ORBCOMM®

ST 6200
User Manual

Mar 2024, Version 01

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CONTACT AND LEGAL INFORMATION

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1.   PRODUCT OVERVIEW

ORBCOMM's ST 6200, Model Number ST6200, is a Mobile Satellite Earth Station Terminal which is designed for satellite mobile communications. The ST6 product family has a few variants including ST 6100, ST 6101, ST 6102, etc., and different mechanical mounting configuration. ST6200 product consists of ORBCOMM's ST6002 module which has a satellite communication transceiver radio, a GPS/GNSS receiver, four input/output ports, an RS-232 port, and an RS-485 port.

Figure 1: ST 6200

The ST 6200 is designed for industrial and fixed applications or to be mounted outdoors on a wide range of platforms such as vehicles or boats. The ST 6200 is designed for harsh industrial applications and can be used for applications that support both fixed and mobile (e.g. trucks and boats) assets.

The terminal's built-in programmability allows it to work as a standalone data-messaging terminal, with built-in I/O data collection and processing capabilities. Feature-rich software tools make programming easy and shorten the design and testing time.

1.1   Terminal

The ST6200 (Table 1) operates on the IsatData Pro network. The ST6200 is self-contained, environmentally sealed,

compact, and provides low power consumption.

The terminal includes an omnidirectional antenna, satellite modem, GPS, programmable microcontroller, accelerometer,

and several I/O (input/output) feeds capable of monitoring and controlling external sensors and terminals.

The built-in programmability allows it to work as a standalone terminal with built-in I/O data collection and

processing capabilities. Each model is suitable for both mobile and fixed installations.

Feature-rich software tools make scripting easy and shorten the script design and testing time.

Table 1: ST 6200 Model

Model	Pins	Configuration
ST 6200	10-pin	side or bottom mount

Terminals are available in two configurations: bottom connector or side connector (see figures below)

Figure 2: ST6200 with Side Connector (isometric)
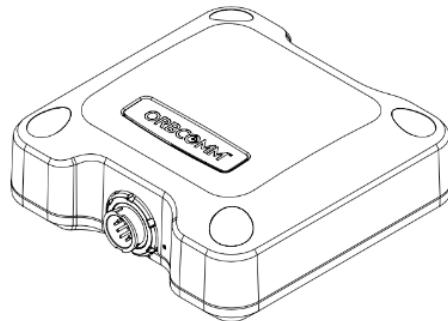
Figure 3: ST 6200 with Bottom Connector
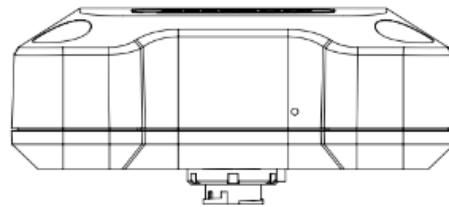
1.2   Key Features and Benefits

The ST 6200 has the following key features and benefits:

- Designed to be used as a standalone or incorporated into a Solution Provider's (SP) solution

- Built-in multi-GNSS receiver to calculate position, speed and heading with SP-preferred constellation

- Quick and easy installation reduces labor time and costs

- Very low power consumption enables a wide variety of autonomous applications

- Ships with installed firmware that is over-the-air upgradeable for significant cost and schedule savings, and convenience

- Wide operational temperature range to support a very broad range of applications and geographies

- Rugged construction to support applications in the harshest environments

- Supports SP-developed application scripts with Lua Service Framework, enabling SPs to introduce an extremely high level of customization

- Supports ORBCOMM out-of-the-box Agents that provide proven sophisticated applications with configurability, allowing reduced time to market for SPs

1.3   Operational States

The terminal has several operational states.

Table 2: Operation States

Operational States	Description
Transmit	In transmit mode the terminal is transmitting a signal to the satellite.
Receive	In receive mode the terminal is attempting or actively listening to the satellite
Processing	In its processing ode the Lua service is actively running. For example, a wake-up to monitor a geofence.
Sleep	There are two parts to this state in a terminal. The modem turns itself off between wake-up intervals. Both the terminal and gateway track the wake-up interval. Consequently, when a terminal is in sleep it does not miss incoming messages. If a modem has a message to send, it automatically exits sleep state without waiting for the next wake-up interval. The other part of this state is when the terminal is set to Power Save, which is enabled by default. In power save, the terminal's controller draws minimal current. It monitors its external inputs (digital and serial) for activity and reacts as required by transitioning to processing state with no loss of information such as incoming serial characters.
Idle	With IsatData Pro, a modem receives messages in one of the 10 half second subframes. In Idle state the modem turns off its receiver waiting for its next assigned subframe. The modem automatically enters Idle state on its own, independent of the application. If Power Save is disabled and the terminal is not receiving or transmitting or processing, it is in the Idle state.

2. COMPLIANCE

The following certifications are pending for the ST 6200:

1. **Industry Canada**

    RSS-170: CONTAINS IC: 11881A-ST6002

    This device contains licensed transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licensed RSS(s). Operation is subject to the following two conditions:
    (1)   This device may not cause interference.
    (2)   This device must accept any interference, including interference that may cause undesired operation of the device.
    This device complies with the Canadian ICES-003 Class B specifications. CAN ICES-003(B) / NMB-003 (B).

    L'émetteur/récepteur autorisée contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio autorisée. L'exploitation est autorisée aux deux conditions suivantes :
    (3)   L'appareil ne doit pas produire de brouillage;
    (4)   L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
    Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada..

2. **FCC**

    1). 47 CFR Part 25: CONTAINS FCC ID: XGS-ST6002

    2). 47 CFR Part 15

    *   FCC Compliance Statement
         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.
    *   FCC Part 15, Radio Frequency Devices.
    *   FCC OET Bulletin 65 Edition 97-01, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, August 1997.

CAUTION: Mount the terminal at least 25 cm away from humans.

CE Mark

ANATEL

RCM

SAE JI455

Ingress Protection

IEC 60945

FFA

ROHS

* Restriction of Hazardous Substances (RoHS)[1]

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

3.   SPECIFICATIONS

3.1 Temperature

Table 3: Temperature

Parameter	Value
Operating Temperature	-40º to +85ºC
Storage Temperature	-40º to +85ºC

3.2 Connector

The terminals use a circular 10-pin (Chogori) connector.

Table 4: Connector

Parameter	Part Number
Mating Connector kit	ST100030-001

3.2.1 Connector Pin Assignment

Figure 4: Terminal Connector Pin Assignment (Male)
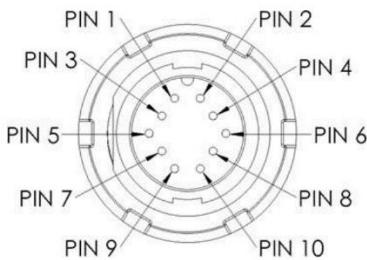
Table 5: Electrical Pin Assignment (ST6200)

Pin	Functionality	Pin	Functionality
1	RS-485 A	2	RS-485 B
3	GND	4	VIN
5	I/O 02	6	I/O 03
7	I/O 01	8	I/O 04
9	RS-232 Tx (Output)	10	RS-232 Rx (Input)

Figure 5: View of terminal Male Connector

Figure 6: Face View of Mating Connector (Female)
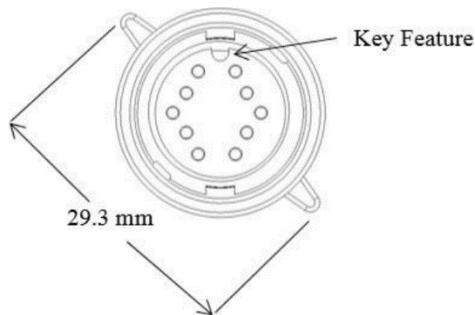
Figure 7: Rear View of Mating Connector (Solder Cups)

3.3 Power

3.3.1 Input Range

Table 6: Input range

Parameter	Value
Power Supply Voltage	9 to 32 V DC
Reverse Polarity Protection	-40 V maximum

3.3.2 Power Consumption

Typical power consumption values at VIN=12 V and at room temperature (23°C)

Table 7: Power Consumption

State of Operation	Current
Transmit	700 mA
Satellite communications receive	70 mA
Sleep	100 µA
	Current
GNSS Power Consumption	30 mA
Peripheral	Current
LED	10 mA

3.3.3 Load Dump Circuitry

The terminal's power supply input voltage range is 9 to 32 V. Above this range the load dump protection circuitry disconnects external power so that the terminal is not damaged, up to 150 V. When the input voltage drops below the threshold, the terminal recovers, going through power on reset.

With this protection, the terminal is capable of withstanding load dumps as specified in SAE JI455 (rev JUN2006) paragraph 4.13.2.2.1.

3.3.4 Fuse

The terminals have an internal 5 A fuse, which provides protection in the event of an internal short on the terminal. The internal fuse cannot be reset and is not field repairable.

3.3.5 Inrush current

Inrush current transients occur when the terminal is:

- First powered on.

- Preparing for transmit. This is when the terminal switches its internal voltage rail to a higher voltage for transmitting.

- Terminal starts to transmit. This is when the terminal's power amplifier is turned on.

Table 8: Inrush Current[1]

Operation Mode	Inrush Current on Input_Power -Amplitude- (A)
Power On	1.5
Transmit	1.0

3.4   Input/Output

The terminal's four configurable I/O lines are each independently operable in one of the following modes:

- Digital Input

- Digital Output

- Analog Input

- Disabled

3.5 Serial Interfaces

3.5.1 RS-232

The RS-232 interface defaults to the following settings: 9600 bps, I start, 8 data, I stop bit, no parity. The baud rate is configurable up to 115,200 bps.

- Rx is protected up to ±25 V

- Tx is protected up to ±13.2 V

- Rx and Tx have ±15 kV ESD protection

The electrical characteristics of the interface are:

3.5.2 Auto RS-232 Power On/Off

The terminal uses the input voltage to turn the RS-232 driver on/off when auto RS-232 mode is selected.

Table 9: Auto RS-232 Power On/Off

Parameter	Value
Valid Rx Input Threshold	Rx > 2.7 V or Rx < -2.7 V
Invalid Rx	-0.3 V < Rx < 0.3 V

3.5.3 RS-485

The electric characteristics of the two wire RS-485 interface are below.

Table 10: RS-485

Parameter	Min	Typical	Max.	Units
Input Common Mode Voltage	-7.0	-	+12.0	V
Differential Input Threshold	-200	-	200	mV
Output Common Mode Voltage	-	1.5	3.0	V
Differential Drive Output, 54Ω load	1.5	-	3.3	V

3.6   RF Specifications

3.6.1 Frequency

Table 11: RF Frequency

Parameter	Value
Receive	
Frequency Band	1525 to 1559 MHz
Modulation	OQPSK
Symbol Rate	3000 symbols/second
Polarization	RHCP
Transmit	
Frequency Band	1626.5 to 1660.5MHz
Modulation	OQPSK
Symbol Rate	900 symbols/seconds (maximum)
Polarization	RHCP

3.6.2 Antenna

Table 12: Antenna

Parameter	Value
Maximum EIRP	7 dBW
Elevation Angle	0 to 90 degrees
Maximum transmit antenna gain	2.5 dBi

3.7   GNSS

The device supports multiple GNSS including GPS, GLONASS, BeiDou GPS/GLONASS, and GPS/BeiDou.

Table 13: Multi-GNSS Specifications

Parameter	Value typical
Time to first fix	
Cold start	30 s
Hot start	1 s
Sensitivity	
Tracking	-166 dBm

Hot Start	-156 dBm
Cold Start	-148 dBm
Accuracy	
Horizontal Position (CEP)	3.0 m
Velocity	0.1 m/s
Heading	0.3 degrees

1CEP, 50%, 24 hours static, -130 dBm

3.8 Accelerometer

The terminal has an internal 3D accelerometer to detect motion in any axis. Figure below shows the positive axes for the accelerometer.

Figure 8: Accelerometer Axis
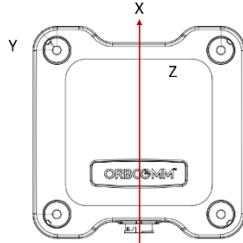
The accelerometer is very important for low power terminals when it is critical to save power while stationary and quickly detect when motion starts. In powered terminals where low power is not critical, GPS can be polled to detect motion. However, for low power applications frequent GPS fixes can dominate the power budget. To reduce power budget effects of GPS fixes, an accelerometer can be used to trigger a GPS fix to detect if motion occurred.

The accelerometer thresholds to detect motion vary depending on the environment. In order to avoid, false motion detects, extensive testing is required to ensure that adequate acceleration magnitude thresholds and time durations are used. Refer to [T405] for further details about the accelerometer.

3.9 Mechanical

The terminal's mechanical enclosure is a rugged, impact, and chemical resistant plastic material. All dimensions are shown in inches (in.).

**Figure 9**: ST6200 Top View Side Connector Enclosure Dimensions

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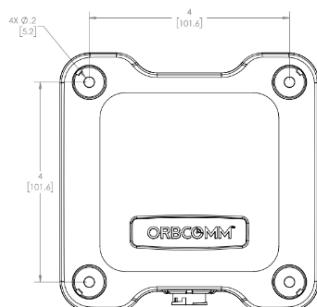
**Figure 10**: ST6200 Side View Enclosure Dimensions
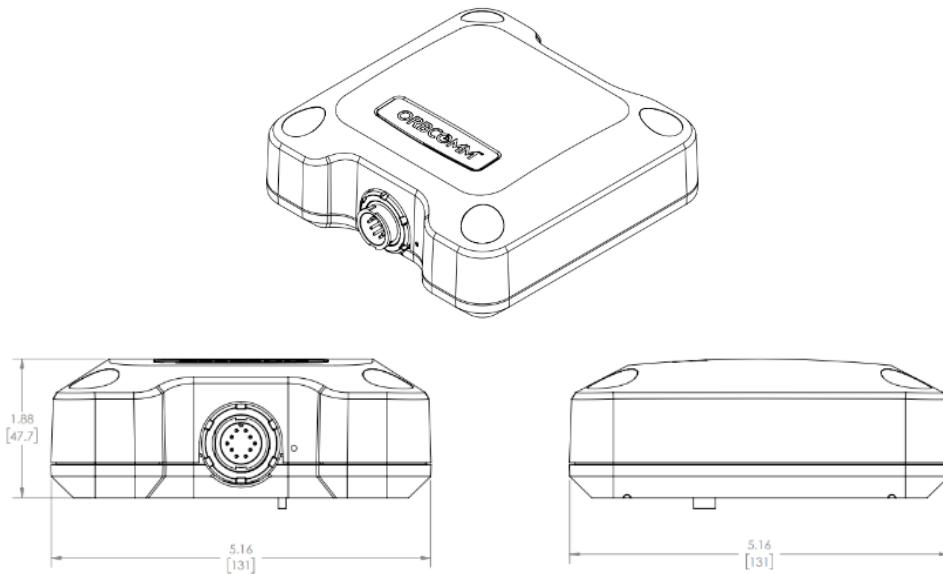
Figure 11: ST6200 Top View of Bottom Connector Enclosure
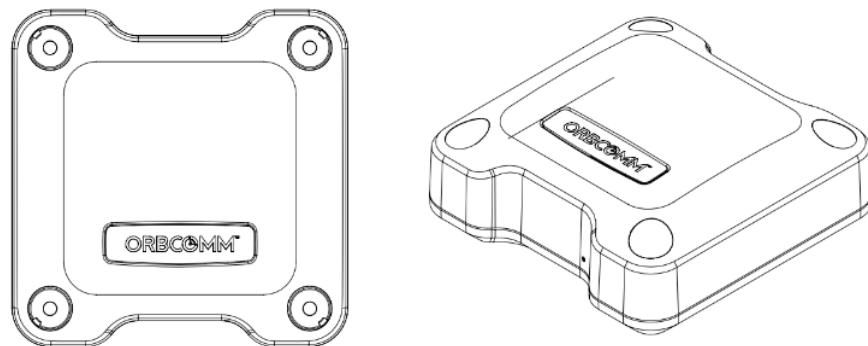
**Figure 12**: ST6200 Bottom View of Bottom Connector Enclosure

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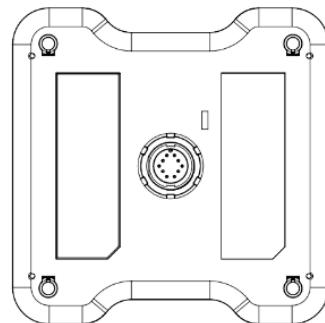
Figure 13: ST6200 Side View of Bottom Connector Enclosure
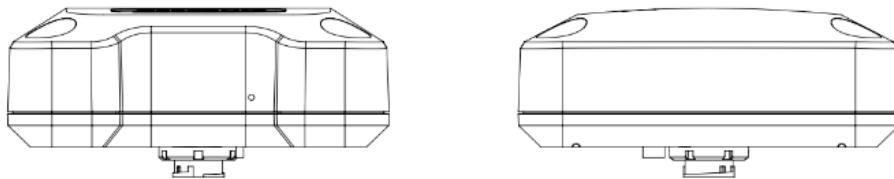
Table 14: Mass and Materials

Parameter	Value
Terminal mass	315 g
Enclosure Material	Lexan EXL9330 Resin

3.10 LED

The terminal has an integral LED to indicate that the terminal has successfully powered on, otherwise it is off.

Table 15: LED

Parameter	Value
Color	White

3.11 Environmental

Table 16: Environmental

Parameter	Description
Humidity	The terminal meets all its specifications during exposure to 90% relative humidity at +85ºC, per the test methodology of SAE J 1455, section 4.2.3.
Vibration	The terminal meets all its specifications during exposure to random vehicular vibration levels per SAE J 1455, section 4.9.4.2 and MIL-STD-810G, section 514.6, fig 514.6C-I.
Mechanical Shock	The terminal 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, 3/axis/(positive and negative direction).
Altitude	The terminal meets all of its specifications after a nonoperating 12.2 km altitude test as detailed in SAE J 1455, section 4.9.3, except with an ambient temperature of -40ºC.
Thermal Shock	The terminal meets all of its specifications after a thermal shock test as detailed in SAE J 1455, section 4.1.3.2
Salt Spray Atmosphere	The terminal meets all of its specifications after a salt spray test as detailed in SAE J 1455, 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 J 1455, section 4.3.3.2.
	The terminal meets all of its specifications after a 30 minute, 1 m depth fresh water immersion test as detailed in IEC 60529, section 14.2.7.
	These immersions were performed without a cable mating with the circular connector.
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
	Antifreeze 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 steam cleaning and 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.
	The terminal meets the acceptance conditions of IEC 60529, section 13.6.2 after a dust and sand bombardment test as detailed in IEC 60529, section 13.4.
Drop Test	The terminal meets all of its specifications after aa handling drop test as specified in SAE J1455, section 4.11.3.1.
ESD	The terminal shall meet all its specifications after exposure of the enclosure to 15 kV ESD air discharge per IEC 60945 and IEC61000—4-2, level 4.