ORBCOMM®

CONNECTING THE WORLD'S ASSETS

PT 7000

Hardware Guide

PT113, Version 01
Oct 2020

LEGAL NOTICE

This documentation is owned by ORBCOMM® and protected by applicable copyright laws and international treaty provisions. Other copyrighted names used are the property of their respective owners. Therefore, you must treat this documentation like any other copyrighted material. This publication, or any part thereof, may not be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, storage in an information retrieval system, or otherwise, without prior written permission by ORBCOMM, Inc. 395 W Passaic Street, Suite 325, Rochelle Park, NJ 07662 USA Phone 703-433-6325. The information in this document is for information purposes only and contains technical information and descriptions of the ORBCOMM product(s) and is subject to change without notice. No warranty or representation, express or implied, is made with respect to its contents.

TRADEMARK NOTICE

The ORBCOMM name and the ORBCOMM logo are registered trademarks of ORBCOMM.

The FleetEdge name is a trademark of ORBCOMM.

The Bluetooth® wordmark and logos are registered trademarks owned by the Bluetooth SIG, Inc.

Other trademarks, trade names, and logos are those of their respective owners.

EXPORT CONTROL STATEMENT

The contents of this document, in whole or in part, shall not be exported from the United States, which export shall include, but not be limited to, transmittal to any non-U.S. citizen wherever said person is located, except in accordance with all United States laws and regulations relating to exports and to all administrative acts of the U.S. Government pursuant to such laws and regulations. Diversion, re-export or transshipment of the contents of this document, in whole or in part, contrary to U.S. law is also strictly prohibited.

CONTACT INFORMATION

Visit ORBCOMM Online

www.ORBCOMM.com

Contact Customer Care

customer.care@orbcomm.com

(North America) 1.800.ORBCOMM (1-800-672-2666)

Headquarters

395 W Passaic Street, Suite 325

Rochelle Park, NJ 07662 USA

Tel: +1-703-433-6300

Fax: 1-703-433-6400

Email: sales@orbcomm.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PREFACE

Purpose

This document is an overview of the hardware characteristics and specifications for the PT 7000 cellular terminal.

Notation

Hardware components and hardware labels in this document might not be exactly as shown and are subject to change without notice.

CAUTION: This safety symbol warns of possible hazards to personnel, equipment, or both. It includes hazards that will or can cause personal injury, property damage, or death if the hazard is not avoided.

Note: A note indicates information with no potential hazard. A note indicates points of interest or provides supplementary information about a feature or task.

Numbered lists indicate a series of steps required to complete a task or function.

Bulleted lists highlight information where order or sequence is not crucial.

Battery Safety Warnings

CAUTION: Do not short circuit or expose the battery to temperatures above the maximum rated temperature.

CAUTION: Always follow local disposal guidelines to properly dispose of the Lithium-ion battery and the device.

CAUTION: Store in a cool, well ventilated area. Elevated temperatures can result in shortened battery life.

CAUTION: DO NOT replace the battery. Changing the battery without ORBCOMM's permission could violate regulatory conformity.

CAUTION: DO NOT throw the internal battery or the device into fire.

Environmental Protection

Waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.

1 PRODUCT OVERVIEW

The ORBCOMM PT 7000 is a ruggedized, single or dual-mode mobile terminal providing accurate and timely equipment status and position information along with key operational metrics so OEMs, dealers, and end users can proactively manage their construction fleet in the most remote areas of the world.

The PT 7000 is part of a comprehensive telematics solution that includes sensors, connectivity, and the powerful FleetEdge web application, which provides construction equipment tracking and position data, geofence status, operational status as well as analytic, predictive, and diagnostic tools for every asset in the fleet

Figure 1: PT 7000

The following PT 7000 configurations are available:

- Satellite terminal with OG2 modem
- Satellite terminal with OGi modem
- Satellite-cellular terminal with OGi modem and GSM
- Satellite-cellular terminal with OG2 modem and GSM
- Cellular terminal with GSM

1.1 Features and Benefits

The PT 7000 offers the following features and benefits:

- Single or dual-mode module to communicate with the network
- Remote firmware updates over-the-air via cellular or locally via diagnostic port
- Remote terminal configuration updates via cellular / satellite
- Local terminal configuration wirelessly through smart device
- Rugged construction
- Wide operational temperature range
- Bluetooth Low Energy capability
- Various serial interfaces
    - 1 x CAN bus with the option for a second CAN bus
    - 1 x RS-232 with the option for a second RS-232 bus

- RS-232 port for diagnostic testing
- Various digital and analog input / outputs capable of monitoring external sensors and devices
- Four analog inputs
- Four digital inputs
- Two digital pull-up outputs
- Two digital pull-down outputs
- Status LEDs
- Li-Ion Polymer internal rechargeable backup battery
- Connector and cable harness to interface with a wide range of accessories
- Waterproof when the connector and harness are attached
- Strain relief for the antenna cables
- Magnet switch
- Factory installed SIM card, if required, based on your specific service provider

Figure 2: PT 7000 with Connector

All PT 7000 terminals offer the following key features and benefits:

Accelerometer

The accelerometer is a three-axis micro-electro-mechanical system (MEMS) within the terminal enclosure. It senses motion, shock, and vibration along the X, Y, and Z axes.

Magnet Sensor

The magnet-switch inside the terminal allows you to physically wake the terminal. On wake from sleep, the terminal immediately enables the LEDs for 60 seconds. The magnet sensor can also be used to queue a position message to aid in installation verification and troubleshooting.

Geofence

A geofence is an imaginary perimeter for a real-world geographic area.

Some geofences are considered simple in that they are defined by two opposite corners, or points, creating a kind of rectangle shaped geofence. Other geofences have multiple points defining a polygonal geofence. The terminal supports 20 simple geofences, and 10 polygonal geofences defined by up to 20 points each.

Motion

Motion determines the state of the asset and is either *Stationary* or *Moving*. A change from stationary to moving is called a *motion start event*. A change in state from moving to stationary is called a *motion stop event*.

GPS position information is used to determine motion state. A change in position of more than a configurable distance (default 1 mile) triggers a motion start event. The same position observed for a configurable time (default 1 hour) triggers a motion stop event. Motion can be configured to report the following: start events, stop event, both starts and stops, neither.

A repositioned report can be enabled to report a change in the last reported position while in the stationary state. Reposition reports can be remotely enabled or disabled.

The accelerometer is used to wake the terminal while in the napping state (refer to section 4) and stationary. This allows more frequent checking of the current position when vibrations are detected to improve latency on detecting changes to the motion state and changes to geofence states.

Schedules

The PT 7000 supports 10 different configurable schedules used to queue messages or activate the radios and listen for modem terminated messages based on time.

Refer to section 3 for more details.

1.2 External Antennas

The PT 7000 supports the following external antenna options based on the type of modem:

- OGi Standard Satellite Antenna
- OG Satellite Antenna
- GPS/Cellular LTE Antenna
- OG2 Tri-Mode Antenna

1.2.1 Satellite Antenna

The IDP (OGi) satellite antenna is waterproof and designed to operate in extreme environments. It has four mounting flanges for installation.

The satellite antenna connects to the terminal using a cable terminated with a carmine red colored FAKRA RF connector. The cable is ordered separately.

Figure 3: IDP Standard Satellite Antenna

1.2.2 External OG Satellite Antenna

The OG external satellite antenna is available as a side or bottom mount configuration. The 1 m (3.3 ft.) antenna cable connects the antenna to the terminal.

The satellite antenna connects to the terminal using a cable terminated with a curry yellow colored FAKRA RF connector. The cable is ordered separately.

Figure 4: External OG Satellite Antenna

1.2.3 External GPS/Cellular LTE Antenna

The external GPS/Cellular LTE low profile, adhesive mount, antenna is ideal for use in restricted spaces. The antenna is ideal for installation on conductive and non-conductive surfaces. The antenna has both a blue and a violet FAKRA connector.

Figure 5: External GPS/Cellular LTE Antenna

1.2.4 OG2 Tri-Mode Antenna

The external OG2 Tri-Mode antenna is a combination ORBCOMM satellite, cellular, and GPS antenna. The antenna is screw mount and works with the rod (order separately) shown below.

Figure 6: External OG2 Tri-Mode Antenna and Rod

2 COMMUNICATION NETWORKS

2.1 Cellular

ORBCOMM is a single source of different cellular providers to meet your unique M2M data requirements.

With a comprehensive suite of M2M cellular network coverage options, ORBCOMM has the right solution at the right price to meet your remote monitoring needs with complete coverage around the globe.

2.2 Satellite

The PT 7000 operates on one of the following networks:

- ORBCOMM OG2 Services

  ORBCOMM OG2 is the world's first and only commercial satellite network 100% dedicated to M2M. The ORBCOMM network uses low-Earth orbit (LEO) satellites to provide reliable and cost-effective M2M communications to and from in the most remote areas of the world.

- IsatData Pro
  IsatData Pro is the fastest low-data rate satellite communications service specifically designed to connect people with equipment and enterprise applications—anytime, in the world's most remote locations. Using the two-way satellite network, IsatData Pro operates over geosynchronous satellites, with a robust infrastructure of ground stations located around the globe.

3 SCHEDULES

The PT 7000 supports 10 different configurable schedules used to queue messages or activate the radios and listen for return messages based on time. Each schedule can be enabled or disabled based on any binary state or input such as motion, geofence, or digital input 1. Any time interval, in minutes, can be configured for a schedule.

Reporting Schedules

Reporting Schedules can be configured for any type of report.

A position report (Short Status), for example, contains: Latitude, Longitude, Position Time, PDOP, Velocity, Heading, and the state of Binary Inputs. This is the only redefined PT 7000 report. The contents of all other reports are fully configurable.

Listening Schedules

Listening Schedules are schedules during which the PT 7000 listens to messages coming from the back end.

Default Schedules

The terminal generates default reporting and default listening schedules at first boot.

The scheduled time is based on the terminal's unique serial number so that messaging activity is spread throughout the day across all terminals. The formula is known to the back-office, so it knows when a terminal is expected to be awake and listening for message traffic.

The following are some examples of what is available within the various schedules:

- Interval Position
- Motion Start/Stop
- Condition-based
    - Fault codes
    - Engine/idle hours
    - Fuel consumption
    - Battery voltage
    - Antenna connect/disconnect
    - Geofence
- Pre-defined Event Triggers

4 POWER MANAGEMENT STATES

The PT 7000 has a number of power management states as shown below.

Figure 7: Power Management States

4.1 Externally Powered

In this state the terminal is externally powered and there is no need to conserve energy. The cellular modem remains on and listens for modem terminated traffic. The satellite modem is on when the terminal does not have cellular coverage. The GPS remains on and constantly updates position.

4.2 Unpowered Normal

Unpowered normal is a time configurable state. In this state the modem remains on the same as when externally powered. The GPS also remains on. This state allows the terminal to be very responsive after it has had external power removed. This is typically used on assets such as construction equipment, which may be turned off when loaded onto a truck to allow quicker detection of geofence breaks when the terminal is removed.

If the state timeout occurs, the terminal transitions to the reduced normal state. If external power is restored the terminal transitions to the externally powered state.

4.3 Reduced Normal

Reduced normal is a time configurable state in which the modems are turned off and the GPS receiver remains on. This state supports the quick detection of geofence breaks after an asset has been turned off.

If the state timeout occurs the terminal transitions to the conserve state. If external power is restored the terminal transitions to the externally powered state.

4.4 Conserve

In this state the modems are only turned on at scheduled listening times or when the terminal needs to send modem originated messages. The GPS receiver is only turned on when it is time to check for position or to collect data for newly queued messages. When the terminal has no activity for some time it transitions to the napping state to reduce power consumption until the next scheduled activity. The terminal may be awakened by external sensors using the wake line or by external power being applied.

The terminal transitions to the Externally Powered state if external power is restored.

4.5 Prepare to Hibernate

At the entry to this state the terminal enters the hibernate state. This could be due to a low battery condition or a configurable timeout in which the asset has been dormant for an extended period of time. The terminal queues a message to inform the back office that it is going off-line and will not message again until external power is restored. The terminal attempts to deliver this message for a configurable period of time. Between message delivery attempts the terminal enters the sleeping state until the next delivery attempt. When either the message has been delivered, or the timeout has expired, the terminal transitions to the hibernating state. The terminal transitions to the Externally Powered state if external power is restored. Before returning to the externally powered state, the terminal queues a message to inform the back office that it is back online.

4.6 Hibernating

During the hibernating state the terminal does not send any messages, listen for messages, maintain position, or monitor any sensors. If external power is reapplied the terminal returns to the externally powered state.

Before returning to the externally powered state the terminal queues a message to inform the back office that it is back online. (Note: the message is still queued even if the going to hibernate message was not delivered when queued, it eventually provides an indication of what the terminal was doing and why it did not message.)

5 SPECIFICATIONS

5.1 Temperature

5.1.1 Terminal

Parameter	Value
Operating Temperature Range	-30°C to +60°C (-22°F to +140°F)
limited features with external power	-40°C to +75°C (-40°F to +167°F)
Storage Temperature Range	-40°C to +60°C (-40°F to +140°F)

5.1.2 Battery

Parameter	Value
Operating Temperature Range	-30°C to +60°C (86°F to +140°F)
Charging Temperature Range	0°C to +40°C (32°F to +104°F)

5.2 Electrical

5.2.1 Input Range

Parameter	Value
Power Supply Voltage	9 to 32 V DC

5.2.2 Power Consumption

Typical values for an external supply of 12V.

Mode of Operation	OGi Current	OG2 Current
External Power Idle	106 mA	170 mA
Sleep	665 µA	665 µA
GPS fix[1]	35 mA (29s cold start, 28s warm start)	35 mA (29s cold start, 28s warm start)
Cellular report[2]	197 mA	197 mA
Satellite report (Tx)	1.0 A	2.4 A

5.2.3 Load Dump Protection

Parameter	Voltage
Load Dump Protection	200 V

---

[1]GPS fix power is included in all operation modes except for sleep.

[2]Some features (GSM communications) may not work across the entire temperature range. The PT 7000 has a reduced operating range when working on internal power only.

5.2.4 Reverse Voltage Input

Parameter	Voltage
Reverse Voltage	-40 V

5.2.5 Magnet-Switch

The PT 7000 has a magnet-switch inside the terminal.

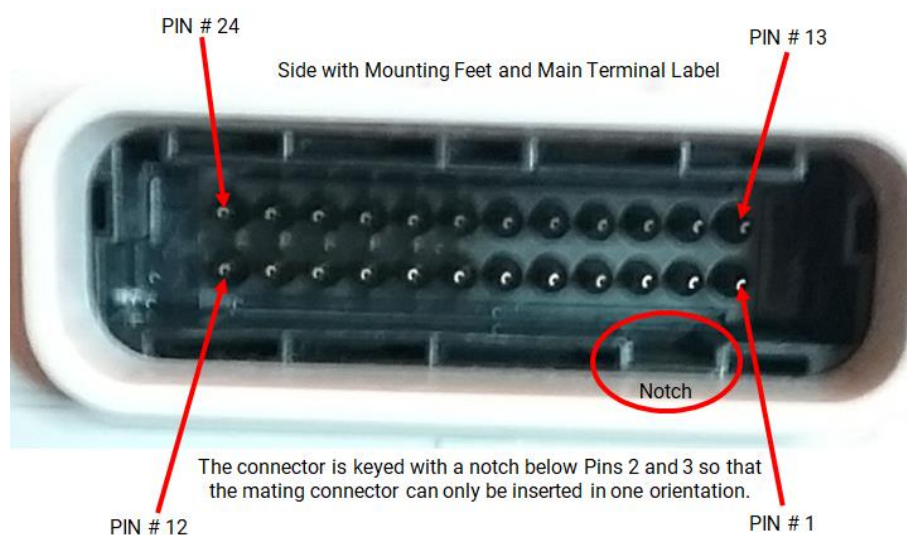| PT 7000 State	Result when using the magnet-switch
Sleeping	Wakes the PT 7000
Pre-Install/Shipping mode	Places the PT 7000 in RUN mode, queues a short status message, and then blinks the LEDs
RUN mode	Wakes the PT 7000, queues a short status message, and then blinks the LEDs
Running	Queues a short status message, and then blinks the LEDs

5.3 Connectors

5.3.1 Connectors

The terminal uses a 24-pin Delphi connector.

The external connector and harness provide access to the terminal's various interfaces and I/Os. The custom connector and harness can be ordered and designed to meet your specific requirements.

Figure 8: Connector (View on Terminal)

5.3.2 Pin Assignment

Table 1 maps to the layout shown in Figure 8.

Table 1: Electrical Pin Assignment

Pin	Signal	Description
1	EXT_PWR	External power from the asset (requires 5 A fuse)
2	GND	Ground from the asset
3	PULL_DWN_1	Digital pull down 1
4	CONSOLE_RS232_RX	Console RS-232 Receive
5	CONSOLE_RS232_TX	Console rS-232 Transmit
6	GND	Ground from the asset
7	CANH_1	High-level CAN bus line 1
8	PULL_DWN_2	Digital pull down 2
9	ANALOG_1	Analog input 1
10	PULL_UP_1	Digital pull up 1
11	PULL_UP_2	Digital pull up 2
12	ANALOG_2	Analog input 2
13	ANALOG_3	Analog input 3
14	ANALOG_4	Analog input 4
15	D_IN_4	Digital input 4
16	CANH_O/EXT_TX[1]	High-level CAN bus line 1 or External RS-232 Transmit
17	CANL_O/EXT_RX[1]	Low-level CAN bus line 1 or External RS-232 Receive
18	CANL_1	Low-level CAN bus line 1
19	D_IN_3	Digital input 3
20	D_IN_2	Digital input 2
21	D_IN_1	Digital input 1
22	GND	Ground from the asset
23	GND	Ground from the asset
24	GND	Ground from the asset

5.4 Input/Output

The terminal supports the following I/Os:

- Four digital inputs
- Two digital output pull-ups
- Two digital output pull-downs
- Four dedicated analog inputs

---

[1]Hardware configurable.

5.4.1 Digital Input

The characteristics of the digital inputs are detailed below.

Parameter	Min.	Typical	Max.	Units
Input impedance	-	307	-	kΩ
Input low range	-17	-	0.9	V
Input high range	2.1	-	200	V
Input Bandwidth	50	-	-	kHz

5.4.2 Digital Output Pull-Up

The two digital output pull-ups can be used as digital output signals or to power external sensors. The output voltage is selectable between 9 V and 12 V. Both outputs are at the same level (that is, the output voltage is not individually selectable).

The characteristics of the digital output pull-ups are detailed below.

Parameter	Min.	Max.	Units
Pull-ups			
Pull-up voltage	9	12	V
Output current [1]	-	1	A
Output leakage current	-	25	uA

5.4.3 Digital Output Pull-Down

The terminal has two digital short to ground pull-downs. The short to ground is internally current limited to protect both the terminal and any connected peripheral.

The characteristics of the digital output pull-downs are detailed below.

Parameter	Min.	Max.	Units
Pull-downs			
Pull-down voltage	-200	200	V
Pull-down current limit	0.5	1	A
Input leakage current	-	10	uA

5.4.4 Analog Input

The terminal includes four dedicated analog inputs that can convert inputs of up to 32 V.

The characteristics of the analog inputs are detailed below.

Parameter	Min.	Typical	Max.	Units
Input impedance	-	1	-	kΩ
Minimum measurement voltage	-	0	-	V

---

[1]Total output current of pull-up 1 and 2 is limited to 1 A maximum.

Parameter	Min.	Typical	Max.	Units
Maximum measurement voltage	32	-	-	V
Resolution (12 bits)	-	0.8	-	mV
Proportional measurement error	-	2	4	%
Offset error	-	2	3	LSB
Voltage limits	-24	-	43	V
Input Bandwidth	100	-	-	kHz

5.5 Serial Interface

5.5.1 Main RS-232

The main RS-232 serial interface to the terminal is asynchronous with 1 start bit, 8 data bits, no parity, 1 stop bit. The baud rate is 9600 bps, and configurable up to 115, 200 bps.

The electrical characteristics of the interface are:

Parameter	Min.	Typical	Max.	Units
Rx Input Low Threshold for DTE Connected	-	-	-2.7	V
Rx Input High Threshold for DTE Connected	2.7	-	-	V
Rx Threshold for DTE Disconnected	-0.3	-	0.3	V
Serial Rx Input Low Threshold	0.6	-	-	V
Serial Rx Input High Threshold	-	-	2.4	V
Serial Tx Low Output (3 kΩ load)	-	-5.4	-	V
Serial Tx High Output (3 kΩ load)	-	5.4	-	V

5.5.2 Secondary RS-232

The secondary RS-232 serial interface is a hardware option chosen when ordering the product. The interface to the terminal is asynchronous with 1 start bit, 8 data bits, no parity, 1 stop bit. The baud rate is 9600 bps, and configurable up to 115, 200 bps. The hardware control and invalid signal are shared between the main and secondary serial interfaces.

The electrical characteristics of the secondary RS-232 interface are the same as the main RS-232 interface.

5.5.3 Main CAN Bus/NMEA 2000

The controller area network (CAN) interface allows signaling rates up to 1 Mbps capable of connecting to CAN interfaces including, but not limited to, NMEA 2000. The CAN interface is suitable for both 12 V and 24 V systems.

Note: You must provide a standard 120-ohm termination resistor externally to the terminal.

The electrical characteristics of this interface are below.

Parameter	Min.	Max.	Units
Differential output voltage (dominant)	1.5	3	V
Differential output voltage (recessive) no load	-50	50	mV
CANH or CANL Voltage Tolerance	-58	58	V

5.5.4 Secondary CAN Bus/NMEA 2000

The secondary CAN interface is a hardware option chosen when ordering the product.

The interface and electrical characteristics of the secondary CAN interface are the same as the main CAN interface.

5.6 RF Specifications

5.6.1 IDP (OGi) Satellite Radio with Standard Antenna

Parameter	Value
Satellite Frequency	Rx: 1518 to 1559 MHz Tx: 1626.5 to 1660.5 MHz, 1668 to 1675 MHz
Receiver Absolute Maximum Input Signal	10 dBm
Transmitter Maximum EIRP	7 dBW
Recommended Operation Elevation Angle	20 to 90 degrees
Antenna Gain	4.5 dBic (with standard patch)

5.6.2 OG2 Satellite Radio with Specific Antenna

Parameter	Value
Receiver Absolute Maximum Input Signal	21 dBm
Transmitter Maximum EIRP	10 dBW
Recommended Operation Elevation Angle	0 to 90 degrees
Antenna Gain	0 dBi typical, 2.14 max.

5.6.3 GPS/Cellular LTE Antenna

Parameter	Cellular	GPS
Frequency	800/850/900/1800/1900/2100 UMTS MHz	1.57542 GHz ±1.023 MHz (L1 band)
Impedance	50 ohm	50 ohm -
VSWR	≤2.0	-
Gain	0 dBi	2 dBi minimum
EIRP	GSM: 33 dBm, HSPA/UMTS: 24 dBm	-

5.6.4 OG2 Tri-Mode Antenna

Parameter	VHF (ORBCOMM)	Cellular	GPS
Gain	typ. 0 dB	typ. 0 dB	typ. 2 dBic
Frequency Range	137-151 MHz	-	-
Voltage Supply	-	-	3-5.5 VDC
Current Consumption	-	-	≤2.5 mA @ 5 V ±0.1 V
Amplification	-	-	typ. 26 dB ±3 dB

5.7 GNSS

Table 2: GNSS Specifications

Parameter	GPS	GLONASS	BeiDou
Time to First Fix[1]			
Cold Start	29 s	30 s	34 s
Aided Start	2 s	2 s	3 s
Hot Start	1 s	1 s	1 s
Sensitivity			
Tracking	-166 dBm	-166 dBm	-160 dBm
Hot Start	-157 dBm	-156 dBm	-155 dBm
Cold Start	-148 dBm	-145 dBm	-143 dBm
Accuracy			
Horizontal Position (CEP) [2]	2.5 m	4.0 m	3.0 m
Velocity	0.05 m/s	-	-
Heading	0.3 degrees	-	-

5.8 Battery Pack

The battery includes a rechargeable 7.4V nominal battery pack able to supply the current necessary for all operational modes. The battery pack includes a protection circuit that provides all required UN 38.3 protection, including over discharge, overcharge, and over current protections. The battery pack is UN 38.3 and IEC62133 certified.

The battery pack is 6.7 x 1.3 x 1.2 cm (2.6 x 1.3 x 0.5") (LxWxH).

The electrical specifications of the battery pack are below.

Parameter	Value
Rated Capacity	1200 mAh
Nominal Voltage	7.4 V
Maximum Output Current	3 A

5.8.1 Battery Controller

The battery control monitors and controls the charge and discharge of the terminal battery pack.

Charging is limited to between the minimum and maximum charging temperature of the battery pack, and temperature is monitored using the thermistor internal to the battery pack.

The microcontroller can disable the battery charger to reduce load on the input power source.

The charge controller electrical specifications are:

---

[1]All satellites at -130 dBm

[2]CEP, 50%, 24 hours static, -130 dBm

Parameter	Min.	Typical	Max.	Units
External Charge Voltage	10.5	-	32	V
Charge Current	-	-	400	mA
Charge temperature - Low Cost Battery	0/32	-	40/104	°C/°F
Float Voltage	-	8.0	-	V
Charge Time	-	-	4	Hours

5.8.2 Battery Supply Voltage

The terminal can measure its main input supply voltage over the 5-8.4 V range, to an accuracy of ±3.3% mV.

5.9 Bluetooth Low Energy

The terminal includes a dedicated Bluetooth® Low Energy module.

Bluetooth Low Energy is a low power short range wireless protocol using the 2.4GHz frequency band. It was combined under the Bluetooth specification with Bluetooth version 4.2. Bluetooth Low Energy is not compatible with standard Bluetooth.

Bluetooth Low Energy allows the terminal to communicate as a peripheral with a mobile phone or other Bluetooth Low Energy enabled host for configuration and some debug logging. It also allows the terminal to communicate as a host to local wireless sensors. The Bluetooth Low Energy system is capable of operating in both the host and peripheral modes at the same time.

The Bluetooth Low Energy characteristics are below.

Parameter	Min.	Typical	Max.	Units
Frequency	2360	-	2500	MHz
Receive sensitivity	-97	-	-	dBm
Bluetooth version compliance	-	4.2	-	version

5.9.1 Bluetooth External Memory

The terminal includes 1 MB of nonvolatile onboard flash storage for data for use with the Bluetooth Low Energy subsystem. The flash is capable of 100,000 write-erase cycles over its operating life.

5.10 Communications

The terminal includes various cellular options.

5.10.1 Cat 1 North American LTE with Global Fallback

This optional cellular module covers North American LTE bands and falls back to global 3G and 2G bands.

The specifications for this module are below:

Table 3: Cat 1 NA LTE Module

Parameter	Minimum Specification
LTE Category	Cat 1
LTE Bands	2, 4, 5, 12
UMTS/HSPA+ Bands	1, 2, 5, 8
GSM Bands	2, 3, 5, 8

5.10.2 Global LTE with Global Fallback

This optional cellular module covers global LTE bands and falls back to global 3G and 2G bands.

Table 4: Cat 4 Global LTE Module

Parameter	Minimum Specification
LTE Category	Cat 4
LTE Bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 18, 19, 20, 25, 26, 28, 38, 39, 40, 41
UMTS/HSPA+ Bands	1, 2, 4, 5, 6, 8, 19
GSM Bands	2, 3, 5, 8

5.11 Memory

Parameter	Value
Nonvolatile Flash	16 MB
Write-Erase Cycles (over operating life)	100 000
SRAM	2 MB

5.12 Environmental

Parameter	Description
Humidity	The terminal meets all its specifications during exposure to 90% relative humidity at +85°C (185°F), per the test methodology of SAE J1455, section 4.2.3 (8-hour humidity cycle per figure 4a).
Vibration	The terminal meets all its specifications during exposure to random vehicular vibration levels per SAE J1455, section 4.9.4.2 figures 6, 7, and 8, and MIL-STD-810G, section 514.6, figure 514.6C-1.
Mechanical Shock	The terminal meets all its specifications after exposure to positive and negative saw tooth shock pulses with peaks of 20 G and durations of 11 ms as specified in MIL-STD-810G, section 516.6, Procedure I, section 2.3.2c.
Altitude	The terminal meets all specifications after a nonoperating 12.2 km (7.6 mi) altitude test as detailed in SAE J1455, section 4.9.3, except with an ambient temperature of -40°C (-40°F).
Thermal Shock	The terminal meets all of its specifications after a thermal shock test as detailed in SAE J1455, section 4.1.3.2
Drop Test	The terminal meets all its specifications after a handling drop test as specified in SAE J1455, section 4.11.3.1

Parameter	Description
Salt Spray Atmosphere	The terminal meets all of its specifications after a salt spray test as detailed in SAE J1455, section 4.3.3.1.
Immersion	The terminal meets all of its specifications after a 6-hour alternating hot/cold salt water immersion test as detailed in SAE J1455, section 4.3.3.2.
Exposure to Chemicals and Oils	The terminal meets all of its specifications after a light to moderate splash test as detailed in SAE J1455 section 4.4.3.2, for the following chemicals: Window Washer Solvent Gasoline Diesel Fuel Fuel Additives Alcohol Anti-Freeze Water Mixture Degreasers Soap and Detergents Steam Waxes Kerosene Freon Spray Paint Paint Strippers Ether Dust Control Agents (magnesium chloride) Moisture Control Agents (calcium chloride) Ammonia Aluminum brightener (acid wash)
Steam Cleaning and Pressure Washing	The terminal meets all of its specifications after a pressure wash test as detailed in SAE J1455, section 4.5.3.
Fungus	The terminal meets all of its specifications after a fungus test as detailed in SAE J1455, section 4.6.3.
Dust and Sand Bombardment	The terminal meets all of its specifications after a dust and sand bombardment test as detailed in SAE J1455, section 4.7.3.
ELD (Enclosure)	All electrical interfaces operate normally after being subjected to 6 kV ESD contact discharge per IEC 61000-4-2, level 3.

5.13 LED

The LEDs are enabled by triggering the magnetic sensor, even if the terminal is asleep. Each activation resets a timer to 60 seconds. There are three LEDs to indicate various states within the terminal.

Color	Category	Pattern	Description
🔴 Red	Power Status	On	Externally powered
		Blinking	Battery powered
		Off	Power failure (battery dead)
🟢 Green	GPS	On	Last position update was successful
		Blinking	Searching for satellites or antenna fault
		Off	Power failure or LED timeout expired (when on battery power)
🟡 Yellow	Communication	On	Transmit queue empty (previous communication attempts were successful).
		Blinking	Transmit queue not empty (continued blinking likely means a communication fault)
		Off	Power failure or LED timeout expired (when on battery power)

5.14 Accelerometer

The terminal has an accelerometer to detect motion.

Parameter	Condition	Min.	Typical	Max.	Units
Acceleration Range	software selectable	-	±2	-	g
		-	±4	-	g
		-	±8	-	g
Bandwidth Filtering	Selectable via digital interface	0.78	-	400	Hz
Sensitivity	2 g	-	4096	-	LSB/g
	4 g	-	2048	-	LSB/g
	8 g	-	1024	-	LSB/g

5.15 Mechanical

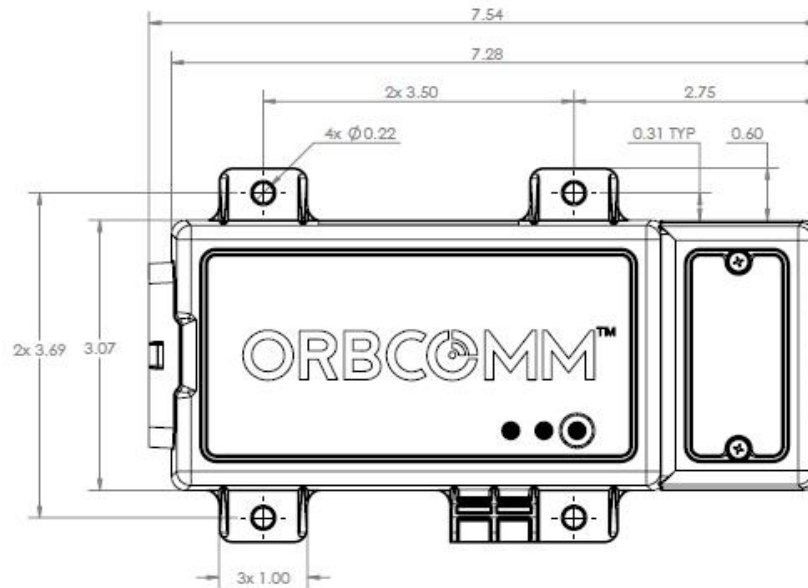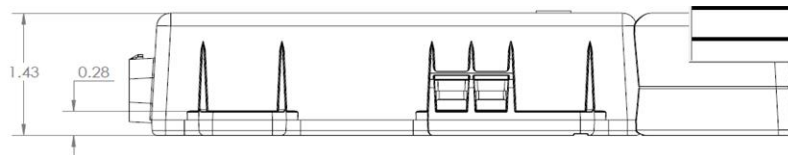| Parameter	Value
Dimensions (excludes connector body)	19 L x 11 W x 4 H cm (7.5 x 4.3 x 1.5 in)
Mass	~346 g (12 oz)
Enclosure Material	Polycarbonate
Color Code	Pantone 420C

Figure 9: Top View Dimensions (inches)

Figure 10: Side View Dimensions (inches)

5.15.1 External IDP Standard Satellite Antenna

Parameter	Value
Mass	Side entry with 5 m cable: 360 g
Enclosure Material	Lexan EXL 9330
Color Code	8T9D076 (white)
Sealing Gasket Material	Santoprene®

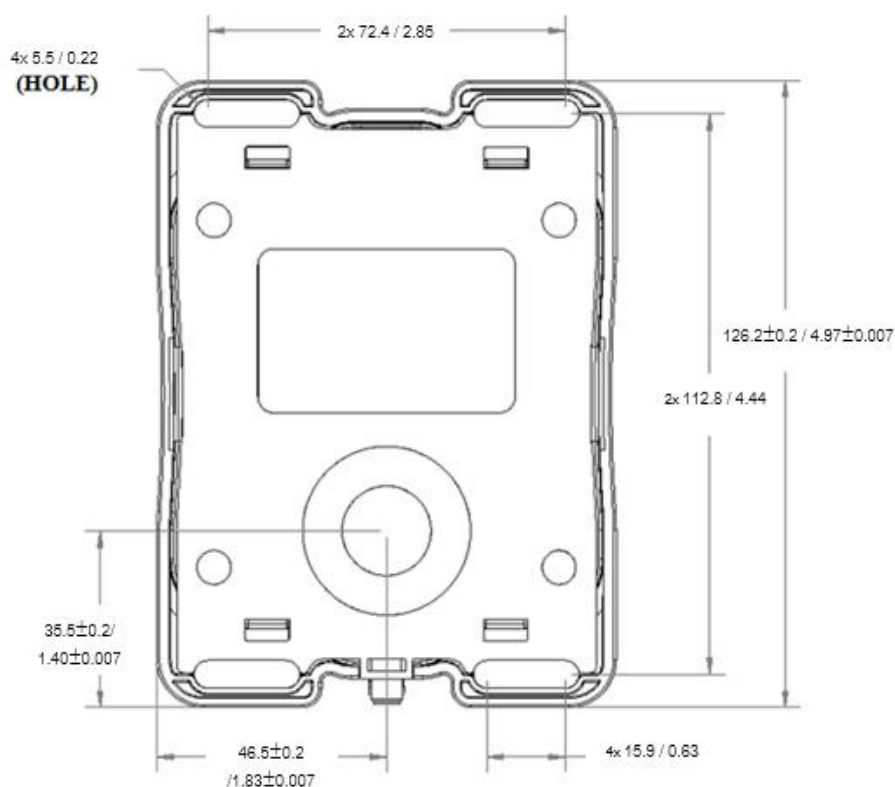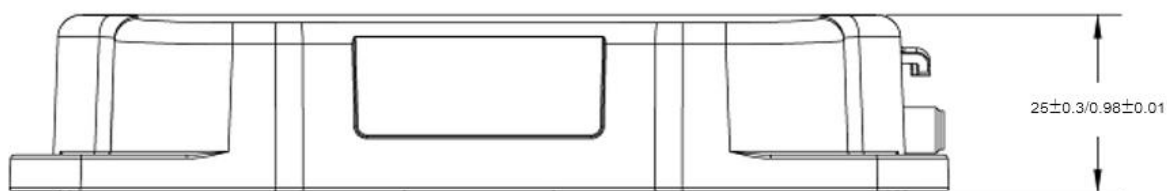Figure 11: IDP Satellite Antenna - Bottom View (mm/inches)

Figure 12: IDP Standard Satellite Antenna -Side View (mm/inches)

5.15.2 External OG Satellite Antenna

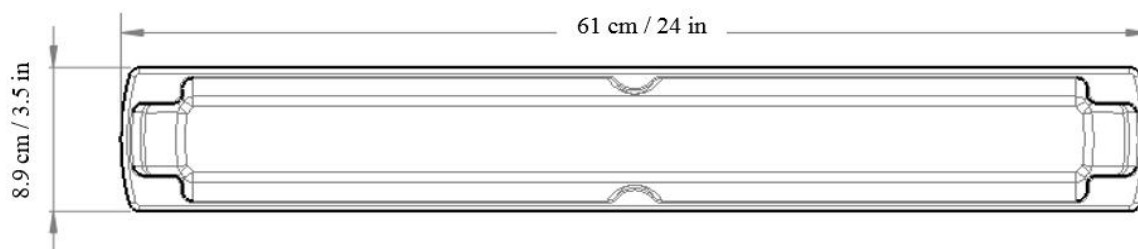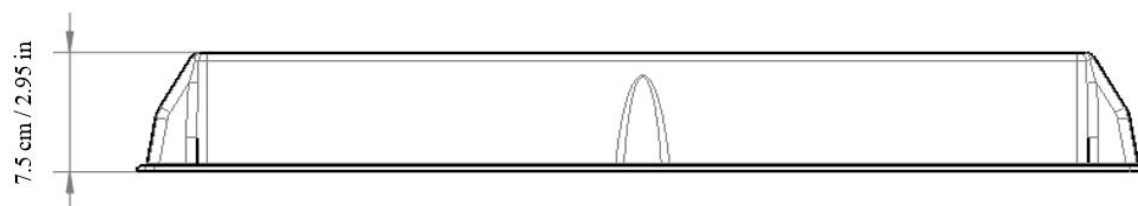| Parameter	Value
Mass (excludes cable, side entry version)	0.65 kg (1.4 lb.)
Enclosure Material	ABS
Connector	FAKRA

Figure 13: OG Satellite Antenna - Top View

Figure 14: OG Satellite Antenna - Side View

5.15.3 GPS/Cellular LTE Antenna

Parameter	Value
Configuration	Side-exit surface mount or bottom mount options
Antenna Cable	3RG 174 low loss, length 5 meters (16 feet)
Connector	FAKRA - blue and violet
Mounting	Adhesive backing with screw mount option

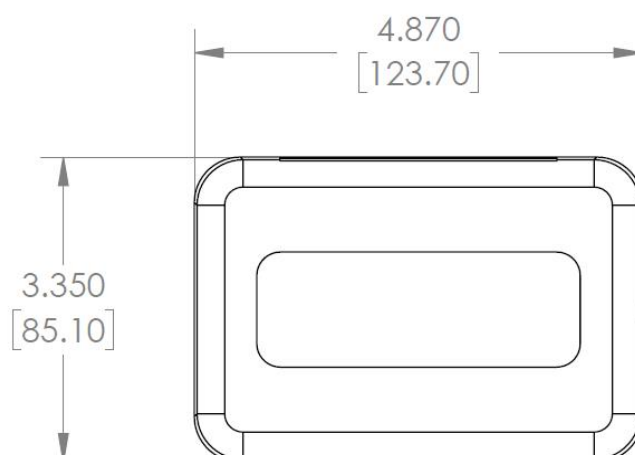Figure 15: GPS/Cellular LTE Antenna - Top View
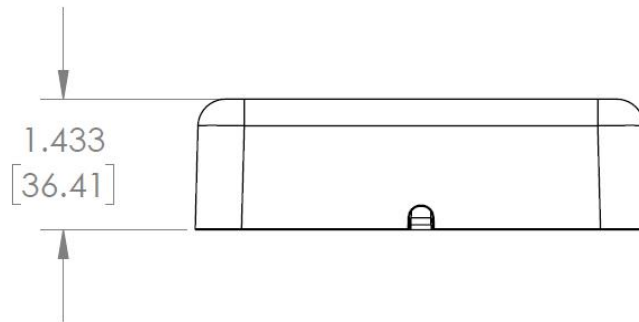
Figure 16: LTE Antenna - Side View
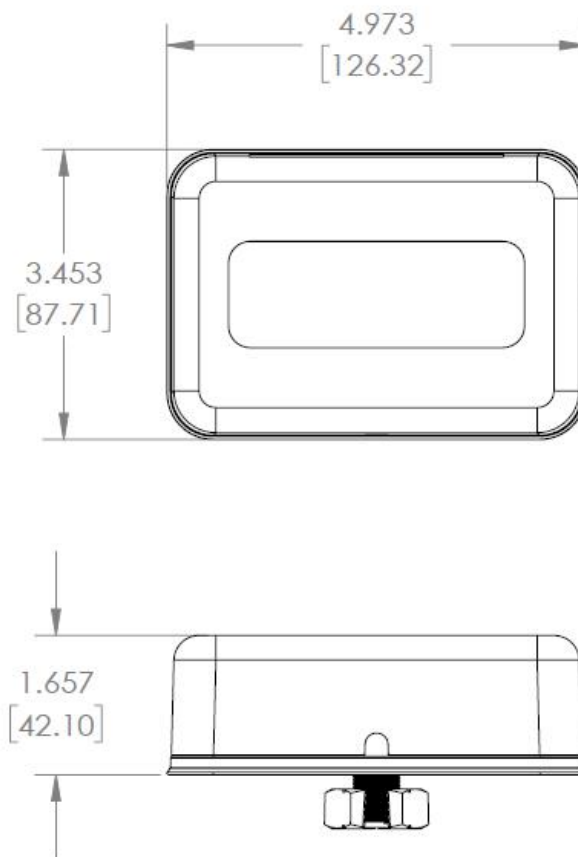

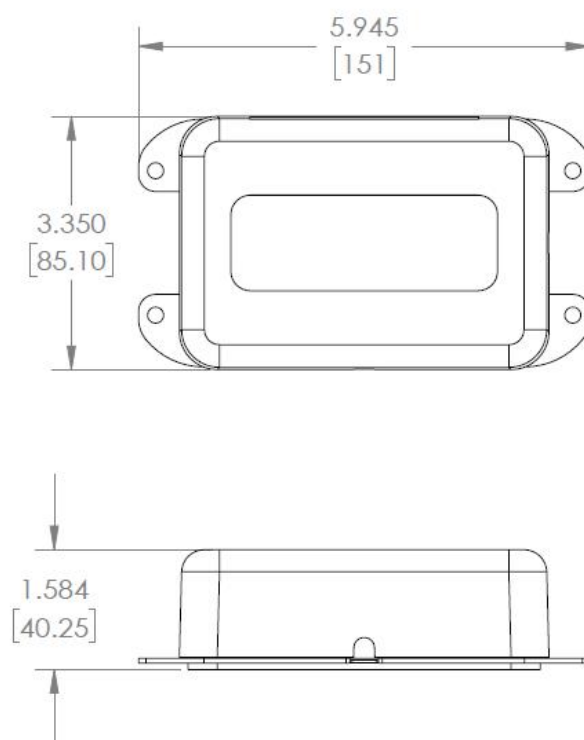Figure 17: LTE Antenna with Overmold Plate

Figure 18: LTE Antenna with Surface Mount Plate

6 COMPLIANCE

The PT 7000 has the following certifications:

Industry Canada

- RSS-170, Issue 2, Spectrum Management and Telecommunications Policy, Radio Standard (IDP-180/IDP190)
- ICES-003

FCC

- CFR Title 47: Telecommunication, Part 15 - Radio Frequency Devices
- CFR Title 47: Telecommunication, Part 25 - Satellite Communications

CE Mark

- EN301426 v1.2.1
- EN301721 v1.2.1

Ingress Protection

- Terminal with 24-pin connector attached - IP67
- External OG satellite antenna - IP67
- External OG2 tri-mode antenna - IP66

RoHS

- Restriction of Hazardous Substances (RoHS) [1]

OGi Modem (if applicable)

Contains:

- FCC ID: XGS-OGI100
- IC ID: 11881A-OGI100

OG2 Modem (if applicable)

Contains:

- FCC ID: XGS-ORBCOG2BAM1
- IC ID: 11821A-ORBCOG2BAM1

Cellular Module

Contains:

- FCC ID: XPYLISAU200
- IC ID: 8595A-LISAU200N

---

[1]European Union's (EU) Directive 2002/95/EEC "Restriction of Hazardous Substances" (RoHS) in Electronic and Electrical Equipment.

ACMA Certificate

EU Declaration of Conformity

Hereby, ORBCOMM Inc. declares that the radio equipment types listed in this document comply with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available from http://www2.orbcomm.com/eudoc.

APPENDIX A PT 7000 OVERMOLDED CONNECTOR CABLE

The cable shipped with the PT 7000 has a connector at the PT 7000 end, is blunt cut at the other, and is environmentally robust.
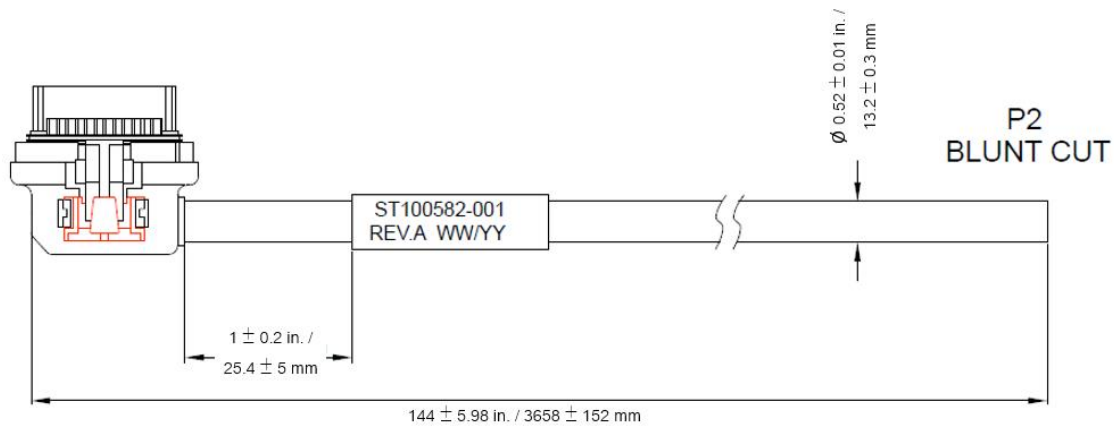
Figure 19: Overmolded Connector Cable

Figure 20: Delphi Female Connector - Rear View of the Connector

Table 5: Delphi Female Connector Pin Descriptions

Pin #	Signal	Color	Description	Direction / Comment
1	GND	Brown	Ground	Not Used
2	GND	Orange	Ground	Not Used
3	GND	Yellow	Ground	Not Used

Pin #	Signal	Color	Description	Direction / Comment
4	D_IN_1	Green	Digital 1	Input, Ignition key ON
5	D_IN_2	Blue	Digital 2	Optional Input
6	D_IN_3	Purple	Digital 3	Optional Input
7	CANL_0	Gray	Primary Can Bus Low-level	Input and Output
8	CANL_1 / EXT_TX	White	External RS-232 / Secondary Can Bus Low-level	Output (External RS-232) / Both (Secondary Can Bus)
9	CANH_1 / EXT_RX	Pink	External RS-232 / Secondary Can Bus High-level	Input (External RS-232) / Both (Secondary Can Bus)
10	D_IN_4	Light Blue	Digital 4	Optional Input
11	ANALOG_4	White/Black	Analog 4	Optional Input
12	ANALOG_3	White/Red	Analog 3	Optional Input
13	ANALOG_2	Green/Yellow	Analog 2	Optional Input
14	PULL_UP_2	Black/White	Digital pull-up 2 to 9V/12V	Optional Output
15	PULL_UP_1	Brown/White	Digital pull-up 1 to 9V/12V	Optional Output
16	ANALOG_1	Red/White	Analog 1	Optional Input
17	PULL_DWN_2	Orange/White	Digital pull-down 2	Optional Output
18	CANH_0	Yellow/White	Primary Can Bus High-level	Input and Output
19	GND	Green/White	Ground	Not Used
20	CONSOLE_RS232_TX	Blue/White	Console RS-232	Output
21	CONSOLE_RS232_RX	Purple/White	Console RS-232	Input
22	PULL_DWN_1	Gray/White	Digital pull-down 1	Optional Output
23	GND	Black	Ground	System Ground – connect to chassis
24	EXT_PWR	Red	External Power	Input Power – 12-24 VDC Requires external 5 A fuse

APPENDIX B ACTIVATE THE PT 7000 FROM SHIP MODE

The PT 7000 is shipped in a preinstallation state, or ship mode, which turns off the cellular and satellite modems. Activating the terminal turns on these modems and allows the terminal to communicate with the ORBCOMM server.

The PT 7000 can be activated at any time, but it is recommended activation be done shortly before or immediately following installation.

You can exit ship mode by turning on the vehicle's ignition after the PT 7000 has successfully been installed or by following the instructions below and using the magnet.

The magnet can be a useful tool for diagnostics and operational confirmation during the installation process.

Figure 21: Magnet Tool

Using the Magnet Tool

1. Place the magnet to the left of the letter O, of the ORBCOMM logo.

Figure 22: Magnet Placement

2. Hold the magnet over this location for at least 5 seconds and then remove it. If the terminal is in a pre-install or shipping mode state, this action places the PT 7000 in RUN mode, queues a short status message, and then blinks the LEDs.