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# ORBCOMM™

CONNECTING THE  
WORLD'S ASSETS



## ST 6100

### Hardware Guide

T406, Version 01  
Dec 2017

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## PREFACE

### Purpose

This document provides an overview of the hardware characteristics and specifications for the ST 6100.

### Notation

Hardware components and hardware stickers 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.

### Reference

The content of the following documents may be useful in conjunction with this guide. These documents are available from the ORBCOMM Developer Toolkit or customer support.

[N200]	IsatData Pro Network Services Overview
[T405]	IsatData Pro Services API Reference for FW v3.x



# 1 PRODUCT OVERVIEW

Each ST 6100 consists of a single environmentally sealed mechanical enclosure containing an integral antenna, a satellite modem for communicating with the satellite, an integral GPS subsystem, four input/output ports, an RS-232 port, and an RS-485 port. The ST 6100 is available in various configurations.

Figure 1: ST 6100



Each ST 6100 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 6100 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 Terminals

The ST 6100 ([Table 1](#)) operates on the IsatData Pro network. The ST 6100 is self-contained, environmentally sealed, compact, and provides low power consumption.

Terminals include 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 61xx Models

Model	Pins	Configuration
ST 6100	10-pin	side or bottom mount

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

Figure 2: ST 6100 with Side Connector

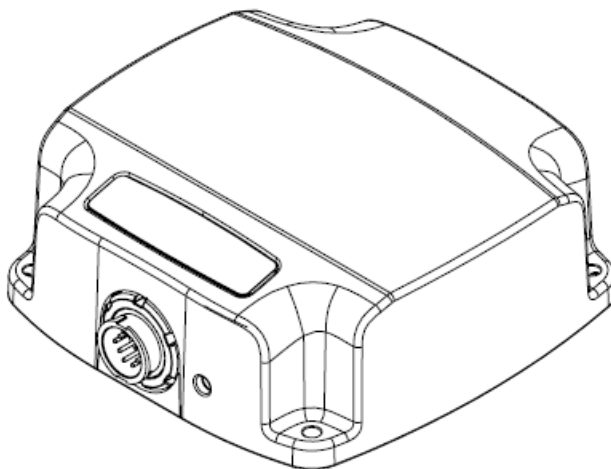
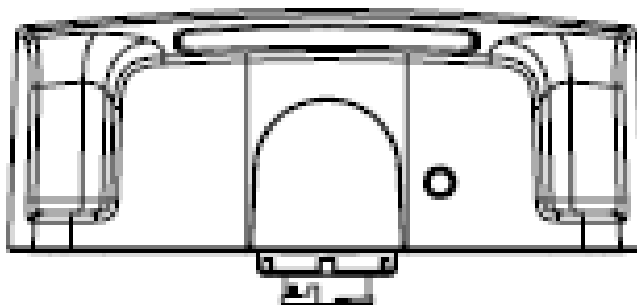


Figure 3: ST 6100 with Bottom Connector



## 1.2 Key Features and Benefits

The ST 6100 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: Operational 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 mode the Lua services are 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.

### 1.3.1 Application Peripherals

These peripherals are either on or off. Power consumption is affected when they are powered on.

Table 3: Application Peripherals

Operational States	Description
GNSS	Can be powered on independently of the IsatData Pro receiver.

Operational States	Description
RS-232	When the RS-232 is on, the RS-232 transmit driver is enabled and the related serial clocks in the application controller are active.
RS-485	When the RS-485 is on, the RS-485 driver is enabled and active.
LED	The LED can be enabled by the software.
I/O Active/Inactive	The I/Os can be configured as inputs or outputs.

## 2 COMPLIANCE

The terminal has received the following certifications:

### Inmarsat Type Approval

The following certifications are pending for the ST 6100:

### Industry Canada

### FCC Part 15

### FCC Part 25

CAUTION: Mount the terminal at least 20 cm away from humans.

### CE Mark

### SAE J1455

### Ingress Protection

### RoHS

- Restriction of Hazardous Substances (RoHS) <sup>1</sup>

### Anatel

---

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

## 3 SPECIFICATIONS

### 3.1 Temperature

Parameter	Value
Operating Temperature	-40° to +85°C
Storage Temperature	-40° to +85°C

### 3.2 Connectors

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

Parameter	Part Number
Mating Connector Kit	ST100030-001

#### 3.2.1 Connector Pin Assignment

Figure 4: Terminal Connector Pin Assignment (Male)

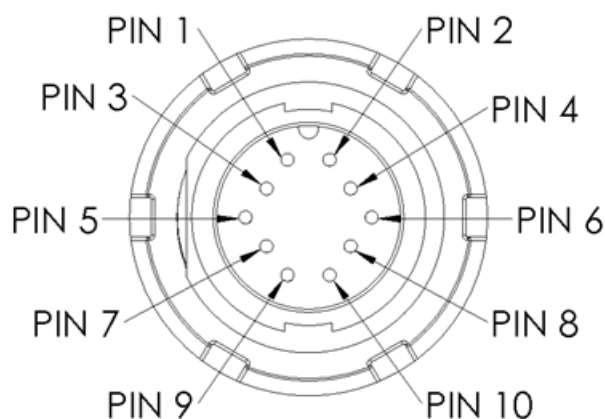


Table 4: Electrical Pin Assignment (ST 6100)

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)

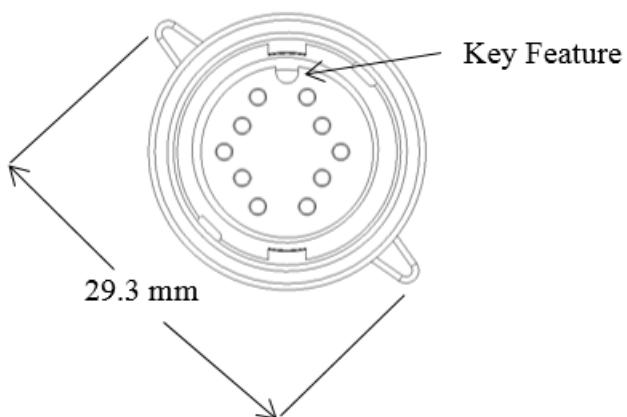


Figure 7: Rear View of Mating Connector (Solder Cups)



## 3.3 Power

### 3.3.1 Input Range

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 5: Power Consumption

State of Operation	Current
Transmit	652 mA
Satellite communications receive	59 mA
Sleep	100 µA
	Current
GNSS Power Consumption	22 mA
Peripheral	Current
LED	7.2 mA

#### 3.3.2.1 Average Power Consumption

The satellite receive current is specified at 59 mA. At times, the receiver might continuously be on when the terminal is searching for a satellite signal, receiving network updates or waiting for acknowledgment responses. However, in normal operation the receiver is not on continuously, instead it wakes up once every five (5) seconds to receive, which results in an average 7.6 mA consumption, at 12 V (152 mAh/day).

In low power mode, the average terminal power consumption is decreased further depending on the wake-up period that extends the modem wake-up period from a default five (5) seconds. The overall power consumption depends on many factors including how often the modem wakes to receive to-mobile messages, how often GPS fixes are requested, the size and frequency of mobile messages and LED settings. Refer to [\[T204\]](#) for additional details on low power operation.

#### 3.3.2.2 Blockage Power

If a terminal is blocked so that it cannot receive the satellite signals, it must scan to reacquire the traffic channels. While scanning for traffic channels, the terminal consumes more power than when it has acquired a traffic channel. For powered applications, the terminal continually scans for a satellite so that it can reacquire quickly when blockage is removed. Refer to [\[N200\]](#) for additional details on network blockage behavior.

The table below shows the terminal configured for MobileMinBattery power profile and with 3 minute and 1 minute GPS fix timeouts. The GPS fix time is a modem register that limits the amount of time the terminal waits for a GPS fix. A long GPS fix time as per the 3 minute default allows time for the GPS to acquire in a partially blocked location. However, GPS consumes considerable power and shortening the acquisition time saves power if terminal is blocked and will never acquire GPS. The GPS Fix time can be restricted by two properties maxFixTimeout (PIN 20) and acquireTimeout (PIN 19) in the Position service (SIN 20). maxFixTimeout defines the timeout for any fix while acquireTimeout defines the timeout for the GPS to see at least one satellite.



Table 6: Blockage Power Consumption (Power Profile = MobileMinBattery)

Blockage Mode	Blockage Recovery Check Interval	3 Minute Maximum GPS Acquisition Time	1 Minute Maximum GPS Acquisition Time
No Blockage - Baseline operation with 1 report	-	Baseline Operation Power consumption as per Power Calculator	
Short Term Blockage (First 2.3 hours of blockage)	5 to 40 minutes. Interval starts at 5 and doubles each attempt.	5.5 times Baseline	
Medium Term Blockage (2.3 hours to 68 hours of blockage)	40 minutes to 24 hours. Interval starts at 40 minutes and doubles each attempt.	1.9 times Baseline	1.0 times Baseline
Long Term Blockage (more than 68 hours)	24 hours	1.2 times Baseline	0.8 times Baseline

### 3.3.2.3 Blockage Recovery

In the battery powered profiles, a consequence of the blockage algorithm is that the longer the terminal is blocked, the longer it takes for the terminal to detect that the blockage condition has been removed. However, an application could use external events such as a digital input (connected to ignition) to force the terminal to force a new satellite channel search if movement is likely to have occurred.

The satellite traffic channel check can be forced by writing any value, including the current value to the modem's wake-up interval. It is important that the application not write to the wake-up interval frequently, as each write will trigger a search that consumes significant power. When the application forces a check by writing to the wake-up interval, the terminal blockage algorithm resumes normal operation if the traffic channel is correctly received. If the terminal cannot find the traffic channel after the search, the terminal resumes the blockage algorithm.

A satellite traffic channel check can also be forced by changing the power mode. In this case, the blockage algorithm restarts all its timers and commences again from the beginning if traffic channels are not detected.

### 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 150V. 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 J1455 (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 7: Inrush Current<sup>1</sup>

Operation Mode	Inrush Current on Input_Power		
	Amplitude (A)	Period (ms)	Charge (mC)
Power On	1.2	1.5	0.45
Receive On	0.541	0.4	0.075
Transmit	0.722	13.6	5.5

### 3.4 Input/Output

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

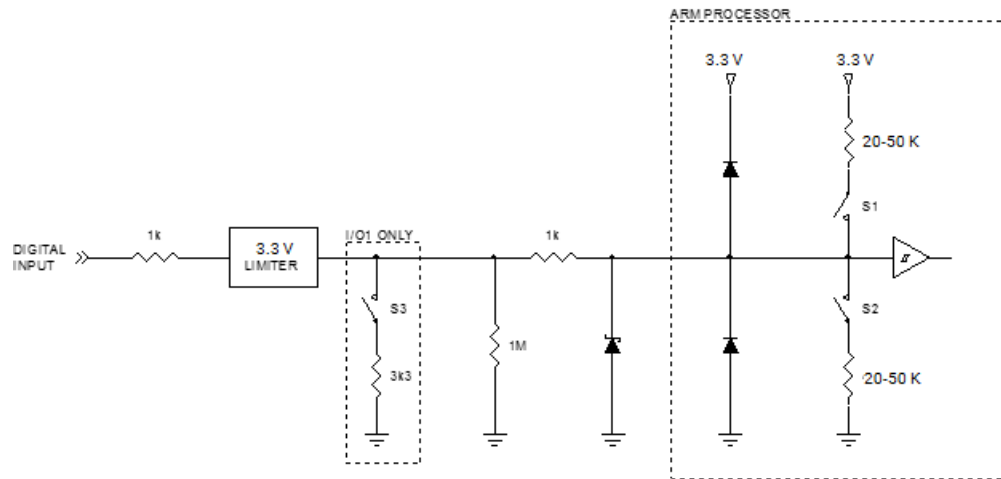
- Digital Input
- Digital Output
- Analog Input
- Disabled

<sup>1</sup>Input voltage is 12 V at 23°C.

### 3.4.1 Digital Input

The figure below shows a schematic of the I/O when configured as a digital input.

Figure 8: Digital Input



Input Type	S1	S2	S3
With weak pull-down	Open	Open	Open
With pull-down	Open	Closed	Open
With pull-up	Closed	Open	Open
Ignition Detection	Open	Open	Closed

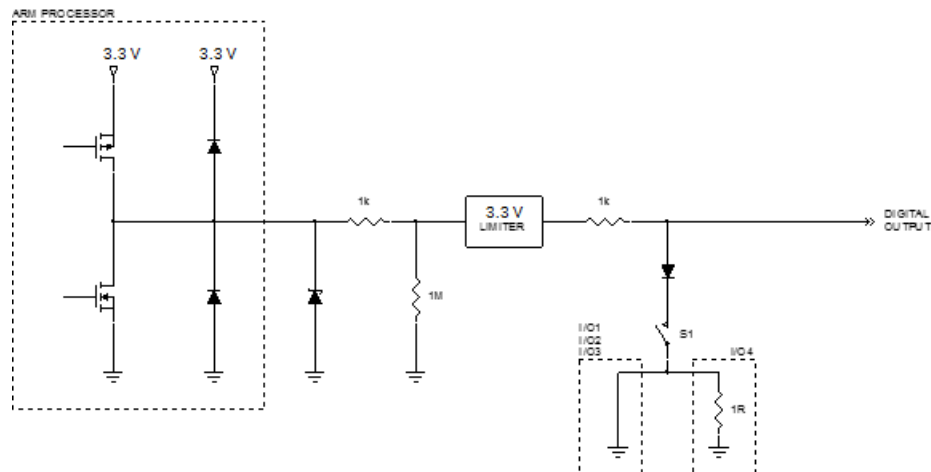
The input specifications are provided in the table below.

Parameter	Min.	Typical	Max.	Units
Input low range	-10	-	1.05	V
Input high range	1.95	-	150	V
Input current with weak pull-down (weak 1 MΩ pull-down still in place); $V_{in} = 3.0$ V	-	3	-	μA
Input source current with pull-up ( $V_{in} = 0.0$ V)	-	75	-	μA
Input sink current with pull-down ( $V_{in} = 3$ to 150 V)	-	81	-	μA
Input bandwidth	1	-		kHz

### 3.4.2 Digital Output

The figure below shows a schematic of the I/O when configured as a digital output. It must be noted that I/O 04 is the only I/O with built-in short circuit protection for open drain outputs.

Figure 9: Digital Output



Push-pull	S1 = Open
Open drain	S1 = Closed (Low Impedance) S1 = Open (High Impedance)

The following tables describe the output specifications.

#### Push-pull

In the push-pull configuration the output is driven directly from the microprocessor.

Parameter	Min.	Typical	Max.	Units
Output high voltage - open circuit	3.14	3.3	3.47	V
Output high voltage (sourcing 25 $\mu$ A)	2.80	-	-	V
Output low voltage (sinking 25 $\mu$ A)	-	-	0.06	V
Output pulse rate	-	-	10 <sup>1</sup>	Hz
Output bandwidth	100	-	-	Hz

#### Open Drain

Parameter	Min.	Typical	Max.	Units
Sink current (do not exceed)	-	-	250	mA
Output voltage (sinking 250 mA)				
I/O 01 to I/O 03	-	1.15	1.35	V
I/O 04	-	1.40	1.60	V
Turn-On Delay (I/O 04 only)	140	200	280	ms
Absolute limits (high impedance)	-10	-	150	V

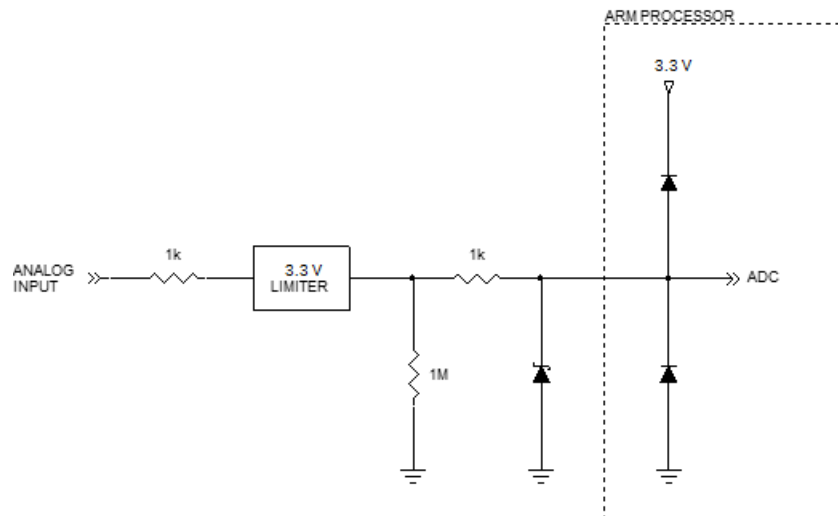
<sup>1</sup>This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the output bandwidth.

Parameter	Min.	Typical	Max.	Units
Output pulse rate	-	-	10 <sup>1</sup>	Hz
Output bandwidth	100	-	-	Hz

### 3.4.3 Analog Input

The figure below shows a schematic of the I/O when configured as an analog input.

Figure 10: Analog Input



Parameter	Value	Units
Input impedance	1	MΩ (typical)
Measurement voltage range	0 to 3.3	V
Resolution	0.806	mV (12 bits)
Accuracy	1.5% + 2	LSB
Voltage limits	-10 to 150	V
Input sample rate	-10	Hz <sup>2</sup>
Input bandwidth	1	kHz minimum

#### 3.4.3.1 Analog Accuracy

The terminal measures the analog inputs using the GND pin as a reference. As the GND pin is shared with the power supply, return current can create a voltage drop between the GND pin and the power supply, which in many cases

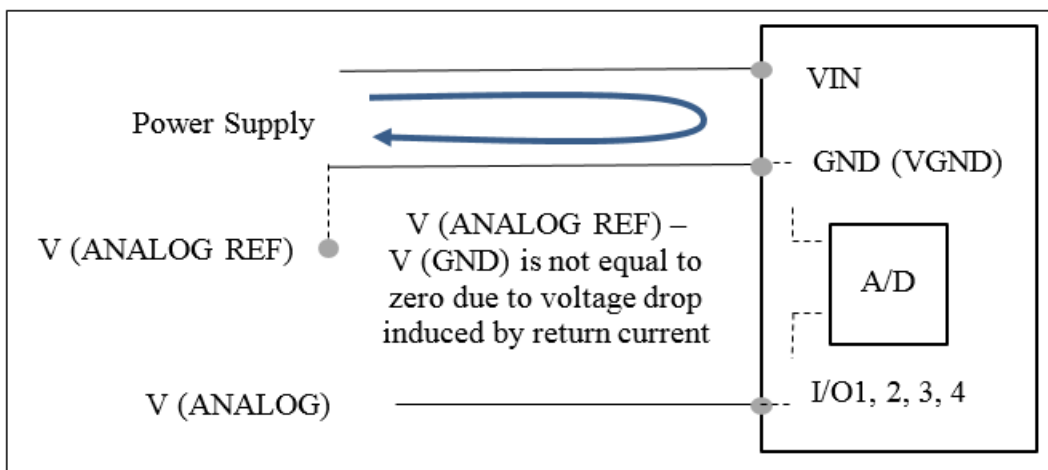
<sup>1</sup>This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the output bandwidth.

<sup>2</sup>This value is dependent on the Lua services being used. This is not a hardware limitation. The hardware limit is specified by the input bandwidth.

changes the reference point for the analog voltage.

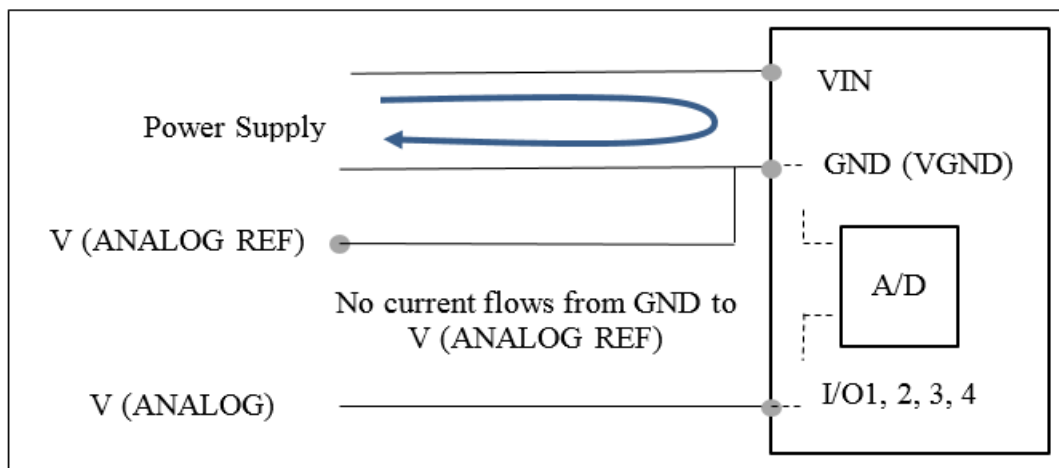
If analog accuracy is required, as per [Figure 11](#), the power supply cables should be designed to limit voltage drop. As well, the application should be aware that current is a function of input voltage and the operating mode (receive, transmit, sleep).

Figure 11: Analog Accuracy by Limiting Voltage Drop on Return Current



Alternatively for accurate analog measurements, the analog reference can be connected on a separate conductor to GND as per [Figure 12](#). In this case, it is important that the power supply's return is fully isolated from the analog reference voltage to ensure return current does not flow to analog reference.

Figure 12: Analog Accuracy with Independent Analog Reference



## 3.5 Serial Interfaces

### 3.5.1 RS-232

The RS-232 interface defaults to the following settings: 9600 bps, 1 start, 8 data, 1 stop bit, no parity. The baud rate is configurable up to 115,200 bps.

- Rx is protected up to  $\pm 25$  V
- Tx is protected up to  $\pm 13.2$  V
- Rx and Tx have  $\pm 15$  kV ESD protection

The electrical characteristics of the interface are:

Parameter	Min.	Typical	Max.	Units
Serial Rx Input Low Threshold	0.6	-	-	V
Serial Rx Input High Threshold	-	-	2.4	V
Serial Tx Low Output (3 k $\Omega$ load)	-	-	-5.0	V
Serial Tx High Output (3 k $\Omega$ load)	5.0	-	-	V

#### 3.5.1.1 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.

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

### 3.5.2 RS-485

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

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, 54 $\Omega$ load	1.5	-	3.3	V

## 3.6 RF Specifications

### 3.6.1 Frequency

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

### 3.6.2 Antenna

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

## 3.7 GNSS

The manufacturer's specifications are given in the table below.

Table 8: Multi-GNSS Specifications

Parameter	GPS	GLONASS	BeiDou	GPS/GLONASS	GPS/BeiDou
<b>Time to First Fix<sup>1</sup></b>					
Cold Start	29 s	30 s	36 s	26 s	27 s
Hot Start	1 s	1 s	1 s	1 s	1 s
<b>Sensitivity</b>					
Tracking	-166 dBm	-166 dBm	-160 dBm	-167 dBm	-165 dBm
Hot Start	-156 dBm	-155 dBm	-155 dBm	-156 dBm	-156 dBm
Cold Start	-148 dBm	-145 dBm	-138 dBm	-148 dBm	-148 dBm

<sup>1</sup>All satellites at -130 dBm

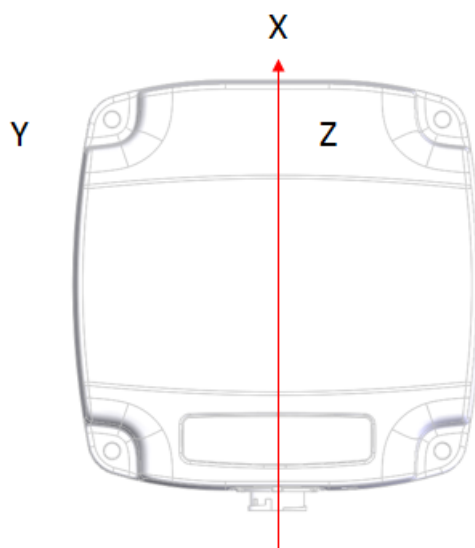


Parameter	GPS	GLONASS	BeiDou	GPS/GLONASS	GPS/BeiDou
<b>Accuracy</b>					
Horizontal Position (CEP) <sup>1</sup>	2.5/2.0 m	4.0 m	3.0 m	2.5/2.0 m	2.5/2.0 m
Velocity	0.05 m/s	0.1 m/s	0.1 m/s	0.05 m/s	0.05 m/s
Heading	0.3 degrees	0.4 degrees	-	0.3 degrees	0.3 degrees

### 3.8 Accelerometer

The terminal has an internal 3D accelerometer to detect motion in any axis. Figure 13 shows the positive axes for the accelerometer.

Figure 13: 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.

<sup>1</sup>CEP, 50%, 24 hours static, -130 dBm

Table 9: Accelerometer Specifications

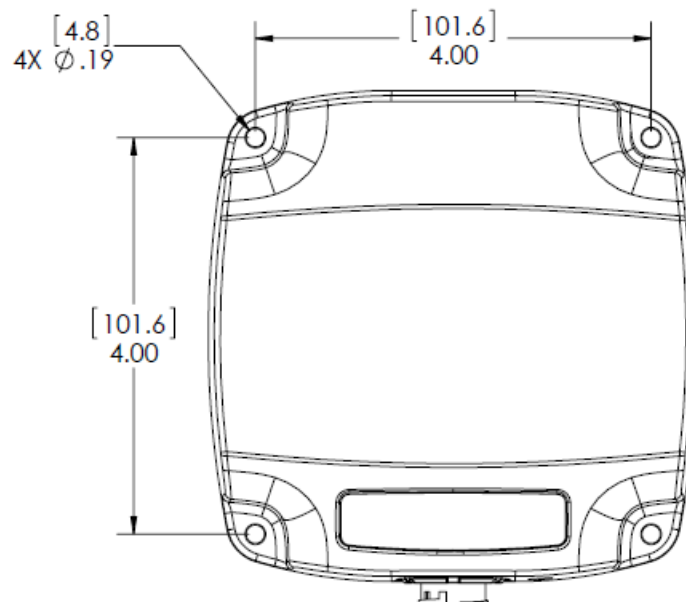
Parameter	Condition	Min.	Typical	Max.	Units
Resolution	2 g	-	3.91	-	mG
Tracking	software selectable	-	±2	-	g
		-	±4	-	g
		-	±8	-	g
		-	±16	-	g
Bandwidth Filtering	Selectable via digital interface	8	-	1000	Hz
Sensitivity	2 g	-	256	-	LSB/g
	4 g	-	128	-	LSB/g
	8 g	-	64	-	LSB/g
	16 g	-	32	-	LSB/g

If using the accelerometer, mount the terminal in one of the configurations shown in [T405].

### 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 14: ST 6100 Top View Side Connector Enclosure Dimensions



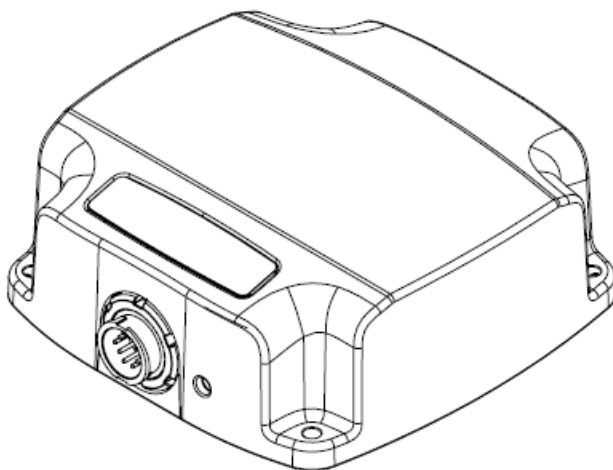


Figure 15: ST 6100 Side View Enclosure Dimensions

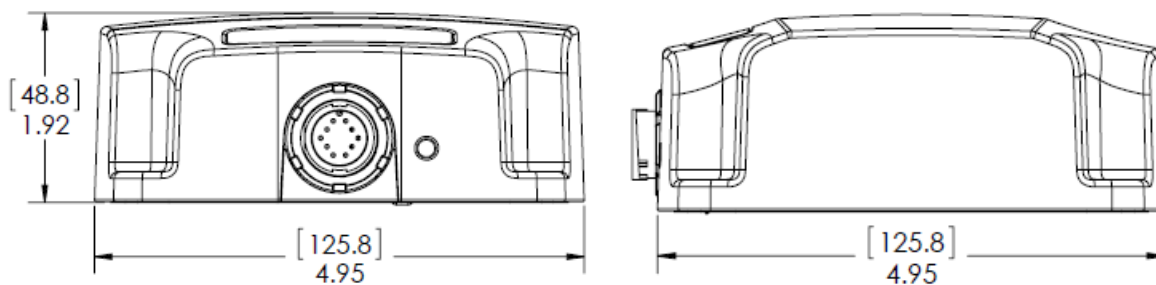


Figure 16: ST 6100 Top View of Bottom Connector Enclosure

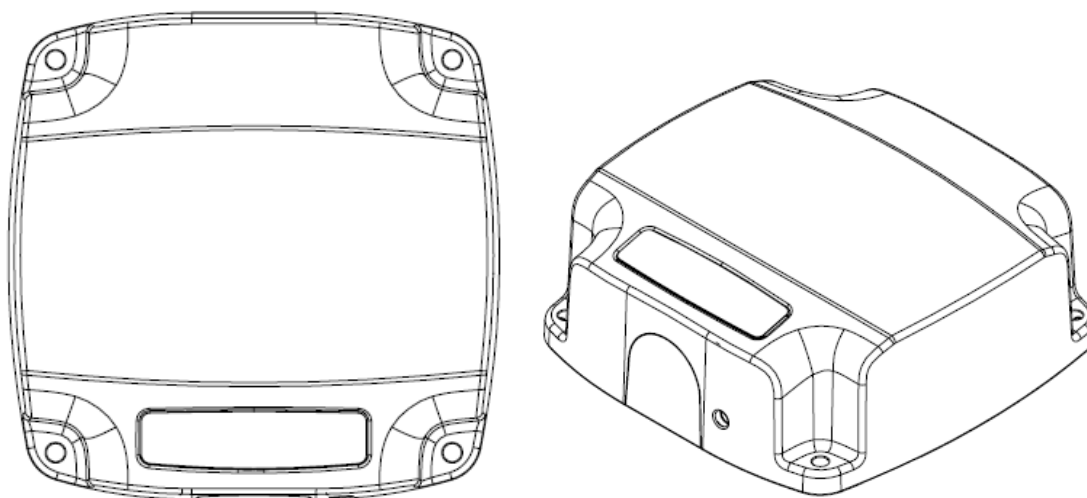


Figure 17: ST 6100 Bottom View of Bottom Connector Enclosure

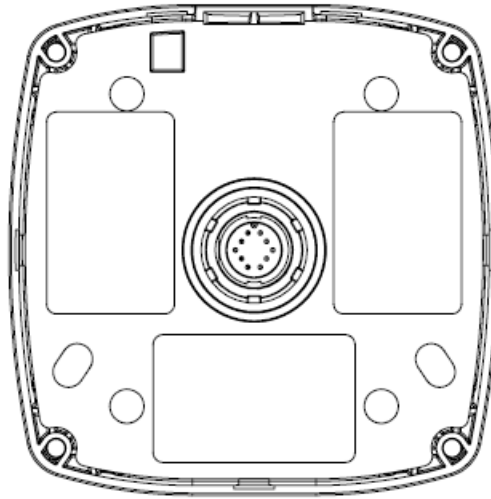


Figure 18: ST 6100 Side View of Bottom Connector Enclosure

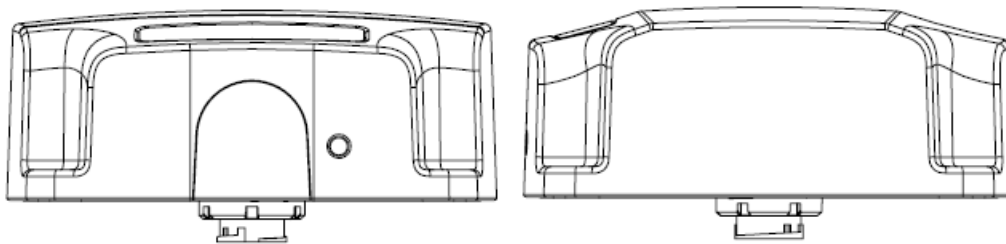


Table 10: Mass and Materials

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.

Parameter	Value
Color	White

### 3.11 Nonvolatile Storage

The terminal has nonvolatile flash memory, which is shared by both the terminal firmware and user services.

Parameter	Value
Nonvolatile Onboard Flash Storage	8 MB
Write-Erase Cycles (per operating life)	100 000

### 3.12 RAM

Parameter	Value
RAM (volatile memory)	4 MB

### 3.13 Environmental

Parameter	Description
Humidity	The terminal meets all its specifications during exposure to 90% relative humidity at +85°C, per the test methodology of SAE J1455, section 4.2.3.
Vibration	The terminal meets all its specifications during exposure to random vehicular vibration levels per SAE J1455, section 4.9.4.2 and MIL-STD-810G, section 514.6, fig 514.6C-1.
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 J1455, section 4.9.3, except with an ambient temperature of -40°C.
Thermal Shock	The terminal meets all of its specifications after a thermal shock test as detailed in SAE J1455, section 4.1.3.2
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	<p>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.</p> <p>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.</p> <p>These immersions were performed without a cable mating with the circular connector.</p>

Parameter	Description
Exposure to Chemicals and Oils	<p>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:</p> <p>Window Washer Solvent</p> <p>Gasoline</p> <p>Diesel Fuel</p> <p>Fuel Additives</p> <p>Alcohol</p> <p>Antifreeze Water Mixture</p> <p>Degreasers</p> <p>Soap and Detergents</p> <p>Steam</p> <p>Waxes</p> <p>Kerosene</p> <p>Freon</p> <p>Spray Paint</p> <p>Paint Strippers</p> <p>Ether</p> <p>Dust Control Agents (magnesium chloride)</p> <p>Moisture Control Agents (calcium chloride)</p> <p>Ammonia</p> <p>Aluminum brightener (acid wash)</p>
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	<p>The terminal meets all of its specifications after a dust and sand bombardment test as detailed in SAE J1455, section 4.7.3.</p> <p>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.</p>
Drop Test	The terminal meets all its specifications after a 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.