

# Installation Manual for the FMS3500

Part Number FMS10A



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## **1. SCOPE**

This document describes the mechanical and electrical installation requirements for the FMS3500 unit including the cellular and GPS/900 MHz dual antenna. This document applies to FMS3500 part number FMS10A.

## **2. APPLICATION**

This document is to be used only by a professional truck and automotive electrical device installers for the purpose of installing the FMS3500 system.

## **3.0 ELECTRICAL REQUIREMENTS**

### **3.1 Specification Requirements for the FMS3500**

The FMS3500 was designed to the specifications of SAE J1455, Surface Vehicle Recommended Practice; (R) Joint SAE/TMC Recommended Environmental Practices for Electronic Equipment Design (Heavy-Duty Trucks)

### **3.2. Voltage and Current Requirements for the FMS3500**

The FMS unit is designed to operate from nominal +12 or +24 volt DC automotive power systems. It will operate normally across a range of 9 to 32 volts. Typical current input is 0.1 amps, with a maximum current of 2 amps when maximum input voltage and current loads are applied.

The FMS unit contains an automatically re-settable fuse device for self protection. The FMS unit is protected against damage from reverse polarity connections. Reverse polarity should not be applied for more than five minutes to prevent component damage.

The fuse is heat activated by over-current caused by reverse polarity or a failed internal component. The fuse can be reset by disconnecting the input power for several minutes to allow it to cool off. If upon re-connection of the power the Green LED does not come on then the FMS unit should be returned for repair.

The FMS unit should be connected to a fused circuit from the vehicle master fuse panel in addition to the FMS unit internal fuse. This will prevent melted wires or fire in case of a pinched wire which occurs before the FMS unit input connector.

Power transient protection and over-voltage protection is also provided by the FMS power supply. The FMS unit will survive being connected to continuous 150 volts, and will survive power spikes up to 630 volts.

### **3.3. Installation Wiring for the FMS3500**

Use a minimum of 20 AWG wire to connect the FMS Mobile unit to +12/24 volt DC vehicle power systems. Do not exceed a wire length of more than 25 feet. Use good installation practices which protect the wire from sharp metal edges or anything that could abrade or cut through the wire insulation and cause a short.

### **3.4. LED INDICATOR**

There are two LED indicators on the FMS front panel:

Green LED;

- Normally on when power is applied. Indicates that the power supply is providing regulated +5 Volts to the internal circuitry.
- Blinks quickly when serial data is being sent to the 900 MHz transmitter or RJ-45 serial port. This should occur at the end of a trip upon return to the home location or when using the FMS debug port with a computer.

Failure Diagnoses:

- Green LED stays off; No +5 volt regulated power. Verify there is +12/24 volt input to the FMS unit, check input power connector for good connection. Remove and re-install I/O connector to reset unit. If there is proper unit operation via the FMS debug port (RJ-45 connector), then the LED may be failed.

Red LED;

- Normally off when power is applied.
- Blinks quickly when serial data and control messages are being sent to the cellular transmitter. This should occur when initializing the microburst cellular radio and when microburst transmission are taking place.

## **4. MECHANICAL REQUIREMENTS**

### **4.1. Mounting Requirements for the FMS3500**

The FMS3500 is not environmentally sealed. The installer must select a suitable location protected from excessive dust and liquids, such as drink spills, rain, road spray, or washing equipment. Keep in mind constraints on lengths for power and antenna cabling.

The FMS3500 enclosure has a front and rear panel with two mounting holes each. The unit should be mounted securely using star washers or captive nuts to ensure against it vibrating loose. Axiom recommends rechecking the mounting screws or bolts as part of an annual periodic maintenance schedule.

The FMS unit is certified to meet SAE J1455 standards for shock and vibration of electronic equipment for truck cab mounting locations.

## 4.2. Antenna Mounting Requirements

Three antennas are required for FMS3500 operation; GPS, 800 MHz cellular band and 900 MHz.

### 4.2.1. GPS/900 MHz Dual Antenna Mounting Requirements

The dual antenna (GPS/900 MHz) is environmentally sealed. Dust or water, such as rain, road spray, or washing equipment does not effect it.

#### **NOTE**

Snow or ice accumulation can significantly attenuate GPS signal strength at the antenna. Bear this in mind when choosing the antenna site.

The dual antenna requires a 9-inch diameter minimum metal ground plane for best performance. This is easily achieved by mounting it on a metal vehicle roof or trunk lid. If a metal plane is not used the antenna will still work but the range performance can be greatly reduced. The antenna should not be mounted inside the vehicle as this will greatly reduce both the GPS and 900 MHz signal strength and may result in unreliable operation.

The dual antenna comes with 5 meters of RG174 type cable for both the GPS and 900 MHz antennas terminated with SMA type connectors. Care must be taken to match the GPS and Cell radio cables to the identified connectors on the FMS front panel.

### 4.2.2. 800 MHz cellular Antenna Mounting Requirements

Only the following antennas are approved for use with the FMS3500 system:

- Maxrad, PN BMMG8350 , magnetic mount; 1/4 wave, Unity gain
- Maxrad, PN 8353, magnetic mount; 1/2 wave, 3 dB gain
- Antenna Specialists, PN APD827.1M; on-glass, 1/4 wave Unity gain (2 dBi)
- Allis, PN GPS-GC, dual GPS/cellular; 1/4 wave 3 dBi, or 0 dBd (dipole)

1/4 wave antennas require a metal ground plane for best performance. This is easily achieved by mounting it on a metal vehicle roof or trunk lid. If a metal plane is not used the antenna will still work but the range performance can be greatly reduced. 1/2 wave antennas do not require a metal ground plane to achieve maximum gain. The cellular antenna should not be mounted inside the vehicle as this will greatly reduce both the signal strength and may result in unreliable operation.

## 5. FCC Certification, Instructions to the User

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC relations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without approval of manufacturer could void the user's authority to operate this equipment.

### **IMPORTANT!**

**In order to comply with the FCC RF exposure requirements, the antenna(s) provided with this unit must be used. Do not use a different antenna(s) or cable. Doing so may result in the installed system exceeding the RF exposure requirements. Further, the antenna must be installed such that a minimum distance of 20 cm away from all nearby persons is maintained.**