

ST 6000

User Guide

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CONTACT AND LEGAL INFORMATION

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PREFACE

Purpose

This guide contains product information for the ST 6000. The intended audiences for this guide include field support personnel, product evaluators, and certified third-party personnel. It is particularly intended for personnel who are responsible for system installation and activation.

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.*

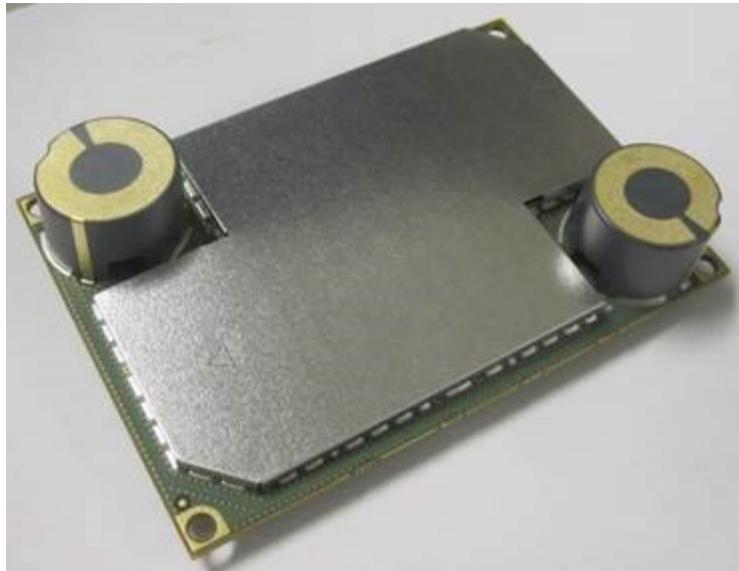
Numbered lists indicate a series of steps required to complete a task or function. Bulleted lists highlight information where order or sequence is not crucial.

1. PRODUCT OVERVIEW

The ST 6000 provides a high performance, low latency, two-way communication solution that uses the IsatData Pro network.

The device consists of a Lua application controller, integral antennas, a satellite modem for communicating with the satellite, an integral GNSS subsystem, several input/output feeds capable of monitoring and controlling external sensors and devices, and also dedicated serial ports (two RS-232 ports). Solution Providers (SPs) must create a custom power supply for their particular application.

ST 6000



The ST 6000 is suitable for both industrial and fixed applications, and it can work as a standalone data-messaging device, with built-in I/O data collection and processing capabilities. Feature-rich software tools make programming easy and shorten the design and testing time.

2. SPECIFICATIONS

2.1. Temperature

Parameter	Value
Operating Temperature Range	-40° to +85°C (-40°F to +185°F)
Recommended Storage Temperature Range	-40° to +85°C (-40°F to +185°F)

2.2. Input Range

The ST 6000 has two power input pins (VAUX and VIN) and can be powered from either a single or dual external DC power source.

VAUX supplies power to the ST 6000 baseband and RF processors. Regulated power must be applied to this pin continuously to keep the device alive and synchronized with the satellite network.

VIN is the input power pin for the RF power amplifier circuitry. Regulated power must be applied to this pin whenever the device drives the TX_PWR_EN line high and may be removed when the TX_PWR_EN line is low. Alternatively, power may be applied to this pin continuously and TX_PWR_EN ignored.

Parameter	Values
VAUX Voltage	3.5 to 5.8 VDC (6 V Max)
VAUX Current	600 mA (max)
VIN Voltage	5.8 VDC ± 3%
VIN Current	1.6 A (max)

2.3. Satellite Transmitting Power

The maximum transmitting power (EIRP) for the IsatData Pro satellite is 7 dbW.

2.4. RF Specifications

2.4.1. IDP RF

Parameter	Value
Rx Operating Frequency	1525-1559 MHz
Frequency Band Modulation	OQPSK
Symbol Rate Polarization	3000 symbols/seconds
Polarization	RHCP
Tx Operating Frequency	1626.5-1660.5 MHz
Frequency Band Modulation	OQPSK
Symbol Rate Polarization	900 symbols/seconds (maximum)
Polarization	RHCP

2.4.2. OGx RF

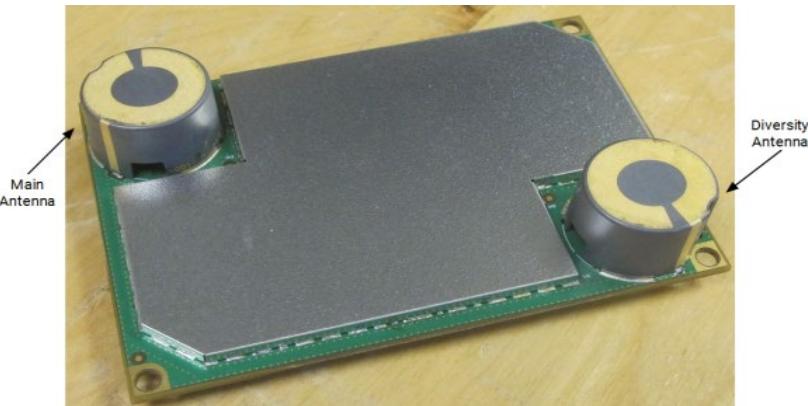
Parameter	Value
Rx Operating Frequency	1525-1559 MHz
Frequency Band Modulation	OQPSK
Symbol Rate Polarization	2000, 8000, 16000 symbols/seconds
Polarization	RHCP
Tx Operating Frequency	1626.5-1660.5 MHz
Frequency Band Modulation	OQPSK, 16QAM
Symbol Rate Polarization	800, 1600, 3200, 6400 12800 symbols/seconds
Polarization	RHCP

2.4.3. Antenna

Parameter	Value
Maximum EIRP	7 dBW
Elevation Angle	0° to 90° degrees
Maximum transmit antenna gain	4.2 dBiC

The ST 6000 supports two standard onboard antennas: Main and Diversity.

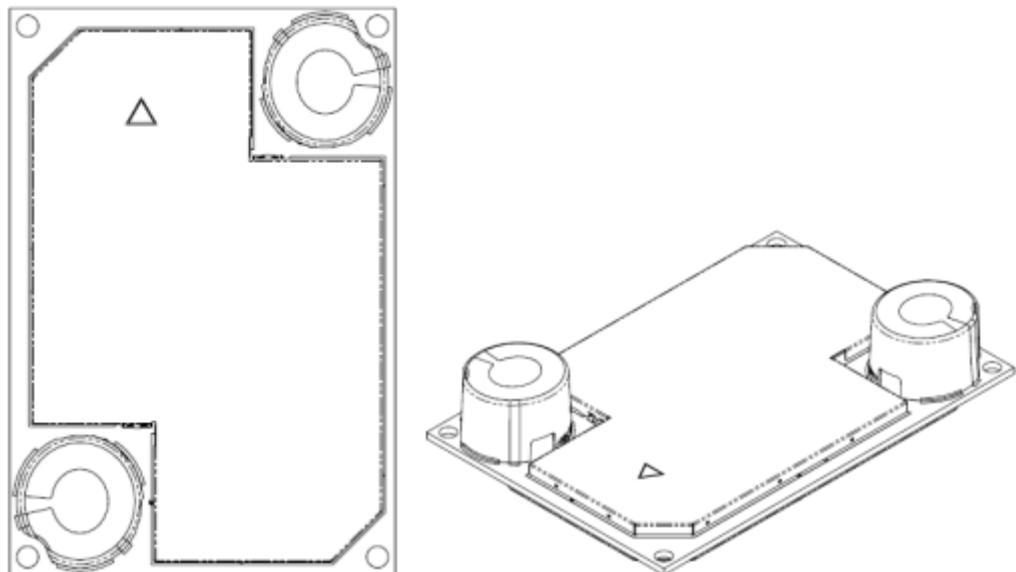
Onboard Antennas

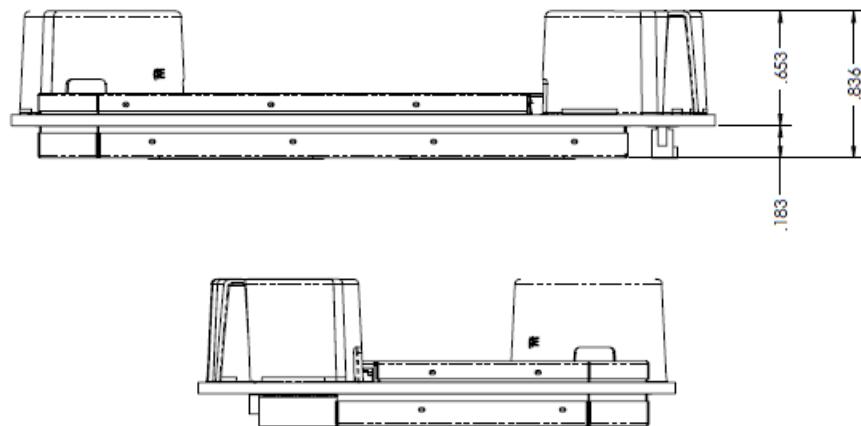


2.5. Mechanical

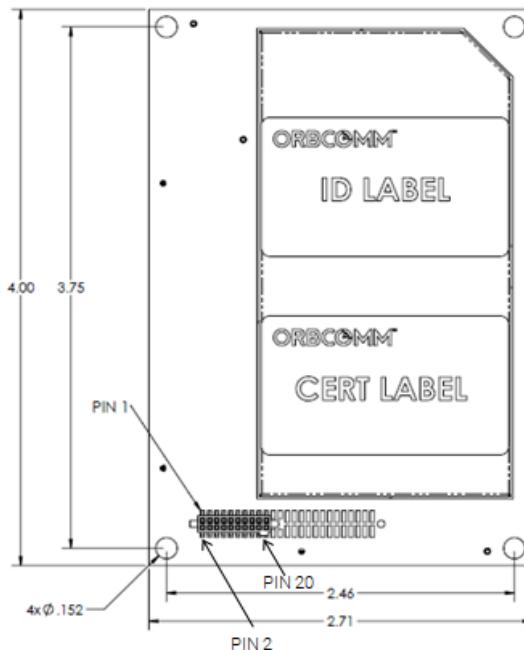
The device and antenna mechanical dimensions are shown below.

ST 6000 Top View and Side View (inches):





ST 6000 Bottom View (inches):



Parameter	Value
ST 6000 weight	59.4 g

2.6. Environmental

Parameter	Description
Vibration	The device 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 device meets all its specifications after exposure to positive and negative saw tooth shock pulses with peaks of 20G and durations of 11 ms as specified in MIL-STD-810G, section 516.6, Procedure I, section 2.3.2c.
Altitude	The device meets all of its specifications after a non-operating 12.2 km altitude test as detailed in SAE J1455, section 4.9.3, except with an ambient temperature of -40 °C.

Parameter	Description
Thermal Shock	The device meets all of its specifications after a thermal shock test as detailed in SAE J1455, section 4.1.3.2.
ESD	The device meets all its specifications after exposure of the device to 2 kV ESD contact discharge per IEC 60945 and IEC 61000-4-2, level 3. All the connections on the connectors, except for the VIN and VAUX power rails, are ESD protected to ± 30 kV contact discharge according to IEC 61000-4-2 far exceeding level 4.

3. COMPLIANCE

The ST 6000 obtained the following certifications:

CE Mark

- EN 301 426

Inmarsat Type Approval

Industry Canada

- IC: RSS-170; ID: 11881A-ST6000

FCC Part 25

- FCC ID: XGS-ST6000
- CFR Title 47: Telecommunication, Part 25 - Satellite Communications, Sub-part C - Technical Standards
- OET 65 - Radiation Safety

RoHS

- Restriction of Hazardous Substances (RoHS) ¹

Mexico

- IFT TA Certificate

South Africa

- ICASA TA Certificate

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

4. INTEGRATION GUIDELINES

IMPORTANT

READ ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING. FAILURE TO DO SO MAY CAUSE PERSONAL INJURY OR DAMAGE TO PRODUCT AND/OR PROPERTY

• Review the product package and contents prior to beginning the installation. Take care when opening the packaging and removing items. If a return is needed, you will want to return the product in its original packaging if possible. • This instruction guide is provided as a GENERAL installation guide; some assets vary dimensionally and may require additional steps. • ORBCOMM has a policy of continuous development and improvements. Therefore, products, guides, and technical information are subject to change without prior notice. • The manufacturer and / or distributors do not accept responsibility for third-party charges, labor, and / or third-party replacement modifications that are not ORBCOMM approved. Some modifications may void the factory warranty. • ORBCOMM does not accept any responsibility for installations performed by installers / third parties not approved and / or authorized by ORBCOMM. Some installations may void the factory warranty. • Exercise due diligence when installing this product. ORBCOMM does not accept any responsibility for asset damage or personal injury resulting from the installation of this product. Careless installation and operation can result in serious injury or equipment damage. • All liability for installation and use rests with the owner / operator. • Always make sure you have a clean, dry, and well-lit work area. • Always ensure products are secure during disassembly and installation. • Always take steps to protect yourself when drilling, cutting, and grinding because this may create flying particles that can cause injury. • Thoroughly inspect the area to be drilled, on both sides of material, prior to modification, and relocate any objects that may become damaged. • Always route electrical cables carefully. Avoid moving parts, parts that may become hot and rough, or sharp edges. • Make sure to fully understand the product, its intended use, and operation prior to use.

This section contains a number of guidelines to assist the Solution Provider (SP) in building their ST 6000 enclosure. It must be recognized that this section provides guidelines only and each SP must use their own discretion to finalize the integration approach that works for them.

4.1 Enclosure Design

The ST 6000 is not designed for outdoor environments. Consequently, the ST 6000 requires a robust environmentally sealed enclosure that can house the ST 6000.

The following guidelines are recommended for the enclosure design.

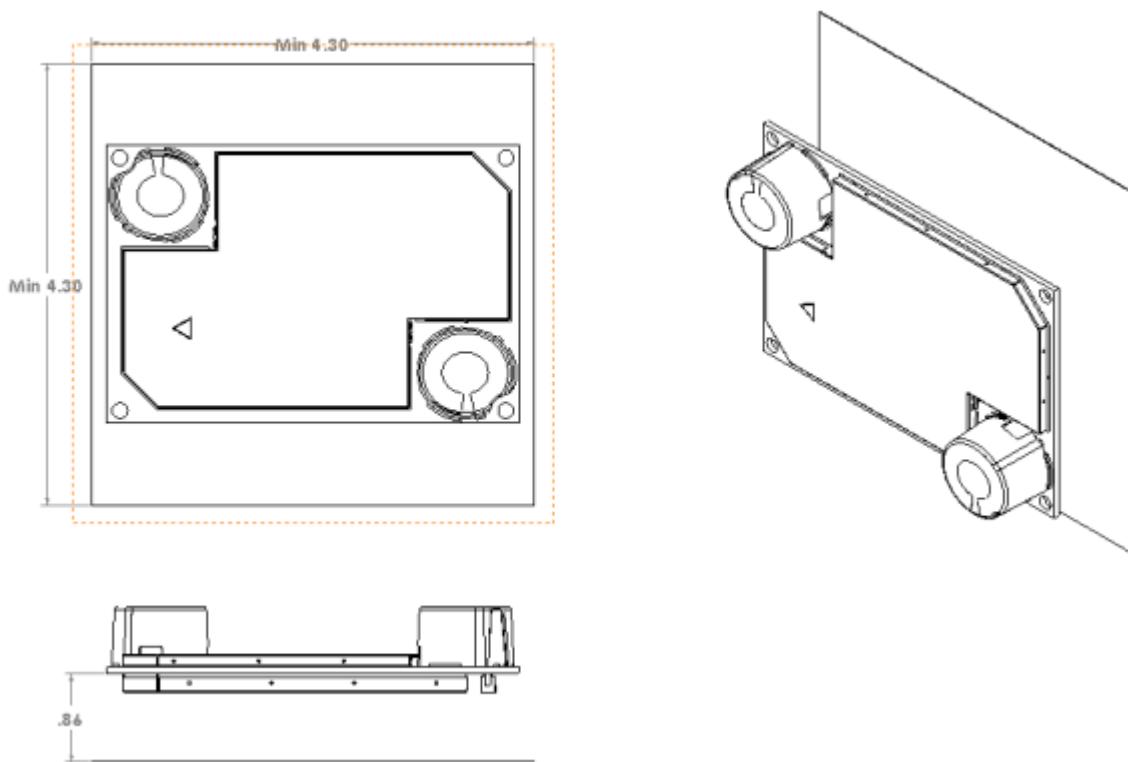
- An IP67 rating or better for outdoor use.
- Use enclosure materials that are transparent to L-Band (1-2 GHz) radio signals.
- Two recommended enclosure materials are:
 - Xenoy® Resin 5220U. This plastic material offers good chemical and UV resistance and great impact resistance even at low temperatures.
 - Lexan EXL 9330.

4.2 Ground Plane Requirements

A metal plate is required under the antenna board. The optimal recommended separation between the metal plate and the modem card is 0.86". This can be reduced to 0.5" with some moderate impact on low elevation gain.

If the ST 6000 is installed on a metal surface larger than the metal plate size indicated in the following figure, then no metal plate is needed as long as the surface-to-antenna distance is the same as shown in the figure that follows.

Ground Plane Requirements (in.)



4.2.1 Antenna Integration

The minimum distance (air gap) recommended between the antenna and the enclosure is 2 mm.

Note: Antennas are fragile elements that can withstand vibration but not direct shock or contact.

Antenna Integration Requirements (in.)

