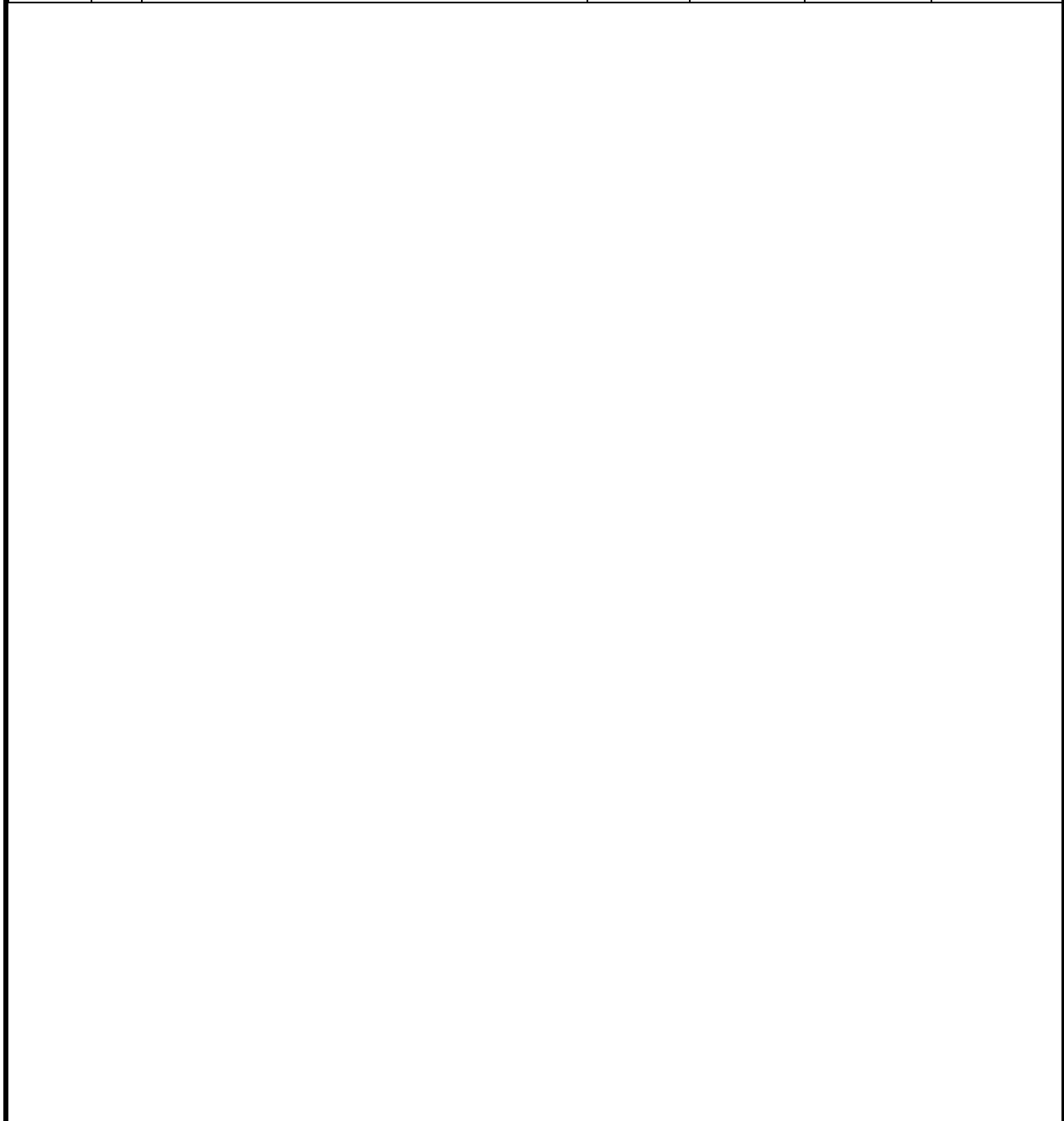



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NAME: <p style="text-align: center;">FP310RAM-X User Manual</p>	DESIGNED	M.N.	March 2009	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-bottom: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="margin-right: 5px;">/</div> <div style="border-bottom: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div> <p style="margin-top: 5px; text-align: center;">21</p>
	CHECKED	G.F.K	March 2009	
	APPROVED	A.S.	March 2009	
	Q.A.	A.S.	March 2009	

PROD/PROJ: FP310RAM-X ASTM Mini Reader	2	1	4	0	7	2	0	4	6	0	0	0	0	SIZE A
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Note:

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.

<p>WARNING! Changes or modifications to this unit not expressly approved by Telematics Wireless Ltd. could void the user's authority to operate the equipment.</p>

The digital portion of the transceiver 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 the following measure:

-Increase the separation between the equipment and receiver.

The antenna and therefore the unit, used for this transmitter must be installed to normally provide minimum separation distance of at least 2 meters from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.



FP310RAM-X Mini Reader User Manual

Version 1.1

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March 2010

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Chapter 1

INTRODUCTION

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Chapter 1

Introduction

1-1. Scope

This manual covers the characteristics, applications, installation, configuration and maintenance of the FP310RAM-X mini reader, an advanced and flexible roadside component offered by Telematics Wireless for use in electronic Automatic Vehicle Identification (AVI) systems.

The information included in this manual is organized as follows:

Chapter 1 – Introduction	Presents the manual scope and organization, and describes the FP310RAM-X mini reader functions and capabilities.
Chapter 2 – Installation	Provides the information needed to plan the FP310RAM-X installation, and detailed installation instructions.
Chapter 3 – Operation	Provides information on the FP310RAM-X operating modes.
Appendix A – Connection Data	Presents the information needed to connect to the FP310RAM-X.

For additional information on the FP310RAM-X technical specifications, its systems integration, help in interfacing to the FP310RAM-X, and other issues regarding utilization of FP310RAM-X advanced characteristics, contact Telematics Wireless.

1-2. General Description

1-2.1 Purpose and Use

The FP310RAM-X mini reader offered by Telematics Wireless is a versatile, compact and reliable unit that serves as the reader component of a vehicle identification system. Figure 1-1 shows a general view of the FP310RAM-X.



Figure 1-1. FP310RAM-X, General View

The Telematics Wireless Mini Reader FP310RAM-X is a reduced version of Telematics Wireless FP300RA road side reader. The mini reader is a versatile, compact, and reliable unit that serves as an integral part of a vehicle identification system and may be used to read and write data to and from TDMA tags and to activate the tag's driver alert signal. The FP310RAM-X mini reader can be used for traffic load monitoring, gate pass applications, tag testing at point of sale and service and more.

The FP310RAM-X may be operated from DC sources in the range of 9 to 30 VDC. It has low power drain (less than 0.3 W) and very compact size.

1-2.2 Main Technical Characteristics

The FP310RAM-X supports two-way communications with in-vehicle transponders (“tags”) using the ASTM V6 Slotted-Aloha Time Division Multiple Access (TDMA) protocol. The physical layer is compatible with ASTM PS111-98.

The FP310RAM-X communicates with transponders that enter its communication zone at speeds of up to 125 mph (200 kph). The communication uses fixed transmit and receive frequency within the ISM band is used (915 MHz); the data rate is 500 kbps, with ASK modulation. The FP310RAM-X can use many types of antennas, to match the spatial resolution needed in the desired operation mode.

1-2.3 Host Utility

Telematics Wireless offers a dedicated reader host utility for the FP310RAM-X that can be installed on any PC running Microsoft® Corp. Windows 2000 or XP. The FP310RAM-X connects to one of the free serial communication ports of the PC using a straight modem cable (9 pin to 9 pin). The host utility provides full control over FP310RAM-X.

1-2.4 Additional Equipment Needed

The only additional accessories that have to be provided are:

- Antennas of a type suitable for the specific installation requirements, and the required coaxial cables for connecting to the antennas.

- DC source capable of providing the required supply voltage (9 to 30 VDC) at maximum 0.3 W.
- Means for communicating with the host (serial asynchronous communication link).

1-2.5 FP310RAM-X vs. FP300RA

Telematics Wireless FP300RA road side reader became the dominant roadside equipment in the ASTM CVO market place. The following table summarizes the major differences between the FP300RA and the FP310RAM-X.

	Function	FP-300RA	FP310RAM-X
RF	Support lanes	Up to 4	1
	Tx power output	Software controlled	Fixed
	Rx sensitivity	Software controlled	Fixed
Protocol	Report tag found	Yes	Yes
	Report tag lost	Yes	Yes
	Read/Write to tag	Multiple tags simultaneously	Multiple tags simultaneously
	Agency programming	Yes	No
Lists	Active list	128	20
	Hot lists	20	None
	Tags in hot lists	40,000	None
	Auto function	Multi level	None
	Interfaces	3 UARTs (Host, Maintenance and Aux)	1 UART (Host only)
	Digital I/O	7 outputs / 8 inputs	2 output / 2 inputs
	Input sense	On all inputs	No
	Real time clock	Yes	No

1-3. Physical Description

Figure 1-2 and Figure 1-3 show the components located on the FP310RAM-X (see Figure 1-1 for orientation). The functions of the various components are described in Table 1-1.



Figure 1-2. FP310RAM-X, Host Side Panel



Figure 1-3. FP310RAM-X, Antenna Side Panel

Table 1-1. FP310RAM-X Connectors, Indicators and Controls

Side	Item	Function
Host	DC IN Connector	3-pin connector used to connect the DC input voltage.
	RESET Push-button	Internal push-button used to initiate cold restart of the FP310RAM-X.
	IND Indicator	Status indicator, provides the following indications: <ul style="list-style-type: none"> Flashing green: normal operation, no tags detected Flashing orange: normal operation, tags detected Flashing red: mute mode (transmission disabled) Blinking red: Test mode
	HOST Connector	9-pin D-type female connector includes a serial asynchronous RS-232 DCE interface used for connection to the host computer.
Antenna	ANT Connector	SMA connector for connection to the main antenna.
I/O	I/O connector	CPA connector

1-4. Functional Description

The FP310RAM-X has three operating modes, Normal mode, Mute mode and Maintenance mode.

1-4.1 Normal Mode

The functions performed by the FP310RAM-X during operation in the normal mode are as follows:

- Report the transponders that are passing through its communication zone
- Maintain a list of the transponders that are currently detected within the reader's communication zone (active list)
- Perform various functions on transponders in response to host requests:
 - Read/write transponder internal or external memory
 - Operate transponder driver interface
 - Send transponder to sleep mode

1-4.2 Mute Mode

In mute mode the reader will not transmit any RF signal.

1-4.3 Maintenance Mode

In maintenance mode the reader can be command to activate various RF test function and to upgrade the reader's software.

1-4.4 Host Communication

The FP310RAM-X supports communication with a host. Two types of messages are used:

- FP310RAM-X initiated message used to report events, e.g., a new transponder
- Messages sent in response to host requests.

Chapter 2

INSTALLATION

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Chapter 2

Installation

2-1. General

This Chapter provides the information needed to install FP310RAM-X mini readers.

The information presented in this Chapter is organized as follows:

- Installation requirements – Section 2-2.
- Installation guidelines – Section 2-3.
- Installation procedures – Section 2-4.

Before starting the installation procedures, make sure to review the **Safety Information** section at the beginning of this chapter.

2-2. Installation Requirements

2-2.1 Integration in Systems

Figure 2-1 shows the connections needed to integrate an FP310RAM-X unit in a typical electronic vehicle identification system. Use the information appearing in Chapter 1 and Appendix A that covers the FP310RAM-X interface characteristics and connection data, to prepare cables in accordance with the specific requirements of each location.

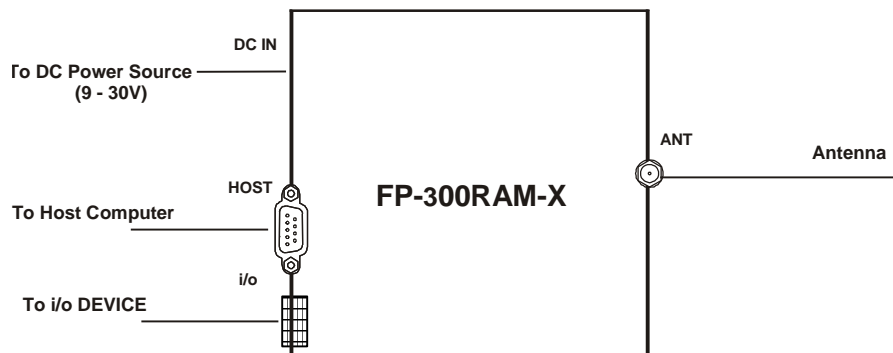


Figure 2-1. FP-310RA Connections

2-2.2 Safety Considerations

In addition to the electrical connections shown in Figure 2-1, the FP310RAM-X case must be connected to protective grounding. Protective devices, complying with the applicable international standards and the national and local regulations, must be used on all the lines connected to the FP310RAM-X, to protect against lightning discharges and accidental contact with high-voltage lines.

2-2.3 Mechanical Data

Figure 2-2 provides mechanical data for planning the installation of an FP310RAM-X unit.

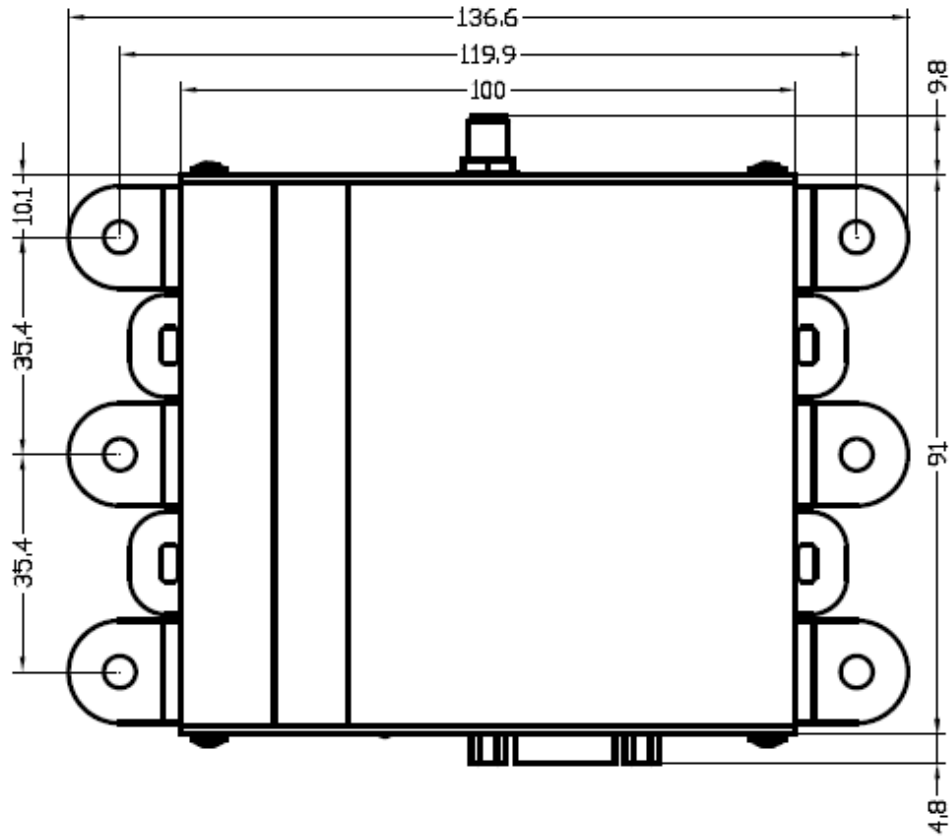


Figure 2-2. FP310RAM-X Mechanical Data

2-3. Installation Guidelines

The FP310RAM-X is intended for installation in protected cabinets that prevent direct exposure to sun radiation, rain, dust and dirt. It does not require forced air cooling.

The unit does not have any surge protection units inside.

2-3.1 Power Requirements

The FP310RAM-X operates on 9 to 30 VDC (nominal operation at 12Vdc), at an average power drain of 0.1W with instantaneous peak power of 0.3W. A suitable power source must be provided as part of the installation.

The FP310RAM-X does not have an ON/OFF power switch, and will start operating as soon as power is connected. Therefore, it is recommended to install a circuit breaker, which will also serve as an ON/OFF switch, to protect the supply line of each FP310RAM-X.

2-3.2 Antenna

The type of antenna to be used with the FP310RAM-X is generally determined by the FP310RAM-X application and communication zone requirements. The positioning of the antenna must be carefully set to achieve the required communication zone pattern. Contact Telematics Wireless if you need help in

selecting suitable antennas.

Note *The antenna (ANT) connector of the FP310RAM-X must always be connected to an antenna or terminated in a matched (50Ω) load.*

2-3.2.1 FP310RAM-X-to-Antenna Cabling

The maximum distance between the FP310RAM-X and its antenna is limited by cable signal loss. Generally, the total signal loss between the antenna and the FP310RAM-X must be less than 3 dB. Any losses on antenna patch panels must also be taken into consideration.

Cable routes should be carefully planned, to ensure they follow the shortest path yet are far from sources of strong electrical interference such as electrical motors, air conditioning equipment, two-way radios, etc. Make sure that cables are physically protected, for example, by routing them within cable ducts: sharp bends, distortion of the cable outer shield, etc., may increase the attenuation by an unpredictable amount.

2-3.3 Communication Cables

The cables connecting the FP310RAM-X host port must be shielded. Communication-grade cables consisting of twisted pairs with external shield should be used, and the shield must be grounded at one end. Cables should be run through grounded conduits, to minimize external interference.

2-3.4 Grounding and Lightning Protection Requirements

All the FP310RAM-Xs, antenna, mounting pole, cabinet, cable conduits and cables must be properly grounded in accordance with the applicable regulations, to prevent injury to personnel or damage to equipment from lightning or other high voltage sources.

Ground bonding points must be free of paint and corrosion. Star washers should be placed on screws to ensure good electrical contact.

For installations where a complete bonded ground connection is not possible for the entire antenna-to-FP310RAM-X cabling, a separate lightning arrester must be installed at a point near the RF connection to the FP310RAM-X cabinet.

2-4. Installation Procedure

2-4.1 Tools and Materials

Huber + Suhner 74Z-0-0-21 - SMA wrench with fixed torque.

Torque screwdriver to close the screws used to mount the FP310RAM-X unit to the cabinet.

2-4.2 Preparation for Installation

Refer to the site installation plan, and make sure all the required components, cables, and accessories are available.

Identify the prescribed physical location of each system component, and find the grounding points.

Before installing any item (FP310RAM-X, cabinet, mounting accessory, antenna, cable conduit, etc.), thoroughly clean the surface on which it will be mounted.

2-4.3 FP310RAM-X Installation Procedure

2-4.3.1 Physical Installation

Use the following general procedure to install the FP310RAM-X in the prescribed location:

1. Identify the exact location and position of the FP310RAM-X.
2. Mark the 6 holes to be drilled in accordance with the information appearing in Figure 2-2, and then drill using an appropriate drill tip for #8x32 screw.
3. Thoroughly clean the surface on which the FP310RAM-X will be mounted.
4. Insert a star washer and a flat washer on each of the 4 or 6 fastening bolts. Prepare additional flat washers and star washers for insertion under the nuts (if 4 are used, then place them on each of the corners).
5. Place the FP310RAM-X on the mounting position, and fasten it with 4 or 6 bolts and nuts using a torque screwdriver set to 0.35 – 0.53 lb/inch.

2-4.3.2 Cable Connections

Caution

The FP310RAM-X does not have an ON/OFF power switch, and will start operating as soon as power is connected. Make sure that no power is supplied until authorization to start operations is received.

1. Identify the cables to be connected to the FP310RAM-X in accordance with the site installation plan.
2. Visually inspect the connectors for any signs of damage: do not attempt to connect if shell or pins are bent. Thoroughly clean using a soft, clean brush to remove dirt and foreign matter.
3. Route each cable to the prescribed connector and mate the connectors. For each D-type connector, secure the connection by tightening the two screws; use SMA wrench with torque (see 2-4.1) to tighten RF connectors. Do not exert excessive force.
4. Four cable tying points are provided around the FP310RAM-X: use cable ties to secure the cables. To prevent stress caused by bending, make sure to leave enough slack.

2-4.3.3 Final Inspection

1. Visually inspect the installation for proper execution, good workmanship and compliance with the applicable practices and regulations.
2. Check cable connections, and check their routes. Make sure that cables are securely routed and fastened.
3. Inspect the installation of the other system components in accordance with the applicable instructions.
4. Correct any problems detected during the inspection.
5. After the inspection is successfully completed, refer to Chapter 3 to continue with the preliminary configuration.



Warning

Do not apply power to the FP310RAM-X before explicit authorization is received from the person in charge. The FP310RAM-X may start transmitting as soon as power is applied, resulting in possible exposure of personnel working near the antenna to microwave radiation.

The FP310RAM-X must not be allowed to transmit without being connected to an antenna, or to other matched (50Ω) load.

Chapter 3

OPERATION

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Error!	Bookmark not defined.

Chapter 3

Operation

3-1. Scope

This Chapter provides the information needed to prepare a new FP310RAM-X for operation in your system, using the FP310RAM-X host utility provided by Telematics Wireless.

3-2. Power-Up

Before performing the other activities described in this Chapter, power up the FP-310RA and connect it to the PC running the host utility.



Warning

Do not apply power to the FP310RAM-X before explicit authorization is received from the person in charge. The FP310RAM-X may start transmitting as soon as power is applied, resulting in possible exposure of personnel working near the antennas to microwave radiation.

The FP310RAM-X must not be allowed to transmit without being connected to antenna, or to a suitable (50Ω) load.

➤ To apply power to the FP310RAM-X:

1. Check that power may be applied to the FP310RAM-X.
2. Apply power and monitor the FP310RAM-X IND indicator: it should start flashing in green.

-
- Notes**
- *Orange flashing indicates that transponders have been detected within the communication zone of the FP310RAM-X. This is possible only when the FP310RAM-X is connected to antennas.*
 - *Red flashing indicates that transmission has been disabled (muted) or the reader in test mode. This is a normal indication. However, steady red means that a malfunction has been detected: press the RESET push-button of the FP310RAM-X and check that the problem disappears after the FP310RAM-X restarts. If the indicator lights steadily in red, service is required.*
-

➤ To connect the FP310RAM-X to the host PC:

1. Identify the serial COM port of the PC that is configured for communication with the FP310RAM-X.
2. Connect a straight DB9 to DB9 modem cable between the host PC COM port and the host connector of the FP310RAM-X.
3. Start the host utility.
4. After the PC establishes communication with the FP310RAM-X, the monitoring window of the host utility should show the information retrieved from the FP310RAM-X.

Appendix A

CONNECTION DATA

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Appendix A

Connection Data

A-1. Antenna Connector

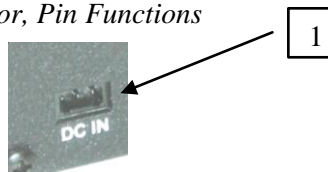
The FP310RAM-X has one SMA female antenna connector.

A-2. Power Input Connector

The FP310RAM-X has one 3-pin connector, designated DC IN, and used to connect the DC input voltage. Table A-1 lists the pin functions.

Table A-1. DC IN Connector, Pin Functions

Pin	Function
1	Input voltage
2	Ground
3	N.C.



A-3. Host Interface Connector

The host interface connector is 9-pin D-type female connector. The connector includes a serial asynchronous DCE interface used for connection to the host computer RS-232 interface @38400 baud.

Table A-2. HOST Connector, Pin Functions for RS-232 Interface

Pin	Designation	Function	Pin	Designation	Function
1	N.C.		6	N.C.	
2	TxD	Transmit data output (going out from the reader) →	7	N.C.	
3	RxD	Receive data input (coming in to the reader) ←	8	N.C.	
4	N.C.		9	N.C.	
5	GND	Signal ground			

A-4. I/O Connector

The I/O connector is 9-pin D-type female connector.

Table A-3. I/O Connector

Pin	Function	Pin	Function
1	GND	5	GND
2	Output 1	6	Input 1
3	GND	7	GND
4	Output 2	8	Input 2

