SYSTEM RELEASE 4.0 VSM
PUBLIC SAFETY LTE

VML750LTE Vehicular Subscriber Modem (VSM)Installation Guide

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As defined by the WEEE directive, this cross-out trash bin label means that customers and end-users in EU countries should not dispose of electronic and electrical equipment or accessories in household waste.

Customers or end-users in EU countries should contact their local equipment supplier representative or service centre for information about the waste collection system in their country.

Document History

Edition	Description	Date
Release 2.0	Second release of *VML750 — LTE Vehicular Subscriber Modem (VSM) Installation Guide*	July 2014
Release 3.0	Third release of *VML750 — LTE Vehicular Subscriber Modem (VSM) Installation Guide*	July 2015
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Contents

List of Figures

List of Tables

About VML750 LTE Vehicular Subscriber Modem (VSM) Installation Guide

The VML750 LTE Vehicular Subscriber Modem (VSM) connects the patrol car, fire apparatus or command vehicle to an LTE network, bringing the benefits of wireless broadband to the vehicle. This installation guide provides a description, and installation, troubleshooting, and operating information.

What Is Covered In This Manual?

The VML750 LTE VSM Installation Guide provides general instructions for installing, operating, and troubleshooting the VML750.

The guide is organized as follows:

- VML750 Description provides the product overview.
- VML750 Installation provides unpacking instructions and all required procedures for installing the VML750.
- VML750 Troubleshooting Causes and Indicators provide details regarding possible malfunctions that may occur after first-time installation of the VML750, their probable cause, and the recommended corrective actions.
- Powering Up the Modem provides general information regarding the use of the VML750.
- VLM750 Specifications provides the VML750 modem specifications.
- VML750 Replacement Parts List provides part numbers information for the modem and Antennas.
- LTE LMR Antennas Mounting Recommendations provides procedures for determining the mounting locations for a Public Safety Narrow Band LMR 700/800 MHz antenna and Broad Band LTE 700 MHz Antennas.

Helpful Background Information

Motorola offers various courses designed to assist in learning about the system. For information, go to http://www.motorolasolutions.com/training to view the current course offerings and technology paths.

Required Documents for Complete VSM Deployment

To complete the full deployment of the modem, you may need the following documents:

- Information related to VML750 configuration in the *VML750 Configuration Guide P/N 6802988C55* at: https://businessonline.motorolasolutions.com
- Information related to VML750 monitoring can be found in the *VML750 LTE Vehicle Subscriber Modem (VSM) Status Utility Quick Reference Guide P/N 6802988C79*.
- Information related to the device licensing can be found in the *Device Licensing Quick Reference Guide P/N 6871024P25* at: https://businessonline.motorolasolutions.com

Safety and Regulatory Information

Before installing/using this product, the installer/operator must be familiar with the RF energy awareness information and operating instructions in the “Product Safety and RF Energy Exposure Booklet for Mobile Two-Way Radios Installed in Vehicles or as Fixed Site Control Stations” enclosed with the VML750 LTE Vehicular Subscriber Modem (For USA) Motorola Publication part number 6881095C99 or RF Energy Exposure and Product Safety Guide for Mobile Two-Way Radios installed in Vehicles or as Fixed Site Control Stations P/N 6866537D37 (for rest of regions) to ensure compliance with Radio Frequency (RF) energy exposure limits.

FCC Interference

The VML750 is granted with two separate FCC IDs for baseline models: FLN0058A, FLN2058A.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this product, not expressly approved by Motorola, void the user authority to operate the equipment, per FCC Rule Part 15.21.

Legal Notice

The VML750 OSS legal notice is provided by Motorola per request.

Chapter 1

VML750 Description

Designed for the harsh environments of public safety vehicles, the VML750 LTE Vehicular Subscriber Modem (VSM) is a solid-state device capable of withstanding vibration, humidity, temperature extremes, and other challenges encountered in the field. Mounted in the trunk or passenger compartment, it provides broadband, wide-area network connectivity to devices in and around the vehicle.

Figure 1 VML750 General View

Table 1 Legend for General View

Item #	*Description*
1.	Modem
2.	Front Panel
3.	Connector Panel (Back Panel - not shown)
4.	CRYPTR Card Door (not shown)

VML750 Models

The Motorola VML750 LTE Vehicular Subscriber Modem (VSM) is a power class 3 device.

The VML750 model F0025 includes the following sub-models:

- FLN1057A: A multi-mode modem that operates in LTE Bands 14/13 and 3G EvDo BC0/BC1. The modem supports WiFi as client and AP as well as GPS for location and support for data encryption (CyrptR).
- FLN2057A: A multi-mode modem that operates in LTE Bands 17/14/13/5/4/2 (Band 13 is hardware ready only) and EvDo BC0/BC1 UMTS B5/B2 GSM. The modem supports WiFi as client and AP as well as GPS for location and support for data encryption (CyrptR).
- FLN5057A: A multi-mode modem that operates in LTE Bands 1, 3, 5, 7 ,8, 28 and UMTS bands 1 and 5. The modem supports WiFi as client and AP as well as GPS for location and support for data encryption (CyrptR).
- FLN5058A: A multi-mode modem that operates in LTE Bands 3, 7 and 20 and UMTS bands 1 and 8. The modem supports WiFi as client and AP as well as GPS for location and support for data encryption (CyrptR).
- FLN5059A: A multi-mode modem that operates in LTE Bands 2, 4 ,7 ,28 and 7 and UMTS bands 2, 4 and 5. The modem supports WiFi as client and AP as well as GPS for location and support for data encryption (CyrptR).

VML750 Front Panel

The VML750 Vehicular Subscriber Modem (VSM) Front Panel is shown in the following figure.

Figure 2 Front Panel

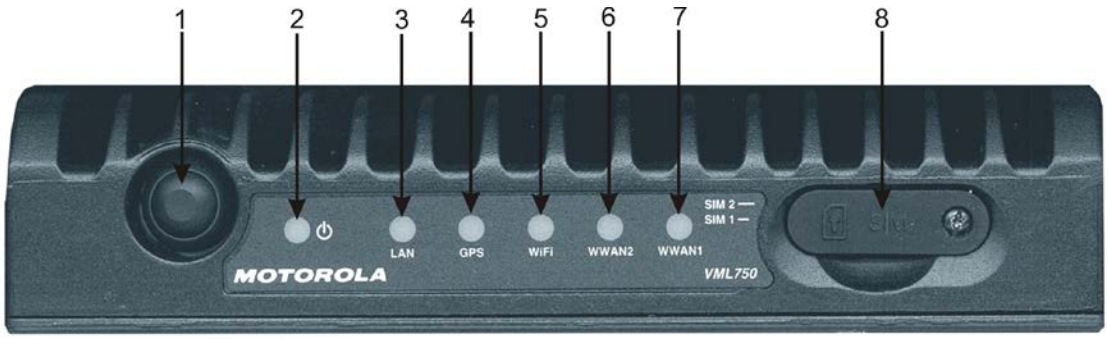


Table 2 Legend for Front Panel

Item #	Item	Description
1.	Power Button*	The power button is used to turn the VML750 LTE Vehicular Subscriber Modem (VSM) on or off when Ignition Sense is disabled. If the Ignition Sense is enabled, you also need to turn the vehicle ignition switch to On. This button is also used to apply factory reset.
2.	Power LED	For LED indications, refer to LED Indications
3.	LAN LED	
4.	GPS LED	
5.	WiFi LED	
6.	WWAN2 LED	
7.	WWAN1 LED	
8.	SIM Card Door	Access door to VML750 SIM

VML750 Back Panel

The VML750 Back Panel is shown in the following figure.

Figure 3 Back Panel

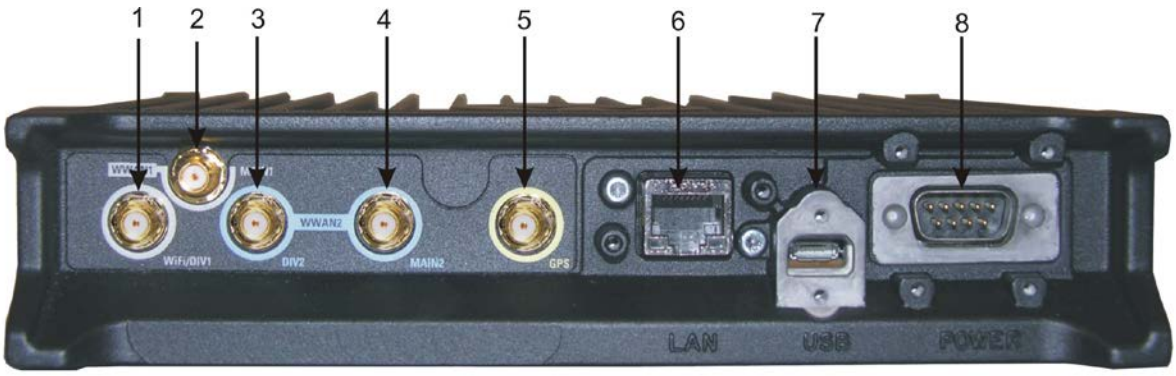


Table 3 Legend for Back Panel

Item #	Description
1	RF SMA female type connector (WWAN1 DIV/WiFi)
2	RF SMA female type connector (WWAN1 MAIN1)
3	RF SMA female type connector (WWAN2 DIV)
4	RF SMA female type connector (WWAN2 MAIN2)
5	RF SMA female type connector (GPS)
6	LAN/Ethernet communication connector (RJ45)
7	Micro AB type connector (USB 2.0)
8	DC power and GPIO D-type, 9–pin connector

Chapter 2

VML750 Installation

Installing the VML750 LTE Vehicular Subscriber Modem (VSM) involves unpacking and inspection, planning, cable routing, installation of the antenna, brackets, VSM, SIM card, CryptR card, and cap, and powering the VSM.

VML750 Unpacking and Inspection

Unpack your equipment and check the contents to ensure that you have received all the specified items.

Thoroughly inspect the equipment for shipping damage as soon as possible after delivery. Report any damage you find to your Motorola Customer Service representative immediately.

Safety and General Information

IMPORTANT: This device requires professional installation to satisfy compliance with FCC requirements.

A properly installed VML750 minimizes service calls. When mounting the VML750 components, consider the following factors:

- The mounting surface must have sufficient strength to support the equipment being mounted and to prevent it from becoming loose over time.
- Do not attach components to any part of the vehicle subjected to excessive vibration.
- Do not mount the VML750 unit on a flat surface where the unit could become partially submersed in water.
- The proposed location of the equipment being mounted or wires/cables attached must not interfere with driver/passenger seating or leg space.
- Select a location such that heat from the unit does not damage any wiring or any other plastic or heat-sensitive parts of the automobile.
- Use the supplied mounting hardware.
- Leave sufficient space around the VML750 unit for air flow and installation.
- Select a location that permits routing the cables as directly as possible.
- 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 controls.
- Only qualified personnel may install communication equipment.
- Ensure secure tightening of cable connectors.

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. Improperly installed communication equipment which causes the air bag to inflate could cause serious injury. If necessary, contact the vehicle manufacturer for air bag information specific to the vehicle.

WARNING: Verify that no vehicle systems are affected by use of the unit, for example, cruise control, ABS breaking, traction control, engine management, direction indicators, and lights.

WARNING: Use existing openings through the firewall to avoid drilling. If drilling is a must, verify not to damage the Vehicle ECMs, fuel lines, brake lines, and/or cable looms.

WARNING: For vehicles equipped with electronic braking systems, see *Anti-Skid Braking Precautions*, Motorola publication 68P81109E34.
Modems installed in vehicles fueled by liquefied petroleum gas must conform to the National Fire Protection Association standard NFPA 58, which applies to vehicles with liquid propane (LP) gas container in the trunk or other sealed off space within the interior of the vehicle.

The NFPA 58 requires the following:

1. The space in which the LP gas container and its fittings are located must be isolated by a seal from the space containing modem equipment.
2. Removable (outside) filling connections must be used.
3. The container space must be vented to the outside.

CAUTION: Installing the VML750 at the end of the vehicle above the exhaust pipe may cause the VML750 to overheat.

CAUTION: Check the required mounting locations. It might be necessary to penetrate the firewall to reach the battery. Before drilling commences, ensure cable clearance on the opposite side of the firewall and do not install the vehicle Electronic Control Modules (ECMs) on the opposite side of the firewall. Protect the cable where it passes through the firewall by using a grommet or similar protective measures.

IMPORTANT: Install this product in a vehicle in accordance with the vehicle manufacturer guidelines and the instructions detailed in this manual. Use only the Motorola parts specified in this manual.

IMPORTANT: Refer to the Safety Instructions in Product Safety and RF Energy Exposure Booklet for Mobile Two-Way Radios Installed in Vehicles or as Fixed Site Control Stations P/N 6881095C99 (for USA) or RF Energy Exposure and Product Safety Guide for Mobile Two-Way Radios installed in Vehicles or as Fixed Site Control Stations P/N 6866537D37 (for EU).

VML750 Installation Planning

Fast, easy, and safe installation requires careful planning and selecting the proper location. For optimal system performance, follow the instructions and recommendations detailed in this manual.

Perform this process to install the VML750 LTE Vehicular Subscriber Modem (VSM).

Process:

1. Ensure adequate space for the installation.
2. Install the Antennas. See Mounting the VML750 Antennas. Also see the *Installation Guide* supplied with each antenna.
3. Route the cables. See VML750 Cable Routing and Connection.
4. Install the brackets and the unit. See Installing the VML750 Modem.
5. Connect the DC Power and Ignition cable. See Installing the DC Power and Ignition Cable.
6. Connect the main antenna cables. See Installing Antenna Cables.
7. Connect the LAN/Ethernet cable. See Installing the LAN/Ethernet Cable, or the Micro USB cable, See Installing the Micro USB Cable.
8. Power-up the VML750. See Powering Up the Modem.

The VML750 can be installed on a flat surface or a side wall of a vehicle.
Before beginning the installation, make sure that the space available at the installation site is adequate for the modem and its accessories. Each installation configuration may require a different area for mounting the modem without obstruction.

When choosing a location, ensure easy access for installation and replacement of the unit.

Vehicle RF Antennas must be installed in external to the vehicle and in accordance with:

- The requirements of the antenna manufacturer/supplier.
- Instructions provided in installation manuals of other radio devices installed next or used with the VML 750.

Figure 4 VML750 Dimensions

Cable Routing

- Before running a wire or drilling a hole, inspect the vehicle to determine how and where you intend to mount the antenna, modem, and input/output device.
- Before installing the antenna cables, add an identical label on both ends of each cable to ensure correct connection between the antenna and its related connector on the VML750 back panel.
- Plan wire and cable routing to provide maximum protection from overheating, battery acid, moving parts, and sharp edges.
- Keep cables away from ignition circuits to reduce noise pickup in the radio equipment.
- Verify that the cables are of sufficient length. Do not connect two short lengths with a splice; doing so results in power loss. Refrain from loose excess in the cables, but leave enough slack to allow re-connection if necessary.
- Do not run cables externally or underneath floor mats.
- Do not locate cables where the driver or passengers can kick them or where they can interfere with operation of the driver foot pedals.
- When routing the cables, do not create sharp bends or kinks.

NOTICE: For detailed antenna cables routing instructions, see the *Installation Guide* supplied with each antenna.

Cable Holes

- Where possible, use existing holes in the firewall, the trunk wall, and the channels above or beneath the doors.
- If you must drill holes, do not damage other wiring, brake lines, or fuel lines.
- When drilling a hole in the roof, do not snag the roof liner.
- To prevent rusting after drilling, remove all metal burrs and residue, and completely clean the area to ensure the removal of all steel dust.
- Insert rubber grommets in all drilled holes to protect cables, except for Antennas cables.

Tools and Equipment

- #2 Phillips screwdriver
- Electric drill and drill bit set
- X-ACTO knife or equivalent
- Wire strippers
- Long-nose pliers
- Small side cutters
- Crimping tool
- Wrench set, including 8-mm wrench for tray-to-unit attachment
- Crescent wrench
- Spanner wrench
- 3-mm Allen wrench set for unit to tray attachment
- No. 8 Torx screwdriver

Electrical tape

Mounting the VML750 Antennas

NOTICE: before installing the antenna cables, add an identical label on both ends of each cable to ensure correct connection between the antenna and its related connector on the VML750 back panel.

The VML750 antenna is used to enhance the reception capability in poor reception areas and support Multiple Input Multiple Output (MIMO) modes for LTE.

Two identical Antennas are used; one for WWAN2 Main and one for WWAN2 div. The Antennas can be provided with 12-ft (P/N: FTN6070A) or 17-ft (P/N: FTN0073A) coaxial cable.

To complete the public network installation, base with cup antenna is used for WiFi connectivity on WWAN1 WiFi/Div and GPS reception (P/N: AN000036A01). The antenna is constructed of three Antennas:

- Internal antenna - for WiFi (to be connected to WWAN1 diversity)
- External antenna – Whip connected to Main1 (for use only with B14)
- GPS active antenna (to be connected to GPS port)

IMPORTANT:

Use the following guidelines for antenna mounting to ensure best performance and avoid signal reduction and interference:

1. When installing antenna Main 1 or Main 2 or Div 2, keep a clear radius of more than 20 cm (8") from other Antennas.
2. When installing antenna Main 1 or Main 2 or Div 2, keep a distance of more than 20 cm (8") from the front edge of the car roof. Install the Antennas in a distance of about 10 cm (4") from the center line crossing the length of the car.
3. Keep a clear distance of more than 30 cm (11.8") between antenna Div. 2 and Main 1.
4. Keep a clear distance of more than 30 cm (11.8") between antenna Div. 2 and Main 2.
5. Keep a clear distance of more than 100 cm (39.4") between antenna Div. 1 and Main 1.
6. Keep a clear distance of more than 100 cm (39.4") between antenna Div. 1 and Main 2.
7. When installing antenna Div. 2 at the center line of the roof, keep a distance of more than 20 cm (8") from the rear edge of the car roof.

IMPORTANT: To assure optimum performance and compliance with RF Energy Safety standards, these antenna installation guidelines and instructions are limited to metal-body vehicles with appropriate ground planes and take into account the potential exposure of back seat passengers and bystanders outside the vehicle.

Special Antenna Installation Considerations

WARNING:

To comply with safety regulations, the distance between Antennas and people sitting inside the vehicle must be more than 8 inches (20 cm).

CAUTION: If your vehicle is equipped with Public Safety Narrow Band (PSNB) equipment, when installing the Antennas, provide a minimum distance of 78 inches (198 cm) between the PSNB antenna and any VML750 antenna to ensure coexistence between all systems.

Main Antenna

IMPORTANT: Install the antenna on a flat metal surface with a minimum size of 24 inches (61 cm) x 24 inches (61 cm).

NOTICE: Install the Private network main antenna (when applicable) and the Public network main antenna on the vehicle roof, preferably in the center front side of it. Ensure that the vehicle roof material is metal. If not, use a 2 ft x 2 ft metal ground plane and mount the antenna in its center. For best performance, keep a minimum distance of 36 inches (91.44 cm) between this antenna and any other antenna.

Installing Antenna Cables

Perform this procedure to install antenna cables for public and private network configurations.

Procedure:

1. Connect the **Internal** cable connector to the WWAN1 WiFi/DIV port on the VML750 LTE Vehicular Subscriber Modem (VSM) connector panel. Connect the GPS cable connector to the GPS port on the VML750 connector panel. Form a service loop for the flexible cables coming out of the antenna bottom near the cable exit to contain any excess cable length. Form these service loops with a minimum bend radius of 1 inch (2.54 cm). If needed, form a second service loop for the excess length of the jumper cables near the VML750 with minimum bend radius of 3 inches (7.63 cm). Use plastic cable ties to secure the cable.

   NOTICE: The combo antenna is provided with three flexible coaxial cables coming out of the antenna bottom side (two threads for internal and GPS are used). Two 12-ft/17-ft coaxial cables are also provided to connect between the internal and GPS threads and the modem connectors.

2. For the Main and Diversity Antennas, connect the RF cable from the antenna to WWAN2 main and WWAN2 DIV.

   IMPORTANT: Do not use pliers or any other metallic tool for tightening - only Hand-tighten. Fully tighten the antenna cable connector and verify it is fastened.

3. For the private network configuration, connect the connector of the cable marked **External** to the WWAN1 Main port on the VML750 connector panel.

   IMPORTANT: To protect any unused connectors (WWAN2, LAN/Ethernet, USB) on the back of the VML750 LTE Vehicular Subscriber Modem (VSM), screw the caps provided in the installation kit onto these unused ports.

Figure 5 Schematic Installation Diagram for Sub-models FLN1057A/FLN2057A WWAN1 & WWAN2 Configuration

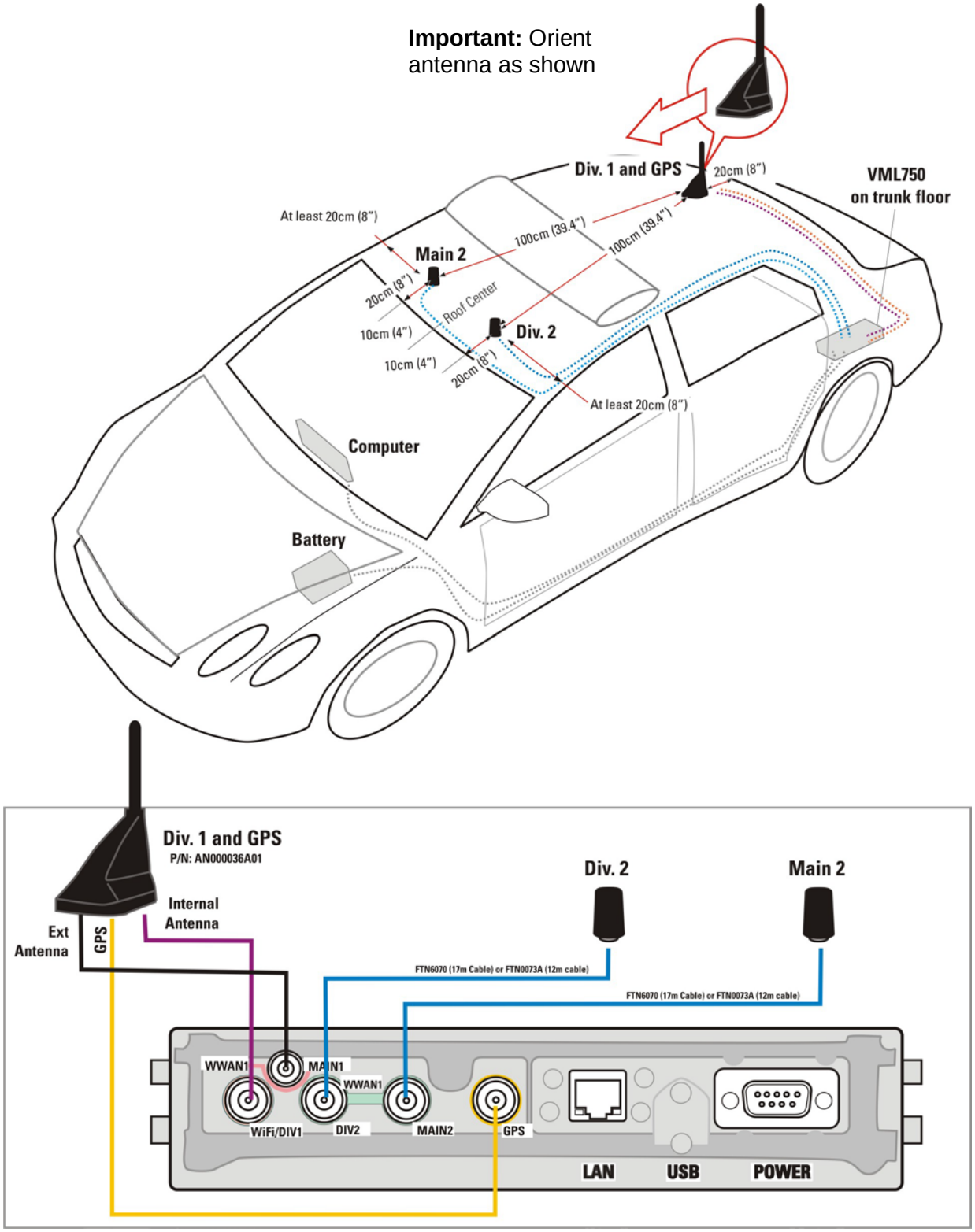


Figure 6 Schematic Installation Diagram for Sub-models WWAN1 only FLN1057A/FLN2057A

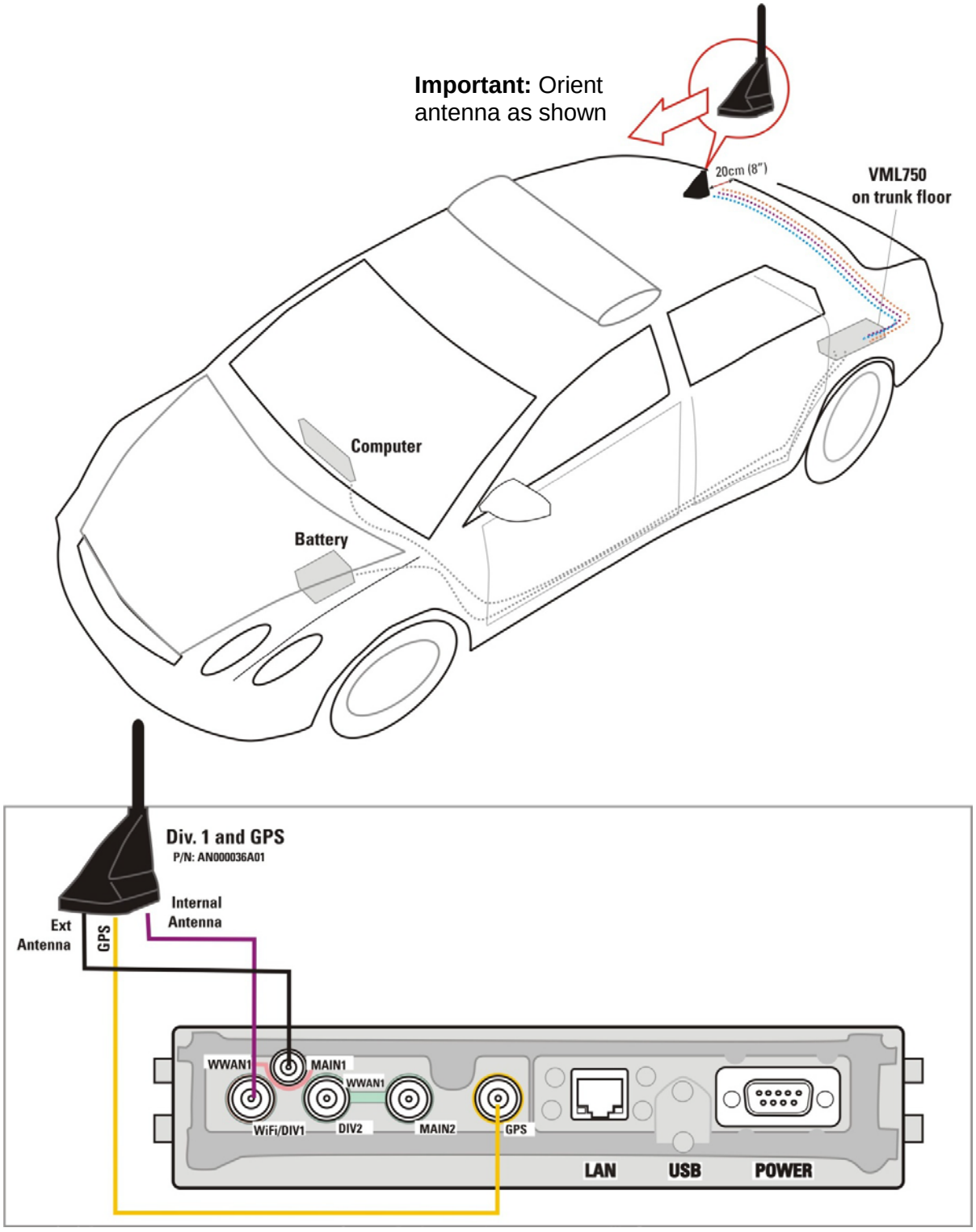
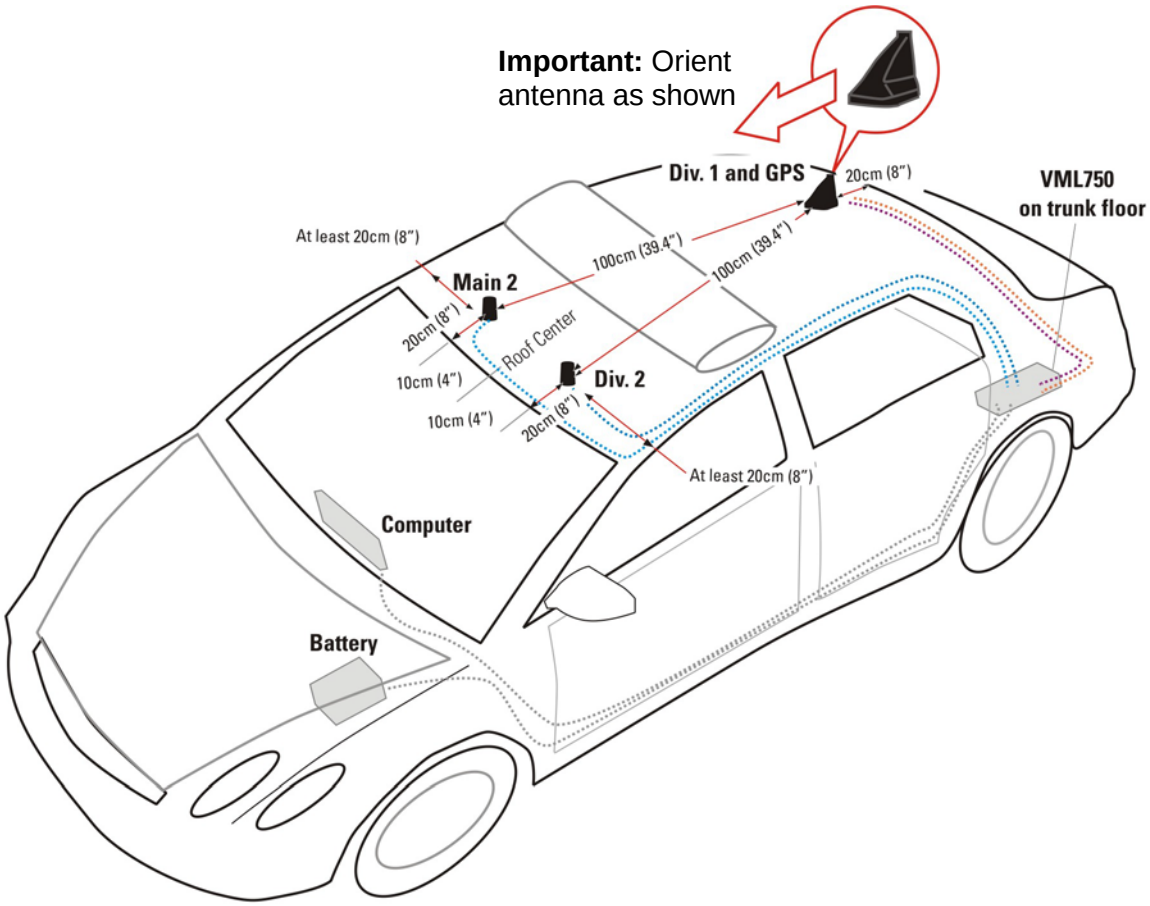


Figure 7 Schematic Installation Diagram for Sub-models WWAN2 Only FLN1057A/FLN2057A/FLN5057A/FLN5058A



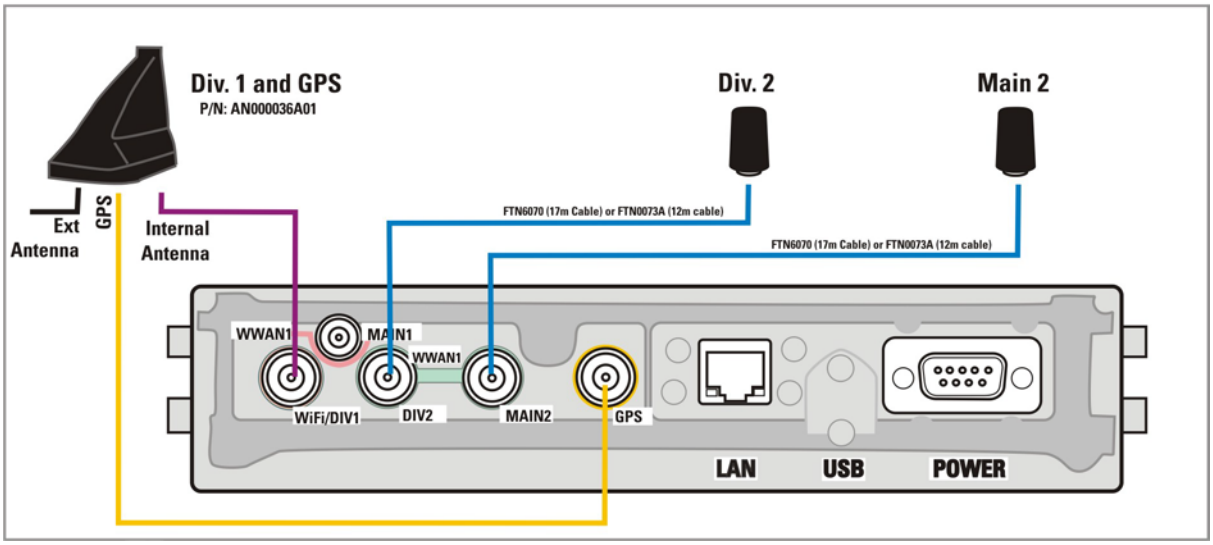
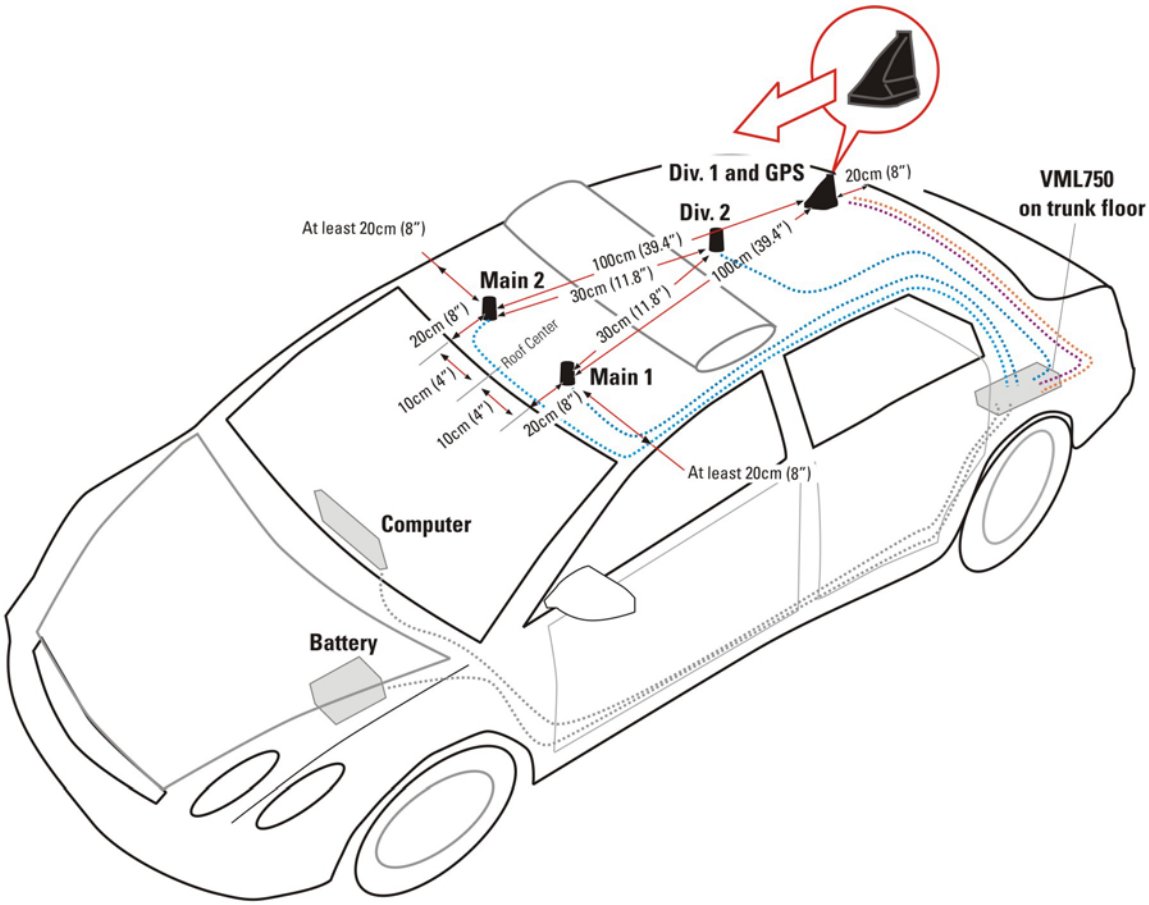
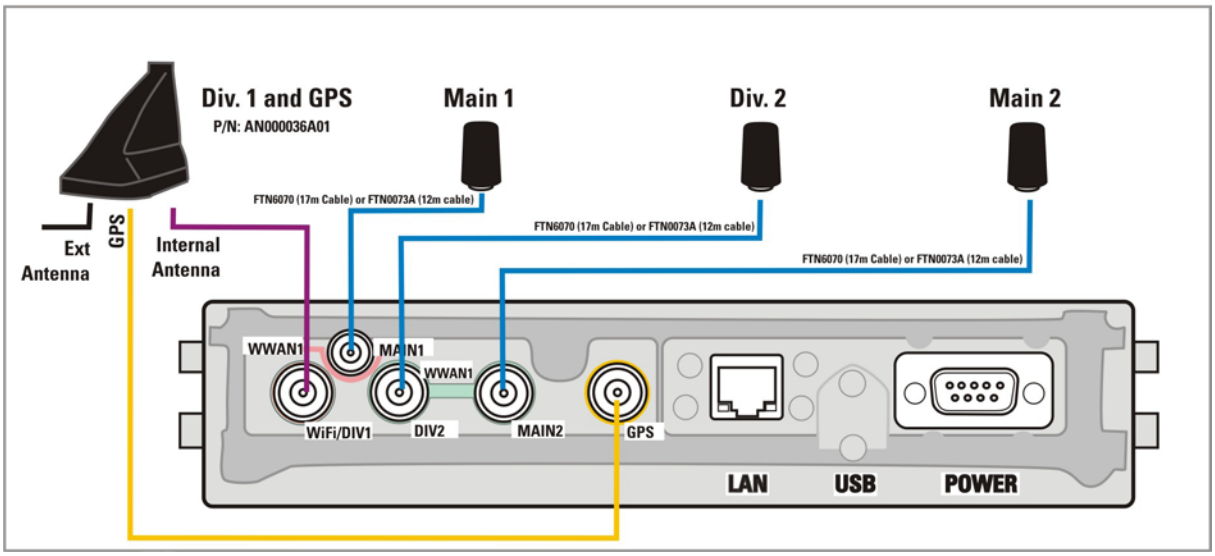


Figure 8 Schematic Installation Diagram for Sub-model FLN5059A

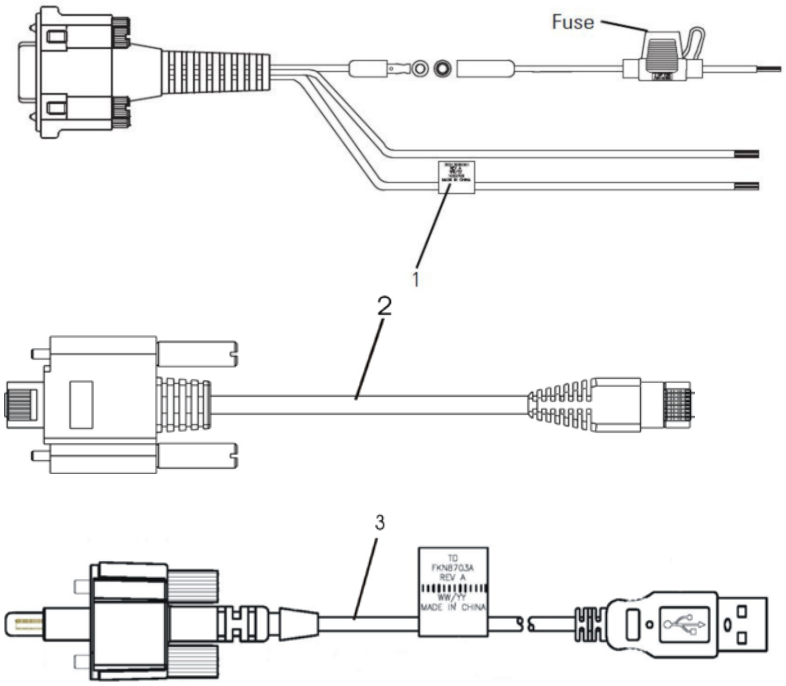




VML750 Cables

The following cables are available with the VML750.

Figure 9 Available Cables



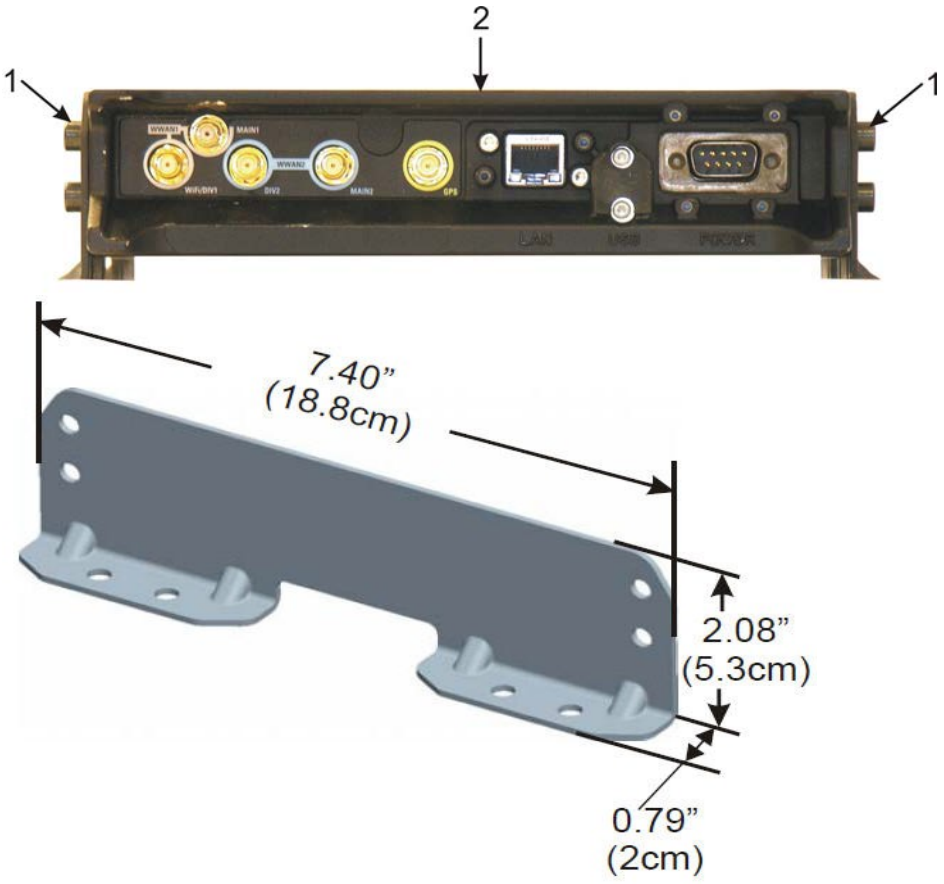
Item #	Description
1	DC Power and Ignition cable (P/N FKN8663A)
2	LAN/Ethernet cable (P/N FKN8570A)
3	Micro USB cable (P/N FKN8703A can be purchased separately)

Mounting the VML750

Procedure:

1. Position the two mounting brackets (1) on each side of the VML750 (2) and fasten to the VML750 using 4 screws.
2. Locate the VML750 with the mounting brackets on the surface.
3. Position the VML750 with the brackets on the surface and fasten to surface using the supplied self-drilling screws.

Figure 10 Mounting the VML750



VML750 Cable Routing and Connection

This section describes installing, routing, and connecting the VML750 LTE Vehicular Subscriber Modem (VSM) cables.

Installing the DC Power and Ignition Cable

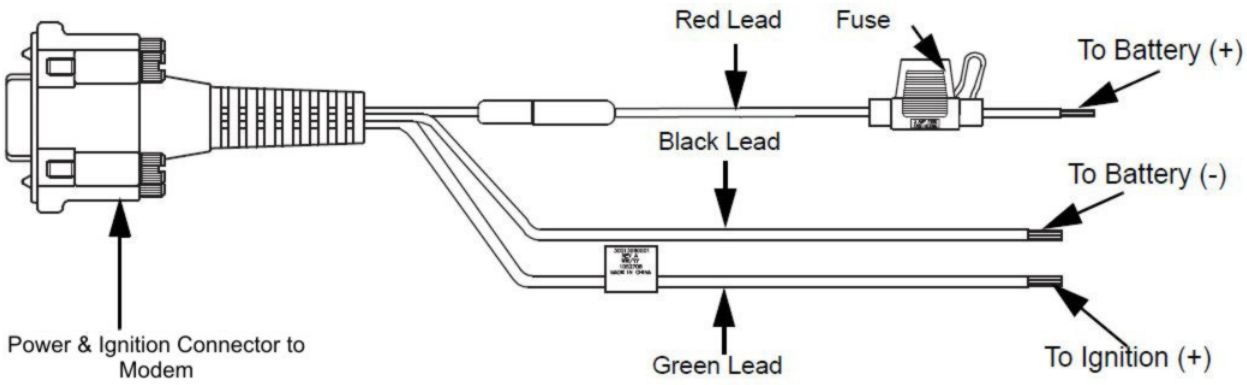
Perform this procedure to route and connect the DC Power and Ignition cable.

CAUTION: Insert the fuse into the fuse holder after installation completion and after carefully inspecting all connections. The VML750 LTE Vehicular Subscriber Modem (VSM) supports 12V (13.8 V ±20%) or 24V (27.6 V ±20% DC) vehicle batteries.
Connecting to higher power source (for example, 48V battery) may damage VML750.

NOTICE: The unit may only be used in a negative ground system. The FKN8663A

DC Power and Ignition Cable is equipped with a 5A fuse (slow-blow). Verify that the electrical system of the vehicle can support current values greater than 5A.

Figure 11 DC Power and Ignition Cable Routing Into Engine Compartment



Procedure:

1. Remove the fuse from the fuse holder.
2. Route the DC Power and Ignition cable leads through the firewall and into the engine compartment. Use an existing opening or, if necessary, drill a 2 cm (26/32 inch) diameter hole through the firewall. Insert a grommet into the hole to prevent damage to the DC Power and Ignition cable.

3 On the engine side of the firewall, connect the black lead to the negative (-) battery terminal.

4 On the engine side of the firewall, perform the following actions to connect the red (A+) lead to the vehicle battery:

   a Verify that the fuse holder is at a distance of 20-30 cm (7.87-11.8 inches) from the connection point, ensuring that it is not close to any hot engine component.

   b Mount the fuse holder using the provided mount, and dress wires as necessary. Connect the red lead plug adaptor (on the fuse holder) to the matching receptacle on the red lead of the DC Power and Ignition cable.

   c Connect the red lead of the DC Power and Ignition cable to the positive (+) battery terminal. Cable tie the wire every 10 cm (4 inches) along its length. Do not tie to existing vehicle cables.

   d Insert the fuse into the fuse holder.

5 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.

6 For ignition installation, perform the following actions:

   a Consult the vehicle documentation to locate the ignition wire.

   b Verify that the voltage is high with the ignition on, during start (cranking), accessory, and while vehicle is running. When the ignition is off, the voltage is zero.

   c Connect the green lead of the DC Power and Ignition cable to ignition (+). Cable tie the wire every 10 cm (4 inches) along its length. Do not tie to existing vehicle systems.

7 Connect the DC Power and Ignition cable connector to POWER connector on the VML750 Connector panel. Fasten the connector using the four fastening screws.

Installing the LAN/Ethernet Cable

Perform this procedure to install the LAN/Ethernet cable.

Procedure:

1. Connect the LAN/Ethernet cable from the LAN connector on the VML750 LTE Vehicular Subscriber Modem (VSM) Connector panel to your vehicle Mobile Data Terminal.

   CAUTION: Do not use pliers or any other metallic tool for tightening. Hand- tighten only. Fully tighten the LAN/Ethernet cable connector and verify it is fastened.

2. Follow the LAN/Ethernet cable 8 +/–2 inches (20 +/–5 cm) from where it attaches to the VML750 and secure it to the vehicle body.

Installing the Micro USB Cable

Perform this procedure if you are not installing the LAN/Ethernet cable.

Procedure:

1. Connect the Micro USB cable from the Micro USB connector on the VML750 LTE Vehicular Subscriber Modem (VSM) Connector panel to your vehicle Mobile Data Terminal USB connector.

   CAUTION: Do not use pliers or any other metallic tool for tightening. Hands tighten only. Fully tighten the Micro USB cable connector and verify it is fastened.

2. Follow the Micro USB cable 8 +/–2 inches (20 +/–5 cm) from where it attaches to the VML750 and secure it to the vehicle body.

Installing the SIM

If your VML750 is intended for use on your private Motorola LTE network, you are provided with a Motorola LTE SIM card (to be inserted into SIM1 slot). If your VSM is intended to home on a public carrier LTE network, you must obtain a SIM card from that public carrier and insert it into SIM2 slot.

The VML750 can be used a WiFi modem without the need for a SIM card. When using the VML750 as a WiFi modem, the VML75 must be configured prior to use. For VML750 configuration, refer to *VML750 Configuration Guide* (6802988C55) at https://businessonline.motorolasolutions.com.

Procedure:

1 Locate the SIM card door on the front right side of the VML750. Unscrew the door and put to the side.

NOTICE: If a SIM card is in the slot, your LTE modem has been staged for you (see*VML750 Configuration Guide PN 6802988C55* if required); skip to step 4.

2 Locate the SIM card Motorola or your public carrier provided. Hold the card so that the metal contacts are facing down.

3 Insert the card into the SIM slot until you feel it 'click' into place.

NOTICE: SIM 1 slot is for private network. SIM 2 slot is for public carrier network.

4 Close the door and screw it into place. Tightened the screw so that the door does not move.

Replacing the CRYPTR Card

Perform this procedure to replace the CRYPTR card in the VML750.

CAUTION: Disconnect your VML750 from the power source before performing this procedure.

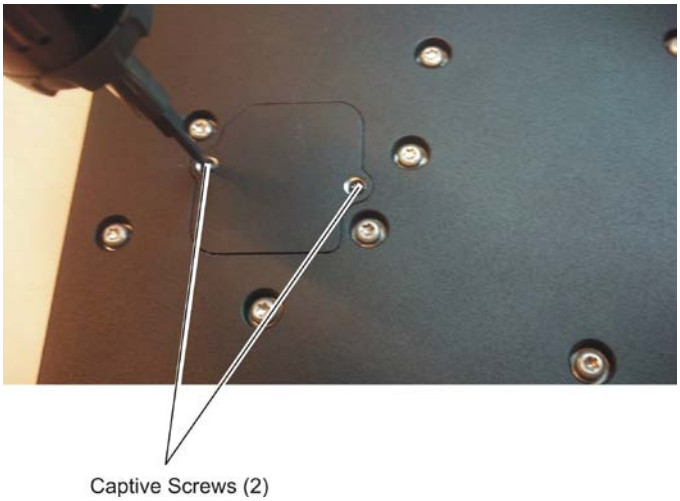
Procedure:

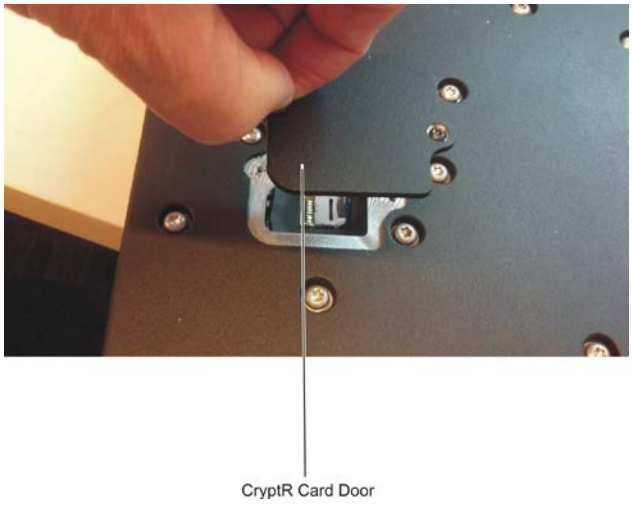
1 Perform the following actions to remove the CRYPTR card.

a On the VSM bottom cover, open the two Torx 8 captive screws fastening the CRYPTR card door.

b Use one of the captive screws to pull the door from the cover.

Figure 12 opening the CRYPTR Card Door





c Pull the card lock back to release it and lift it up.

d Remove the card from the VSM.

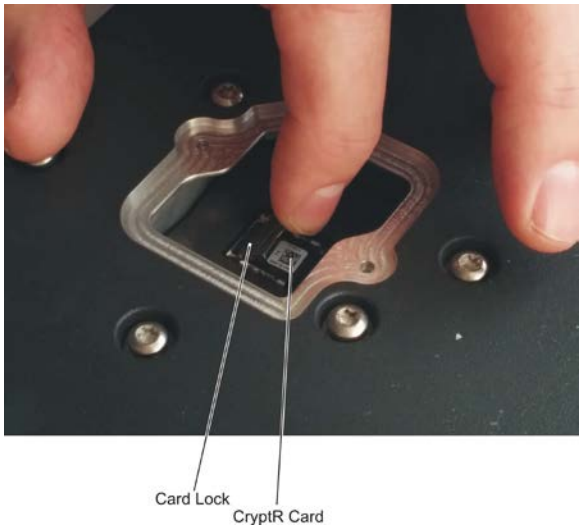
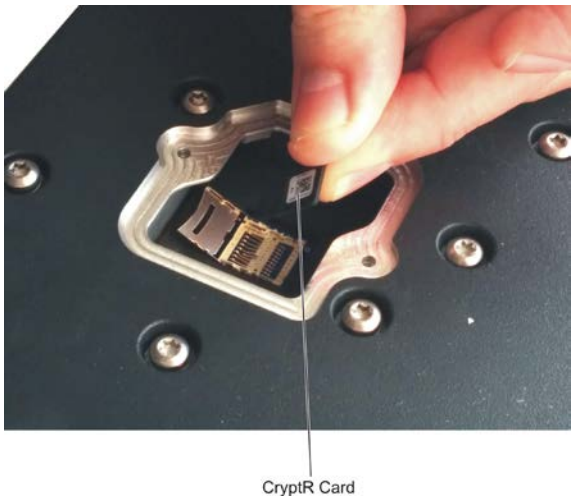


Figure 13 Installing the CRYPTR Card



2 Using the above illustrations, perform the following actions to install the CRYPTR card.

   a Insert the CRYPTR card into its location in the VSM.

   b Lower the lock and push it forward to lock it.

   c Install the card door on the VSM lower cover.

   d Close two Torx 8 captive screws. Fasten with a torque of 12 inch-lb.

Powering Up the Modem

Perform this power-up procedure after installing the VML750 LTE Vehicular Subscriber Modem (VSM).

Procedure:

1 Verify that the vehicle ignition switch is in **On** position.

2 Press and hold the power button on the LED Indicator Panel for 2 to 3 seconds. Release the button when the Power LED turns green (blinking or solid).

3 If your modem is connected to a computer using LAN/Ethernet/USB cable, the LAN LED turns green. If no LAN/Ethernet/USB cable is connected, the LAN LED is off.

4 The GPS LED blinks orange while your modem is searching for GPS satellites. After satellites are acquired, the GPS LED turns green.

NOTICE: The time for acquiring satellites during initial power up may take up to 5 minutes.

5 WiFi LED is tuned off until WiFi configuration was performed. See the *VML750 Configuration Guide, PN 6802988C55*.

6 After configuring the modem to WiFi Access Point mode, the WiFi LED turns green. When data is transferred, the WiFi LED blinks green.

7 If a SIM card is inserted and the SIM door is closed and you are in an LTE coverage area, the following sequence takes place:

a LTE LED blinks orange while the modem searches for the LTE network.

b LTE LED blinks green while registering to the network.

c LTE LED is solid green after registration and activation.

8 If your VML750 is equipped to support LTE, activate it on the associated LTE network (your private PS LTE network or on the public carrier network). Contact the manager of your network (Motorola, public carrier, or your internal technical support) and provide the SIM card identifier number, called the IMSI. This identifier can be found on the plastic credit card frame for the SIM.

NOTICE: The time for registering and activating your account may vary and could typically take up to 2 minutes.

- If the SIM door is not closed, the LTE LED rapidly blinks red.
- If SIM card is not inserted, the LTE LED blinks red.

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Chapter 3

VML750 Troubleshooting Causes and Indicators

Motorola has made every effort to ensure that this product is of excellent quality. However, if you experience any problems with the VML750 LTE Vehicular Subscriber Modem (VSM), contact your Motorola service representative with product-related information. For complete information on ordering required parts and kits, contact your local customer service representative. See the "Contact Us" section and FRU/FRE Kit/Part Number Kit Description.

VML750 Troubleshooting

This table gives details regarding possible malfunctions that may occur after first time installation of the VML750 LTE Vehicular Subscriber Modem (VSM), their probable cause, and the recommended corrective action. For correct LED indications, See LED Indications.

IMPORTANT: Contact Motorola Solutions Support Center (SSC) team for further troubleshooting assistance if necessary. For contact information, see the "Contact Us" section.

Table 4 Troubleshooting the VML750

Malfunction	Probable Cause	Corrective Action
VML750 does not turn On.	Power cable is not properly connected.	**1** Check the cable connections; connect as required and turn on the VML750. **2** Verify that the **Power LED** is blinking red (standby mode). **3** Press the power button to turn on (expect LED behavior according to ignition state).
	Power button was not properly pressed.	**1** Apply power to the modem. **2** Verify that the **Power LED** is blinking red. **3** Press the **Power Button** for 2 to 3 seconds. **4** Verify that the **Power LED** is blinking orange (in "ignition enabled" mode), or blinking green and then solid green (in "ignition disabled" mode).
No LAN/Ethernet connection.	LAN/Ethernet cable is not connected, or, Micro USB cable is not connected.	Connect the LAN/Ethernet cable (See Installing the LAN/Ethernet Cable) or the Micro USB cable (See Installing the Micro USB Cable) and verify that the LAN LED is green.
No GPS reception.	GPS cable (from Main antenna) is not connected	**1** Connect the GPS cable (See Installing Antenna Cables).

Table continued...

Malfunction	Probable Cause	Corrective Action
		2 Verify that the GPS LED is blinking orange and then changes to solid green.
No WiFi connection.	WiFi was not configured as required.	See *VML750 Configuration Guide* (6802988C55) in https://businessonline.motorolasolutions.com for WiFi configuration.
	Div/WiFi cable is not connected.	**1** Connect the WiFi/Div cable (See Installing Antenna Cables). **2** Verify that the WiFi LED is blinking/solid green.
No LTE connection.	Device has not yet been activated on the LTE network.	**NOTICE:** The following steps assume your network manager or service provider created a subscription for the LTE service. **1** Locate ICCID (the identifier for the LTE SIM card) or PSN (the device serial number) which is printed on a sticker affixed to the VML750 casing. **2** Contact the network manager or technical service department and report the ICCID or the PSN number. **3** Verify that your device has been activated on the LTE network. See Powering Up the Modem.
	SIM card is not inserted/ damaged.	**1** Insert a new SIM into relevant SIM slot. See Installing the SIM. **2** Close the SIM door. **3** Turn the VML750 On. **4** Verify the LTE LED is blinking orange/green and then change to solid green.
	LTE cable (from Main antenna) is not connected.	**1** Connect the LTE cable (See Installing Antenna Cables). **2** Verify that the LTE LED is blinking orange/ green and then changes to solid green. **3** If the above actions do not help, check the connection between the jumper and the thread cable.
	Missing LTE Band.	See *VML750 Configuration Guide* (6802988C55) in https://businessonline.motorolasolutions.com for downloading the license file.

LED Indications

This table describes the functions of the LED indicators on the VML750 LTE Vehicular Subscriber Modem (VSM) front panel.

Table 5 LED Indicators Function

LED Name	Power	LAN	WWAN1	WWAN2	WiFi	GPS
LED Status						
OFF	Power off	No link	Off	Off	Off	Off
Solid Green	Power on	Link is on	Connected	Connected	Available (for AP) Connected (for client)	Tracking
Blinking Green	Powering up	TX/RX Activity	Connecting/ Registering	Connecting/ Registering	TX/RX Activity (for AP) Scanning (for client)	—
Solid Orange	—	—	—	—	—	—
Blinking Orange	No Ignition The user turns on the power (power button pressed) ignition is off	—	Searching for signal	Searching for signal	—	Searching for signal
Solid Red	—	—	Problem/ Over-heat	Problem/ Overheat	Problem/ Overheat	Problem
Blinking Red	Standby External power is connected to the system	—	SIM card is not installed in the modem	SIM card is not installed in the modem	—	—
Rapid Blinking Red	Problem	—	SIM door is open	SIM door is open	—	—

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Chapter 4

VML750 Operation

After installing the VML750 LTE Vehicular Subscriber Modem (VSM) in your vehicle, it must be configured for proper operation. To configure your modem, see*VML750 Configuration Guide PN 6802988C55*. After configuring the modem, it should be turned on automatically upon your vehicle ignition and operate properly.

If you detect any malfunction in the VML750 operation, See VML750 Troubleshooting Causes and Indicators.

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Appendix A

VLM750 Specifications

This section provides physical, port, LED, temperature, power, and RF specifications for the VML750 LTE Vehicular Subscriber Modem (VSM).

VML750 Physical Specifications

Dimensions (Modem)	8.07 in x 7.87 in x 1.71 in (20.5 cm x 20 cm x 4.35 cm +/–1 mm)
Weight (Modem)	6 lb (2.5 kg)

VML750 Communication Ports

LAN	Ethernet 10/100 – RJ45
USB	USB 2.0 high speed – Micro AB

VML750 RF Ports

WWAN1 MAIN1	SMA connector (Female)
WWAN1 Diversity + WiFi	SMA connector (Female)
WWAN2 MAIN2	SMA connector (Female)
WWAN2 Diversity	SMA connector (Female)
GPS	SMA connector (Female)

VML750 Power Port

Power	9-pin D-TYPE

VML750 LEDs

See LED Indications.

VML750 Operating Temperature

Ambient temperature	-30 °C to +60 °C

VML750 Power Specifications

Input Voltage	11 to 33 VDC
Power Consumption:	
Modem Standby	less than or equal to 0.3 A RMS
Modem Transmit	less than or equal to 1 A RMS

VML750 RF Characteristics

Frequency:	
LTE	4G B1 Tx 1920MHz – 1980MHz
	4G B1 Rx 2110MHz – 2170MHz
	4G B2 Tx 1850MHz – 1910MHz
	4G B2 Rx 1930MHz – 1990MHz
	4G B3 Tx 1710MHz – 1785MHz
	4G B3 Rx 1805MHz – 1880MHz
	4G B4 Tx 1710MHz – 1755MHz
	4G B4 Rx 2110MHz – 2155MHz
	4G B5 Tx 824MHz – 849MHz
	4G B5 Rx 869MHz – 894MHz
	4G B7 Tx 2500MHz – 2570MHz
	4G B7 Rx 2620MHz – 2690MHz
	4G B8 Tx 880MHz – 915MHz
	4G B8 Rx 925MHz – 960MHz
	4G BC13 Tx 777MHz –787MHz
	4G BC13 Rx 746MHz –756MHz
	4G BC14 Tx 788MHz –798MHz
	4G BC14 Rx 758MHz –769MHz
	4G B17 Tx 704MHz – 716MHz
	4G B17 Rx 734MHz – 746MHz
	4G B20 Tx 832MHz – 862MHz
	4G B20 Rx 791MHz – 821MHz
	4G B28 Tx 703MHz – 748MHz
	4G B28 Rx 758MHz – 803MHz
WCDMA	3G B1 Tx 1920MHz – 1980MHz
EVDO	3G B1 Rx 21100MHz – 2170MHz
	3G BC0 Tx 824MHz – 849MHz
	3G BC0 Rx 869MHz – 894MHz
	3G BC1 Tx 1850MHz –1910MHz

	3G BC1 Rx 1930 – 1990 MHz 3G BC2 Tx 1850MHz – 1910MHz 3G BC2 Rx 1930MHz – 1990MHz 3G BC4 Tx 1710MHz – 1755MHz 3G BC4 Rx 2110MHz – 2155MHz 3G BC5 Tx 824MHz – 849MHz 3G BC5 Rx 869MHz – 894MHz 3G BC8 Tx 880MHz – 915MHz 3G BC8 Rx 925MHz – 960MHz
WiFi	2401 MHz – 2473MHz

Bandwidth	
LTE	5 MHz 10 MHz 20 MHz
EVDO	1.288 MHz
UMTS	5 MHz
WiFi	20 MHz (802.11b/g/n)
Output transmit power:	
LTE	23 dBm
EVDO	23 dBm
WiFi	15 dBm
Receiver sensitivity:	
LTE	10 MHz -94 dBm, typ -96 dBm 5 MHz -97 dBm, typ -99 dBm
EVDO	-105.5 , typ -109 dBm
UMTS	-110dBm
WiFi (802.11g)	-87 dBm
Frequency Stability:	
LTE	+/-2.5 ppm
EVDO BC0	+/-300 Hz
EVDO BC1	+/-150 Hz
WiFi	+/-20 ppm

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Appendix B

VML750 FRU/FRE List

The VML750 LTE Vehicular Subscriber Modem (VSM) is composed of numerous Field Replaceable Units (FRUs) and Field Replaceable Entities (FREs). If you must replace a FRU, FRE, or part, obtain the precise FRU/FRE Kit Number or part number. Review the replacement procedures provided, including all safety precautions and system impact information. This chapter lists the FRUs and FREs.

For complete information on ordering required parts and kits, please contact your local Motorola service representative. See the "Contact Us" section.

VML750 Replacement Parts List

Table 6 VML750 Replacement Parts List

FRU/FRE Kit/Part Number	Description
Antennas	
See VML750 Approved Antennas and Cables Replacements List	
Bracket, Screws, Washers	
0312002B14	Mounting Screw, Bracket to Car, 4
03013013001	Mounting Screw, VSM to Bracket, 8
0487623U12	Spring Washer, VSM to Bracket, 8
07013065001	Bracket, 2
Cables	
FKN8570A	LAN/Ethernet Cable (177 in/450 cm)
FKN8730A	Micro USB cable
FKN8663A	DC Power Ignition Cable (177 in/450 cm)
SIM card	SIM Card Kit
CRYPTR card	CRYPTR Micro SD card

VML750 Kit Replacement Parts List

FRU/FRE Kit/Part Number	Description
FLN1057A	VML750, VzW LTE VSM Modem
FLN 2057A	VML750, VzW / AT&T LTE VSM Modem
FLN5057A	VML750 R4.0 SKU1 LTE VSM
FLN5058A	VML750 R4.0 SKU2 LTE VSM
FLN5059A	VML750 R4.0 SKU3 LTE VSM

VML750 Approved Antennas and Cables Replacements List

FRU/FRE Kit/Part Number	Kit Description
AN000036A01	VML750 base antenna with a cap
FTN0073A (85013022001)	Wideband Fix-Mounted Vehicular Antenna (12 ft cable)
FTN7686A (85013016001)	LTE Whip Antenna
FTN6070A (85013022001)	Wideband Fix-Mounted Vehicular Antenna (17 ft cable)
CB000133A01	SMA-F to SMA-M 12 ft RG174 cable type
CB000133A02	SMA-F to SMA-M 17 ft RG174 cable type
CB000221A01	NMO Antenna Mount 12 ft
30013096001	NMO Antenna Mount 17 ft
30013072001	SMA-F to SMA-M 12 ft LMR200 cable type
30013093001	SMA-F to SMA-M 17 ft LMR240 cable type

Appendix C

LTE LMR Antennas Mounting Recommendations

This appendix provides procedures for determining the mounting locations for a Public Safety Narrow Band (PSNB) Land Mobile Radio (LMR) 700/800 MHz antenna and Broad Band (BB) LTE 700 MHz Antennas.

The following procedures are given:

- Police patrol vehicle with a PSNB antenna and a standard BB antenna.
- Bus with a PSNB antenna and a low profile BB antenna

Police Patrol Vehicle Antennas Location Considerations Overview

Individually select the Antennas mounting location for every vehicle before starting the actual installation process. The following list gives general recommendations for determining the mounting location of Public Safety Narrow Band (PSNB) and Broad Band (BB) Antennas based on several key considerations:

- Keep a minimum distance of 8 in (20 cm) between the LTE [BB] Antennas; including WiFi to any other antenna and any potential bystander (for bystander safely).
- Follow the guidelines in the installation and safety manuals of the Land Mobile Radios (LMRs) (PSNB) with regards to mounting locations and operation of radio in the presence of bystanders (for bystander safety).
- Keep a minimum separation of 39.4 in (100 cm) between the PSNB and BB LTE Antennas.

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