is ON and an active call is present.2. Verify that the microphone is properly connected to the junction box.3. Verify that the directional microphone is adjusted to your direction.4. Replace the microphone.5. Replace the cradle assembly.6. Replace the junction box.
5	A dispatch call can't be made.	<ol style="list-style-type: none">1. Verify that the remote PTT is properly connected to the junction box.2. Replace remote PTT.3. Replace the cradle assembly.4. Replace the junction box.
6	Poor communication.	<ol style="list-style-type: none">1. Verify that the antenna is properly installed.2. Verify that the RF cable is properly connected to the antenna from one side and to the cradle on the other side.3. Verify that the antenna is not damaged or broken.4. Verify that the RF connector on the cradle assembly is not damaged.5. Replace the cradle assembly.

Table 2: Troubleshooting Procedures (Continued)

No.	Malfunction	Corrective Action
7	A bothersome background echo is heard at the far end during a phone or dispatch call.	<ol style="list-style-type: none"><li data-bbox="385 178 972 305">1. Verify the speaker is mounted properly (at least 0.9m away) and not pointed at the microphone. Move and/or readjust the speaker and re-test for echo.<li data-bbox="385 314 972 414">2. Verify the microphone is pointing directly at the driver's lips and not towards the speaker.<li data-bbox="385 424 972 578">3. If the above two steps do not resolve the echo, increase the distance between the microphone and the speaker, perhaps by moving the microphone from position 1 to position 2 in figure 11.