

ORBCOMM®

CONNECTING THE
WORLD'S ASSETS



ST 9100

Installation Guide

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PREFACE

Purpose

This document is as an overview of the installation procedures for the ST 9100 terminal.

Note: This is a Beta Trial document. Information in this document is subject to change.

Notation

A terminal consists of a transceiver unit plus antennas.

Hardware components, labels, and figures 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 might be useful in conjunction with this guide. These documents are available from the downloads section at support.skywave.com guide or from the ORBCOMM Developer Toolkit (ODT), which is also available from the website.

Document names and numbers are subject to change, or be discontinued, without notice.

[N210]	IsatData Pro Gateway Web Service 2 User Guide
[N206]	MTWS Cellular Protocol
[T404]	LSF Developer Guide FW v4.x
[T405]	IsatData Pro Service API Ref FW v4.x.x
[T413]	ST 9100 Hardware Guide

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.



1 INSTALLATION

The following section contains recommended installation guidelines for the Solution Provider (SP). These recommendations should be incorporated into installation guidelines for end users.

CAUTION: The installer is responsible for following all safety guidelines during product installation. Refer to the [Preface](#) section for details.

The terminal uses very low power during transmission and therefore presents no radiation hazard during normal use, installation, testing, and troubleshooting.

1.1 Getting Started

Getting the ST 9100 ready for operation requires doing the following:

1. Prepare for the installation (Section [1.2](#))
2. Determine a suitable mounting location (Section [1.3](#))
3. Mount the antennas (Section [1.4](#))
4. Route the main cable (Section [1.5](#))
5. Connect the cables and mount the ST 9100 (Section [1.6](#))
6. Connect to power (Section [1.7](#))
7. (optional) Attach the terminal shroud (Section [1.8](#))
8. Register the terminal (Section [1.9](#))

1.2 Prepare for the Installation

Check that you have the items and tools listed below before installing the terminal.

1.2.1 Shipping Box Contents

Unpack the contents of the shipping boxes, and then use the list below as a guide to check that you received the items you ordered.

- ST 9100 (p/n ST9100-D01 for use in the Americas, and ST9100-C01 for use outside of the Americas)
- Power and I/O connector (p/n ST101096) or blunt cut cable assembly (p/n ST101062-002)
- Cellular antenna with FAKRA connector (p/n ST101066-001)
- Satellite antenna with FAKRA connector (p/n ST901065-AFA standard antenna, ST901066-AFA low elevation antenna)
- Terminal shroud (optional - p/n ST101014-001)

1.2.2 Additional Materials

You might require some of the following materials to install a transceiver. These materials do not ship with the terminal:

- SIM card (Refer to section [1.2.5](#) for SIM card procurement and installation)
- Cable ties as a mounting option for the transceiver

If fastening the transceiver unit and the antenna to a mounting surface, you require:



- Qty. 4 - #8 stainless steel fasteners (for the transceiver or the terminal shroud)
- Qty. 4 - M4 stainless steel fasteners (for the satellite antenna)

Refer to [APPENDIX G](#) for details regarding the blunt cut cable.

1.2.3 Required Tools

You may require the following tools to install a terminal:

- Drill and drill bit
- #1 and #2 Philips screwdriver or Hex head socket

1.2.4 Transceiver Identification

Each transceiver has a unique mobile ID used to register it on the IsatData Pro network. This is a 15-digit alphanumeric identifier in the format NNNNNNNNSKYXXXX for satellite-cellular transceivers or an International Mobile Station Equipment Identity (IMEI) 15-digit identifier for cellular transceivers. The mobile ID is located on the bottom of the transceiver and on the shipping box. The IMEI number is located near the mobile ID.

1. Record the mobile ID for future reference.

Note: ORBCOMM might activate transceivers on the network prior to or after shipping based on the Purchaser (SP) agreement.

2. Provide the IMEI 15-digit number to your cellular Service Provider if using the cellular capabilities.

1.2.5 Install the SIM Card

The transceiver includes two embedded SIM cards and provides the option of installing a third, optional, SIM card. To use the cellular capabilities of this transceiver you must install a SIM card. You may need to purchase a SIM card, activated for use with a cellular network, from a Service Provider serving the area where the transceiver operates. The SIM card must support operation on 1.8 V or 3 V. The transceiver does not support 5 V SIM cards. You might want to record the SIM card's ICCID number.

The SIM door has a hook that prevents removal of the door when the transceiver is mounted to an asset with screws.

1. If connected, disconnect the power connector from the power source.

CAUTION: Never insert or remove the SIM card if there is power to the transceiver. Transceivers with a backup battery might still be powered on if the power connector is disconnected from the transceiver. In this case, it is recommended that the transceiver be powered off locally using the shutdown command [\[T405\]](#) at the shell prompt, or by sending an over-the-air powerOff message (SIN 17, MIN 1) [\[T405\]](#). The transceiver automatically wakes up when the power connector is reconnected.

2. Remove the SIM card door ([Figure 1](#)).

Figure 1: Remove SIM Card Door



3. Push and release any existing SIM card (Figure 2) to remove it from the SIM holder.

Figure 2: Remove any Existing SIM Card



4. Insert the SIM card, circuit up and the notch facing away from you and to the left (Figure 3).

Figure 3: Sample SIM Card Orientation



5. Push gently until the card is all the way in ([Figure 4](#)).

Figure 4: SIM Card Installed



6. Replace the SIM card door.

Note: Ensure that the screws are fully seated / bottomed out. Failure to do so could result in water getting in the transceiver.

7. Reconnect any cables you removed earlier and connect to external power.
8. Contact your cellular data solution provider to ensure your SIM card is operational.

1.2.5.1 Reset Button

CAUTION: Transceivers with a backup battery might still be powered on if the power connector is disconnected from the transceiver. In this case, it is recommended that the transceiver be powered off locally using the shutdown command [\[T405\]](#) at the shell prompt, or by sending an over-the-air powerOff message (SIN 17, MIN 1) [\[T405\]](#). The transceiver automatically wakes up when the power connector is reconnected.

To access the transceiver reset button,

1. Disconnect the transceiver from a power source and remove the SIM card door.

Note: If the transceiver has a shroud, you must remove this before you can access the SIM card door.

2. Press the reset button.



3. Reattach the SIM card door.

Note: Ensure that the screws are fully seated / bottomed out. Failure to do so could result in water getting in the transceiver.





4. Reapply power to the transceiver. You may also need to reattach the terminal shroud.

1.2.5.2 LED Location and Operation

The transceiver has four visible LEDs (Figure 5) to indicate status.

Figure 5: LED Location



	Sensor	Indicates whether the terminal is receiving sensor data, or if paired with a sensor.
	Cellular	Indicates cellular communications status.
	Satellite	Indicates satellite communications status.
	Power	Indicates that the transceiver has external power.

1.2.5.3 LED User Control

After power on and ignition, you can control the LED by configuring the LED Control property to 1. The firmware supports a function call (ledControl) that defines this operation. You can specify on time (msec), period (msec), and number of repetitions (0 - 65535 where 0 signifies repeat forever).

This function allows a user service to flash the LED over a short period of time. The user service is responsible for repeating this short pattern over a longer period. As an example, using the connection offline case from the previous section, the LED control API allows a user service to flash the LED four times; the service is responsible for setting a timer allowing it to restart this pattern every 30 seconds [T405].

1.3 Determine a Suitable Mounting Location

Before installing the transceiver, consider the important guidelines provided below.

CAUTION: Most users install the ST 9100 in a vehicle. It is very important for installers to install the ST 9100 in a safe and secure way to avoid danger or damage to persons or property.

CAUTION: Do not mount or operate near flammable gases or fumes.

- Mount indoors, inside a vehicle, or in an area protected from environmental elements. If mounting outdoors, use a terminal shroud.
- Fasten the transceiver securely so that it is not loose and does not move easily.
- Mount the transceiver on a surface that does not get hotter than the maximum operating temperature. If the surface might get hotter, mount the transceiver with a thermal barrier between it and the mounting surface.
- Do not mount the transceiver close to other electrical equipment due to possible radiated and/or conducted electromagnetic interference.
- Do not mount the transceiver where water, or ice, might build-up or collect.
- Check that the transceiver's cable reaches the power source before you drill any mounting holes.
- Do not mount the transceiver close to radar or other communications antennas. Use the following guidelines:
 - > 1 m (39 in) from VHF/UHF antenna
 - > 3 m (10') from loop antenna
 - > 4 m (13') from MF/HF antenna
 - > 5 m (16') from other satellite antennas
 - Not within a radar beam
- Mount the transceiver on a flat surface that is either parallel or perpendicular to the ground, for proper operation of the internal accelerometer.

When you have selected the mounting location, mount the transceiver.

1.3.1 Standard Satellite Antenna Mounting Guidelines

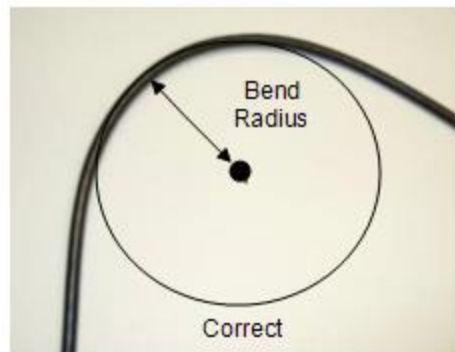
CAUTION: Mount the antenna at least 25 cm (9 in.) away from humans.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. Secure the cable no more than 15 cm (6 in.) from the antenna enclosure and at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the connector. Damage to the connector interface or cable may otherwise result and lead to hardware failure.

- Do not drill any holes before checking that you have room for the bend radius of the antenna cable. For reliable operation, do not go below a bend radius of 1.5 cm (0.6 in.). Measure the bend radius of the cable as shown in [Figure 6](#).



Figure 6: Antenna Cable Bend Radius



- Mount on a surface that is free from dirt, grime, water and grease to avoid damaging the mounting surface or the vehicle's paint.
- Mount so that the cable end faces the rear of the vehicle.
- For fixed installations ensure that the satellite antenna is pointing towards the equator, facing south if in the Northern Hemisphere and facing north if in the Southern Hemisphere, and its line-of-sight to the sky (satellite) is clear of obstructions.
- For a mobile installation, mount the antenna at the highest point on the vehicle or vessel where it has a clear view of the sky (satellite) in all directions.

1.3.2 Cellular Antenna Mounting Guidelines

- Mount indoors, for example, on the inside of a vehicle window, near the transceiver unit.
- Mount on a flat surface for maximum adhesion.
- Mount at least 2 cm (0.8 in) from metal objects.
- Mount the cellular antenna at least 1 m (39 in) away from the satellite antenna.

1.4 Mount the Antennas

The transceiver operates with a satellite antenna and/or a cellular antenna (section 1.4.3). Two mounting options are available for the satellite antenna: screw mount (section 1.4.1) or cable tie mount (section 1.4.2).

1.4.1 Screw Mount

If mounting an antenna, the following tools and materials are required:

- Drill
- M4 hardware
- Outdoor waterproof adhesive sealant (silicone)

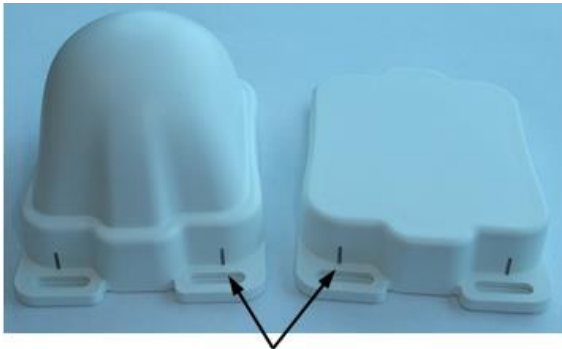
To mount the antenna, follow the steps below.

1. Find a location for the antenna following the guidelines provided in section 1.3.
2. Use the mounting template ([APPENDIX B](#)) or the antenna as a template, to mark the location of the mounting holes.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. Secure the cable no more than 15 cm (6 in.) from the antenna enclosure and at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the transceiver connector. Damage to the transceiver connector interface or cable may result in hardware failure

3. Drill the holes using a drill.
4. Apply waterproof sealing compound, such as RTV silicone, around the drill holes so water does not leak into the asset.

CAUTION: Do not block the air vent features (two places).



Do Not Block These Features

5. Secure the antenna in place with self-tapping screws or machine screws and nuts depending on access to the mounting surface.

1.4.2 Cable Tie Mount

Mount the antenna with cable ties when mounting holes are not an option on the mounting surface.

1.4.2.1 Side Connector Mount

The following tools and materials are required if mounting a side cabled antenna with cable ties.

- Isopropyl alcohol or an equivalent

To mount the antenna:

1. Find a location for the antenna following the guidelines provided in section 1.3.
2. Clean the asset surface with isopropyl alcohol or an equivalent product that does not leave a residue.
3. Use the provided cable ties to secure the antenna to the asset.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. Secure the cable no more than 15 cm (6 in.) from the antenna enclosure and at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the transceiver connector. Damage to the transceiver connector interface or cable might result in hardware failure.

1.4.2.2 Bottom Connector Mount

The following tools and materials are required if mounting a bottom connector antenna with cable ties.

- 5/16" or 8 mm wrench
- Drill
- 12 to 19 mm drill bit for a straight SMA cable connector
- 29 mm minimum drill bit (hole saw) for right-angle SMA cable connector
- Isopropyl alcohol or an equivalent

To mount the antenna:

1. Find a location for the antenna following the guidelines provided in Section 1.3.
2. Drill a 12 to 19 mm hole in the asset surface (Figure 7) when using a straight SMA cable connector. For a right-angle SMA cable connector, refer to step 7.

Figure 7: Drill Mounting Hole



3. Clean the asset surface with isopropyl alcohol or an equivalent product that does not leave a residue.
4. Insert the cable through the hole, from inside the asset, and thread the cable connector onto the antenna. Torque the connector finger tight plus a 45-degree rotation using an 8 mm wrench.

Figure 8: Attach Cable to Transceiver



5. Apply silicone around the hole in the asset and to the bottom surface of the antenna.

Figure 9: Apply Silicone to Hole in Asset



6. Lower the antenna onto the mounting surface.

The straight SMA cable connector can be lowered straight down onto the mounting surface.

The right-angle SMA cable connector, not shown, must be pivoted down onto the mounting surface to fit the right-angle cable and connector through a larger clearance hole. Additional care is required with this installation to ensure the right-angle cable and connector does not smear the silicone around the clearance hole when attempting to pivot the antenna into position.

- Use the provided cable ties to secure the antenna to the asset.

Note: If the large clearance hole required for the right-angle SMA cable connector is considered too large, there is the option to use a smaller clearance hole in the mounting surface and install the cable from inside the asset after the antenna has been tied down.

In this case, first confirm there is enough room from inside the asset to thread the SMA cable connector by hand and clearance for the wrench to apply the final torque.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. Secure the cable no more than 15 cm (6 in.) from the antenna enclosure and at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the transceiver connector. Damage to the transceiver connector interface or cable might result in hardware failure.

1.4.3 Cellular Antenna

- Clean the antenna mounting surface with isopropyl alcohol to remove any dirt or grime. Make sure the surface is dry before applying the antenna's adhesive strip.
- Remove the adhesive strip from the cellular antenna.
- Mount the cellular antenna on the inside of the window. [Figure 10](#) shows mounting examples on an automobile.

Figure 10: Sample Cellular Mounting Locations – automobile example



- Secure the cellular antenna cable in place.

1.5 Route the Main Cable

Consider the following guidelines before routing the cable assembly.

CAUTION: Ensure the power cable is not pinched, kinked or worn down by any objects or moving parts such as the door hinges. It is very important to secure the cable at many points along its path.

CAUTION: Prior to working on any cabling, ensure that the transceiver is powered off and unable to start while work is in progress.

- Do not route the cable near the engine if routing through the engine compartment. This location subjects the cable to extreme heat.
- Keep the cable away from hot surfaces such as exhaust pipes because this may damage the cable.

- Do not run the cable over sharp or jagged edges.
- Place the cable in recesses and channels, whenever possible, to prevent potential damage or wear by foot traffic.

Note: Remember to leave enough cable slack near the transceiver for strain relief so as not to introduce any additional force on the connector. ORBCOMM recommends securing the cables during installation.

Figure 11: Sample Cable Placement in a Vehicle Cab



1.5.1 Protect the Cables and Cable Connectors

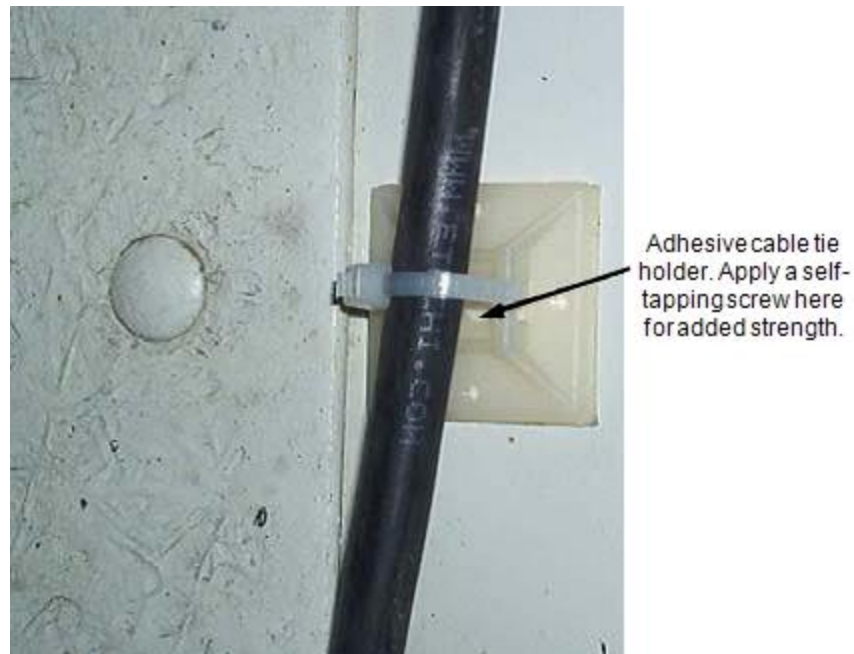
CAUTION: Cable management and connector strain relief must be incorporated in the installation.

ORBCOMM highly recommends securing the cable at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the connector. Damage to the connector interface or cable may otherwise result and lead to hardware failure.

To protect the transceiver's connector interface, follow the guidelines below

- Apply tape around the cable ends to help in routing the cable.
- Secure the cable such that it does not pull on the connector or strain the transceiver connector.
- Tie the cable down so that the weight of a vibrating cable does not stress or strain the connection.
- Tie the cable down using cable ties and tie holders (Figure 12) at 30 to 60 cm (12 to 24 in.) intervals along the cable route to prevent chafing, wear, or strain.
- Secure the cable tie holder with a self-tapping screw (Figure 12) for best holder retention.

Figure 12: Cable Management



1.6 Connect the Cables and Mount the ST 9100

Note: The Solution Provider is responsible for providing mounting instructions if the mounting is to be done using tools or configurations that are different from the ones described in this document.

Note: The Installer is responsible for complying with local electrical codes.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. ORBCOMM highly recommends securing the cable at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the connector. Damage to the connector interface or cable might result and lead to hardware failure.

1.6.1 Connect the Cables

1. Connect the satellite antenna to the curly yellow FAKRA connector on the transceiver by pushing until you hear a click.



2. Connect the cellular antenna to the violet FAKRA connector on the transceiver by pushing until you hear a click.



3. Connect the power and I/O cable to the transceiver by pushing and twisting until it locks in place.



1.6.2 Mount the Transceiver

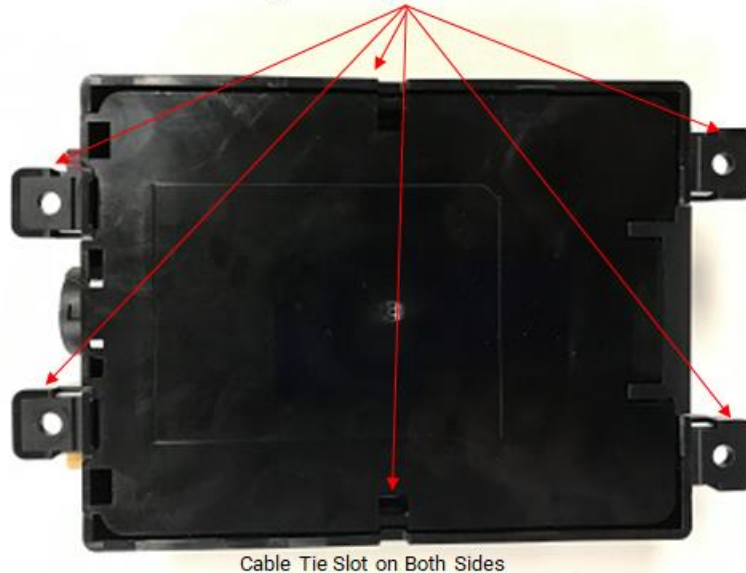
CAUTION: Skip this step if using a terminal shroud.

1. Review the mounting guidelines before permanently mounting the transceiver.
2. Mount the transceiver using cable ties or washers and screws. You can use cable ties if the transceiver remains flat and is either parallel or perpendicular to the ground, for proper operation of the internal accelerometer. Otherwise, fasten the transceiver to a rigid surface using washers and screws.

Use the holes to mark and drill pilot holes based on the type of screws.

There are multiple flanges or cable tie locations around the transceiver.

Flanges and/or Cable Tie Slots



1.7 Connect to Power

CAUTION: Apply power only after making ground connection.

CAUTION: Before applying power to the transceiver, make sure that your power supply's rated voltage follows the recommended values. Refer to [\[T413\]](#) for details.

CAUTION: The installer is responsible for complying with local electrical codes.

Note: ORBCOMM recommends that if possible, wait until the terminal is unblocked (has a full view of the sky) before powering on the transceiver.

1. Locate the main power input and the ground (GND) wires using the connector pin out table ([APPENDIX E](#)).
You can connect the transceiver ground to ground in the fuse panel or to chassis ground. To do this, secure the ground wire on the cable assembly to a piece of metal electrically connected to the vehicle chassis using a sheet metal screw.
2. Ensure that the main power input and ground wires reach the vehicle fuse panel.
If the wires are not long enough, splice similar gauge wires to the main power input and ground wires so that they reach the fuse panel. Cover any splices with adhesive lined heat shrink.
3. Correctly mate connectors before applying power.
4. Connect the ground wire to the grounding point selected in an earlier step. Check that the polarity is correct, and the voltage source is 9-32 VDC.
5. Connect the main power input wire to the unswitched vehicle power source within the fuse panel.
6. Loop and secure any excess cabling.

If your application requires extended cable lengths, it is necessary to calculate the cable voltage drop to determine if the transceiver is receiving at least 9 V (with 1.7 A draw). Large cable voltage drops might adversely affect transceiver operation.

1.7.1 CAN bus Connection

It is recommended that you do not connect directly to the CAN bus wires on the installation vehicle. Cutting or damaging those wires might void the warranty on the vehicle.

To connect the transceiver CAN bus serial interface to the CAN bus of the vehicle, ORBCOMM recommends using a J1962 (OBDII) connector or an induction sensor, which allows the transceiver CAN bus interface to read information from the CAN bus without damaging the vehicle wires. An example of this type of sensor is the CANGOclick. Refer to <http://www.cango.ro/index.php/en/product/10/cangoclick.html> for more information on the CANGOclick.

1.8 (Optional) Attach the Terminal Shroud

The optional terminal shroud protects the cable connectors that connect to the transceiver. It protects the transceiver from solar loading (that is, provides shade) when mounted outside.



Figure 13: Terminal Shroud



To attach the terminal shroud:

1. Position the terminal shroud over the installed transceiver by lining up the LEDs.



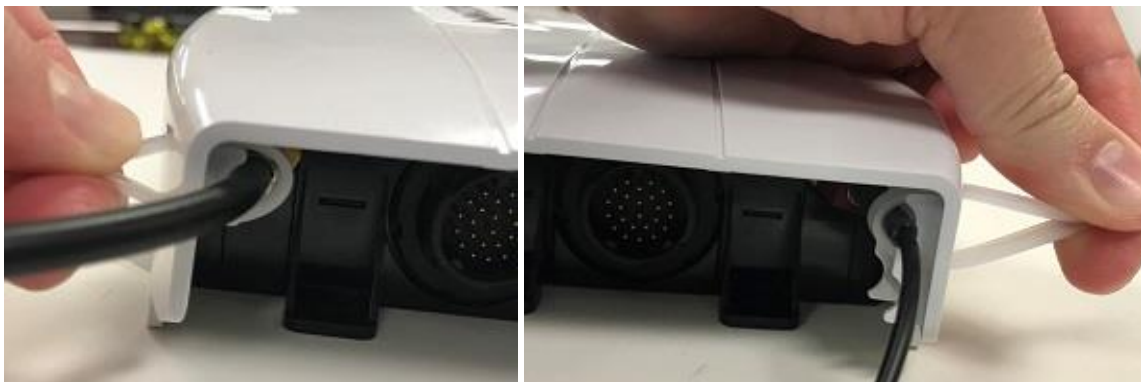
2. Press down on the terminal shroud to ensure it is securely mounted on the transceiver.



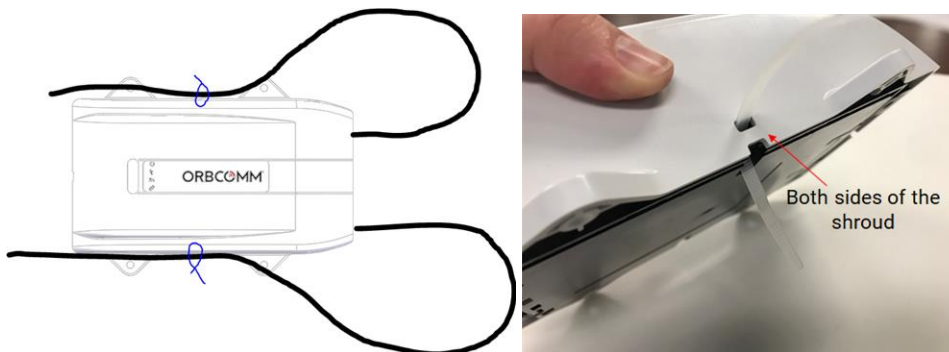
- Use screws (four locations) to secure the terminal shroud to the asset.



- Use cable ties to secure the antenna cables to the terminal shroud and eliminate strain on the connector.



Note: If cabling is routed behind the transceiver, cable ties can be installed on the side of the terminal shroud.

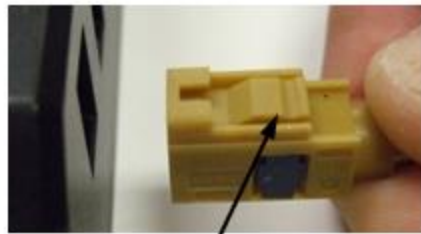


1.8.1 Disconnect the FAKRA Connector

If you need to disconnect the FAKRA connector, follow the steps below.

1. Hold the FAKRA connector between your thumb and finger as shown in [Figure 14](#).
2. Press down firmly, with your thumb, on the raised section of the FAKRA thumb release ([Figure 14](#)) and pull the FAKRA connector away from the transceiver unit while firmly holding down the thumb release ([Figure 14](#)). You might need to hold the transceiver unit while removing the connector.

Figure 14: Disconnecting the FAKRA Connector from the Transceiver Unit



Raised section of FAKRA thumb release



Press down and pull to remove the connector from the transceiver

To remove antenna cables when the terminal shroud is attached, do the following:

1. Cut the cable ties securing the antenna cables to the terminal shroud.
2. Insert a flat head screwdriver through the cut-outs on the side of the terminal shroud to access the FAKRA release.



3. Press down on the FAKRA release, and then pull on the connector to remove it from the transceiver.

Note: Remember to secure the cables with cable ties to eliminate strain on the cables when you reattach the antenna cables to the transceiver.

1.9 Register the Terminal

Note: The terminal must complete registration to operate.

1.9.1 Activate the Terminal

Once you apply power, the terminal goes into satellite search mode to acquire the IsatData Pro network. This activity may take a few minutes to complete. The terminals must complete registration to operate.

Once the terminal synchronizes itself with the network, it sends a registration message to the IsatData Pro network. The terminal will not register until it has a clear line-of-sight to the satellite.

The IsatData Pro network records the registration message and forwards the registration message to the user's application. The IsatData Pro network sends an acknowledgment message over the satellite to the terminal. The terminal is now available to send and receive messages via satellite.

1.10 API

Refer to [\[T405\]](#) for programming information for the ST 9100.



APPENDIX A TROUBLESHOOTING THE TERMINAL

The following section contains troubleshooting information for the Solution Provider (SP) to provide to end users.

A.1 Terminal Does Not Register or Report

On application of external power, the terminal should register with the satellite and send a report.

Note: The terminal must be visible to the satellite to register with the network and registration normally takes a few minutes.

If the terminal fails to register or report:

- Ensure that the antenna has a clear line-of-sight to the satellite. The terminal must operate outdoors and be unobstructed by buildings, forest canopy, and rock cuts.
- Check that no objects or debris are on the antenna and blocking transmission.
- Verify that the terminal is assigned to your account and registered (that it is sending and receiving) and that the IsatData Pro network is operating properly.

Replace the terminal if the above checks fail to uncover the problem.

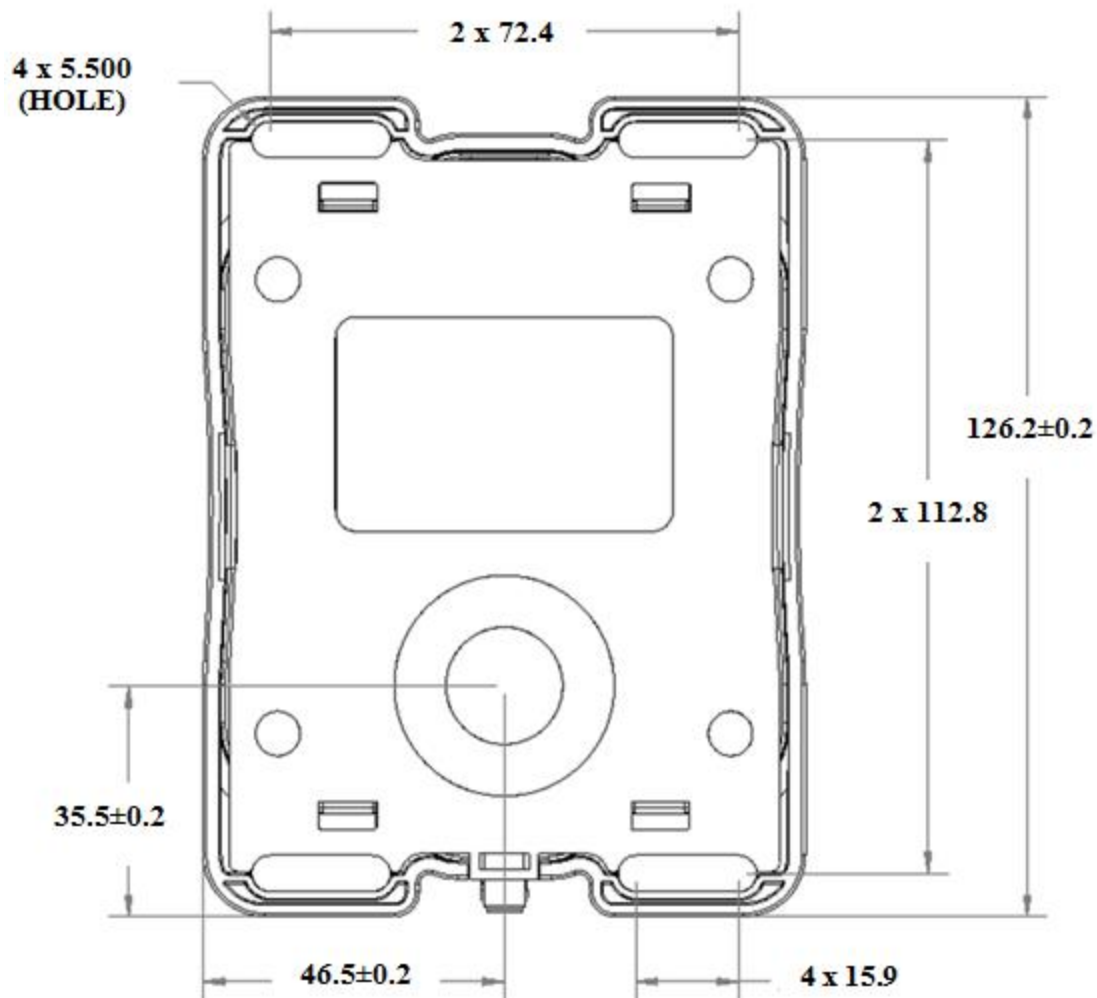


APPENDIX B SATELLITE ANTENNA DIMENSIONS

CAUTION: Before drilling check the template against actual hardware for dimensional accuracy. If it is not correct, **DO NOT USE THIS TEMPLATE.** Use the physical antenna hardware as a template.

CAUTION: Cable management and connector strain relief must be incorporated in the installation. Secure the cable no more than 15 cm (6 in.) from the antenna enclosure and at regular intervals along its length as part of the installation to prevent cable wear and eliminate strain on the connector. Damage to the connector interface or cable may otherwise result and lead to hardware failure.

Note: Dimensions shown in mm.



APPENDIX C TRANSCEIVER DIMENSIONS

Figure 15: Transceiver Top View

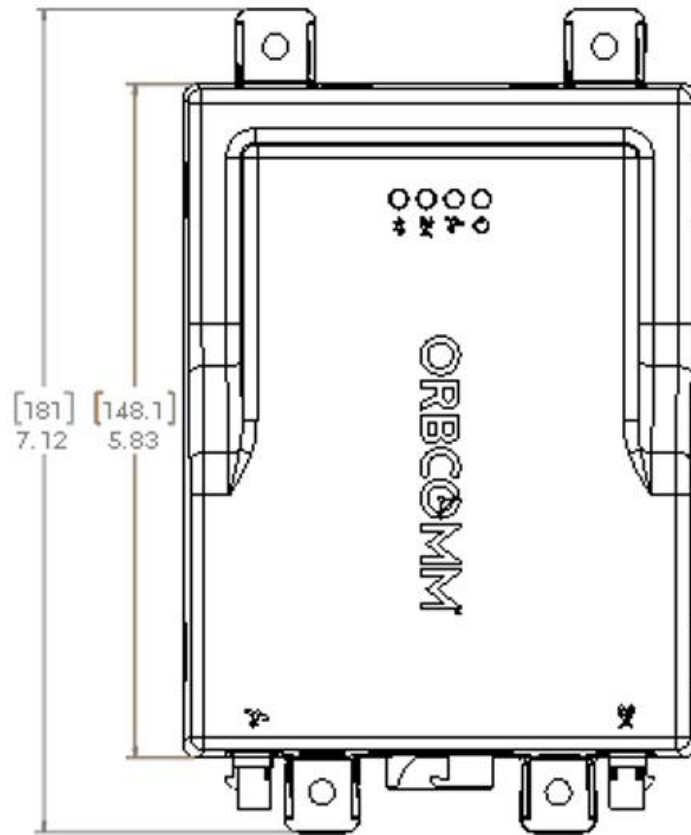
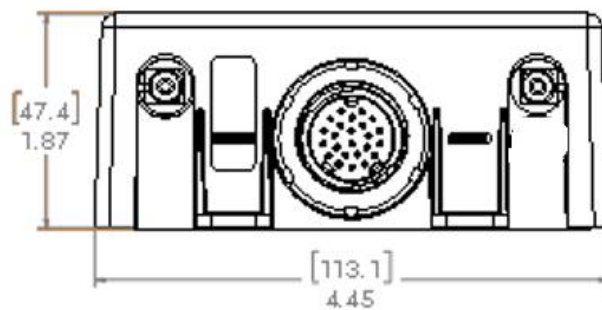


Figure 16: Transceiver Side View Dimensions



APPENDIX D TERMINAL SHROUD DIMENSIONS

Figure 17: Terminal Shroud Top View

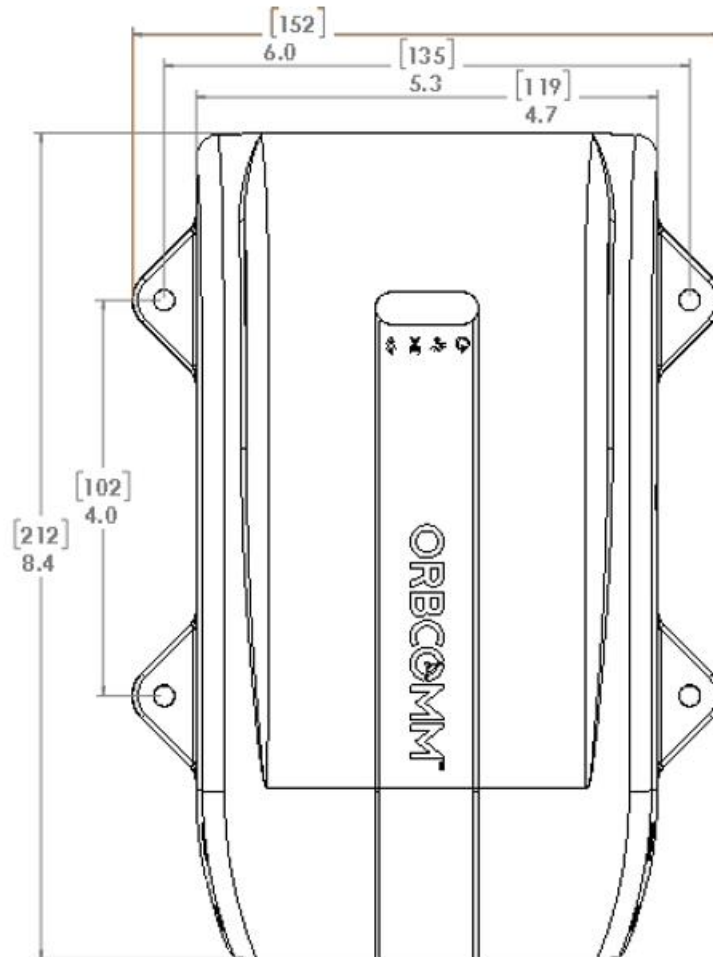
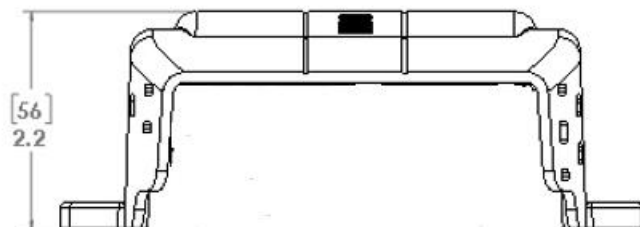


Figure 18: Terminal Shroud Side View



APPENDIX E PIN CONNECTIONS

Table 1 maps to the layout shown in Figure 19.

Figure 19: Cable View of Connector

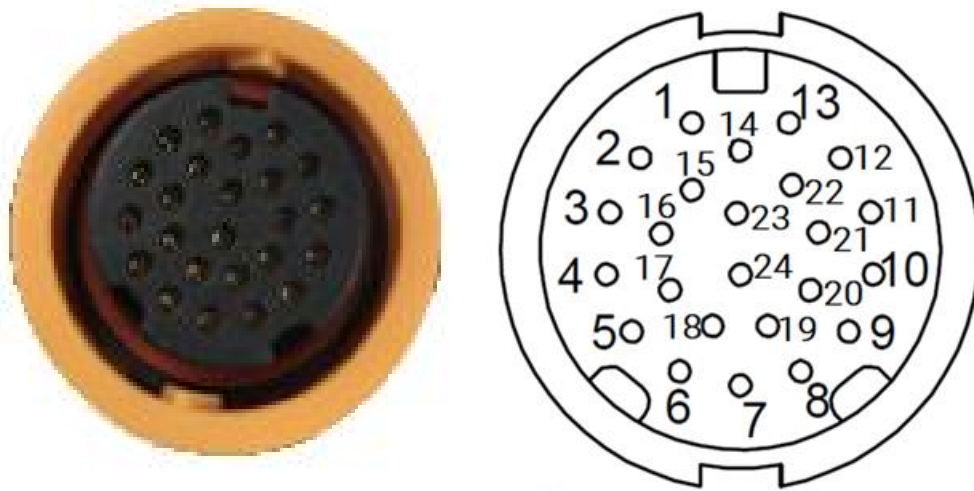


Table 1: Electrical Pin Assignment

PIN	Function	Type	Description
1	RS485_A	I/O	Half duplex RS485 driver output or receiver input (complementary to RS485_B)
2	Digital Input_4	I	Digital input/0-5 V analog input and 4-20 mA return
3	Digital Input_2	I	Digital input/0-5 V analog input and 4-20 mA return
4	I/O_4	I/O	Multifunction GPIO, push-pull, analog input, current limited current sink and ignition load
5	I/O_2	I/O	Multifunction GPIO, push-pull, analog input and current sink
6	Ground	PWR	External supply ground return
7	External Voltage	PWR	External 9-32 VDC supply
8	Output_6	O	Open drain output
9	1Wire Com	PWR	1-WIRE return path
10	Console_RS232_TX	O	±15 kV ESD protected, RS-232 level (nominally ±5.5 V) transmitter outputs
11	AUX_RS232_RX	I	TTL/CMOS level receiver outputs
12	CAN1_H	I/O	High level CAN BUS line
13	CAN1_L	I/O	Low level CAN BUS line
14	CAN0_L	I/O	Low level CAN BUS line
15	RS485_B	I/O	Half duplex RS485 driver output or receiver input (complementary to RS485_A)
16	Digital Input_1	I	Digital input/0-5 V analog input and 4-20 mA return
17	I/O_3	I/O	Multifunction GPIO, push-pull, analog input and current sink

PIN	Function	Type	Description
18	I/O_1	I/O	Multifunction GPIO, push-pull, analog input and current sink
19	Output_5	O	Open drain output
20	1Wire_DATA	I/O	Input/output driver for 1-Wire Line
21	Console_RS232_RX	I	TTL/CMOS level receiver outputs
22	AUX_RS232_TX	O	±15 kV ESD protected, RS-232 level (nominally ±5.5 V) transmitter outputs
23	CAN0_H	I/O	High level CAN BUS line
24	Digital Input_3	I	Digital input/0-5 V analog input and 4-20 mA return



APPENDIX F CLEANING INSTRUCTIONS

The transceiver and cellular antenna are for indoor use, and under normal circumstance should not require any cleaning. However, if cleaning is required, wipe with a damp cloth using a mild detergent. Do not immerse in water and ensure that water does not enter through the connector openings.

The satellite and cellular antennas can be steam cleaned or pressure washed with mild soap or detergent.



APPENDIX G BLUNT-CUT CABLE

The blunt-cut cable (p/n ST101062-002) is 5 m long. [Table 2](#) maps to the layout shown in [Figure 20](#).

Figure 20: Cable View of Connector

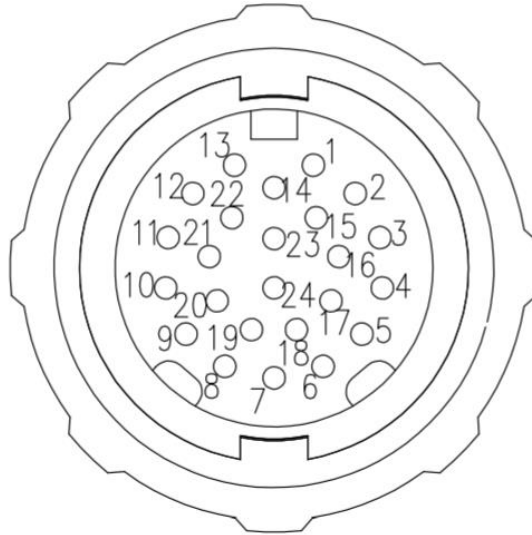


Figure 21: Transceiver View of Connector

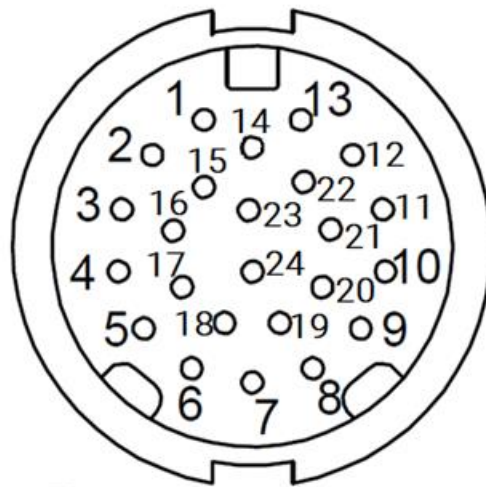


Table 2: Blunt-Cut Cable Electrical Pin Assignment

PIN	Function	Color ¹	Type	Description
1	RS485_A	Blue	I/O	Half duplex RS485 driver output or receiver input (complementary to RS485_B)
2	Digital/Analog_IN4 / 0-5 V_IN4 / P2_4-20 mA	Orange/Black	I	Digital input or 0-5 V analog input or 4-20 mA
3	Digital/Analog_IN2 / 0-5 V_IN2 / P1_4-20 mA	Pink	I	Digital input or 0-5 V analog input or 4-20 mA
4	I/O_4	Orange	I/O	Multifunction GPIO, push-pull, analog input, current limited current sink and ignition load
5	I/O_2	Yellow	I/O	Multifunction GPIO, push-pull, analog input and current sink
6	Ground	Black (22 AWG)	PWR	External supply ground return
7	External Voltage	Red (22 AWG)	PWR	External 9-32 VDC supply
8	Output_6	Black/White	O	Open drain output
9	1Wire Com	Red/White	PWR	1-WIRE return path
10	Console_RS232_TX	Orange/White	O	±15 kV ESD protected, RS-232 level (nominally ±5.5 V) transmitter outputs
11	AUX_RS232_RX	Red/Black	I	TTL/CMOS level receiver outputs
12	CAN1_H	Brown	I/O	High level CAN BUS line
13	CAN1_L	Brown/White	I/O	Low level CAN BUS line
14	CAN0_L	Green/White	I/O	Low level CAN BUS line
15	RS485_B	Blue/White	I/O	Half duplex RS485 driver output or receiver input (complementary to RS485_A)
16	Digital/Analog_IN1 / 0-5 V_IN1 / P1_4-20 mA+	Light Green	I	Digital input or 0-5 V analog input or 4-20 mA
17	I/O_3	Purple	I/O	Multifunction GPIO, push-pull, analog input and current sink
18	I/O_1	Black	I/O	Multifunction GPIO, push-pull, analog input and current sink
19	Output_5	Purple/White	O	Open drain output
20	1Wire_DATA	Yellow/Black	I/O	Input/output driver for 1-Wire Line
21	Console_RS232_RX	Green/Black	I	TTL/CMOS level receiver outputs
22	AUX_RS232_TX	Gray/Black	O	±15 kV ESD protected, RS-232 level (nominally ±5.5 V) transmitter outputs
23	CAN0_H	Green	I/O	High level CAN BUS line
24	Digital/Analog_IN3 / 0-5 V_IN3 / P2_4-20 mA+	White	I	Digital input or 0-5 V analog input or 4-20 mA

¹24 AWG unless noted otherwise.

APPENDIX H FIELD INSTALLABLE CONNECTOR

Below are the details for the ST 9100 Field Installable Connector (p/n ST101096).

Figure 22: ST 9100 Field Installable Connector

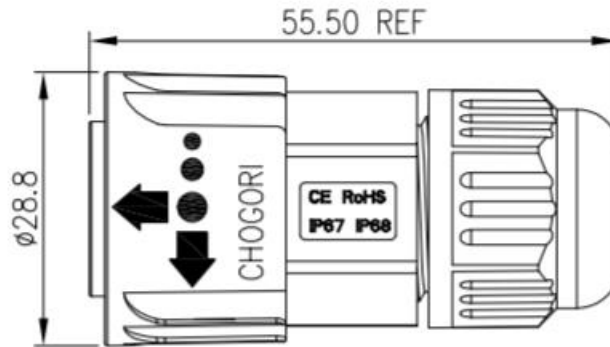


Figure 23: Connector Front View

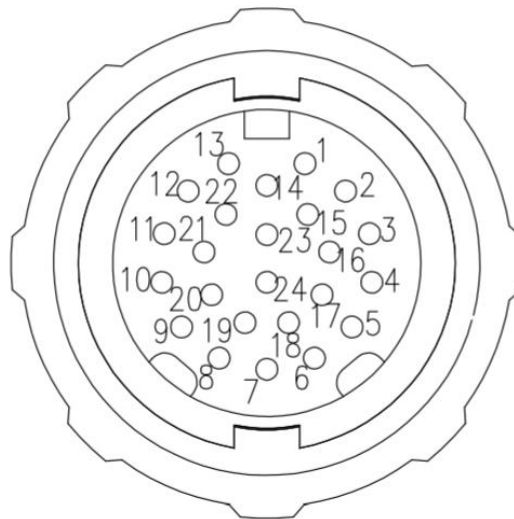


Table 3: ST 9100 Field Installable Connector Details

Manufacturer	Chogori
Waterproof	IP67
Compliance	CE RoHS
Connector Pin Assignment	Refer to PIN # and Function columns in Table 2