

GPSdome-SunStone

Integration Manual

2025

infiniDome
NAVIGATION RESILIENCY

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Introduction

Thank you for choosing GPSdome-SunStone .

GPSdome-SunStone is a cutting-edge, compact module designed to ensure continuous navigation and reliable operation in GNSS-dependent systems, even under jamming conditions. This advanced solution is engineered to protect both autonomous and Beyond Visual Line of Sight (BVLOS) operations, making it ideal for applications where uninterrupted GNSS functionality is critical.

With its fully retrofit capabilities, GPSdome-SunStone is compatible with most GNSS receivers and active antennas, providing flexible protection across a range of frequencies. Featuring upgradeable anti-jamming algorithms and monitoring capabilities, GPSdome-SunStone effectively shields against both current and emerging GNSS threats. Whether you're operating in a civilian, commercial, or military environment, this solution is designed to meet the demands of the most challenging navigation conditions.

GPSdome-SunStone is compact, lightweight, and simple to install, offering a cost-effective and scalable option for protecting GNSS systems against interference. A reliable solution for GNSS resilience in the field, providing real-time reporting of detected jamming activity, Jamming frequency, Jamming power level and more.

Safety and Compliance

General Cautions



- Secure GPSdome-SunStone using the mounting holes provided.
- To prevent damage to any cable assemblies used in this installation, ensure the cables are not bent, deformed, or snagged to cause damage to the internal wiring or the connector ends.
- Caution: Hot Surfaces (Up to 70°C)
- GPSdome-SunStone OEM is a sensitive electronic module, installation must be performed by a qualified professional.
- Avoid touching the device while it's operating as some surfaces may become hot. Allow time for cooling before handling.
- Avoid touching internal components.
- Disassembling the product will immediately void the warranty and is prohibited under the product usage agreement.

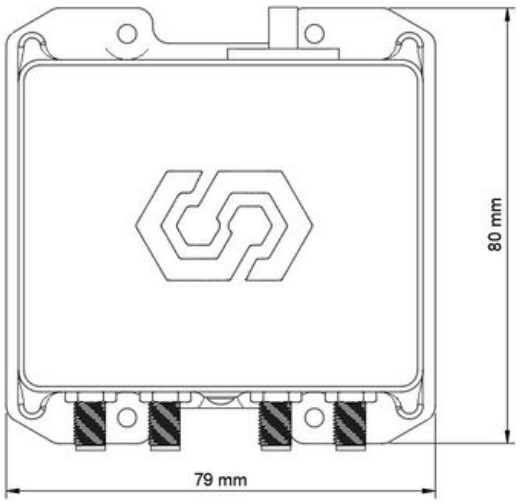
Electrical Safety



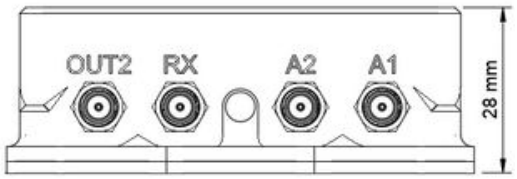
- During installation ensure there is NO power applied to the module.
- The length of the power cable should not exceed 3 meters.
- Please make sure that the GNSS receiver is powered off before connecting it.
- Ensure there is no exposed conductive cable that could short the unit.

Technical Specifications

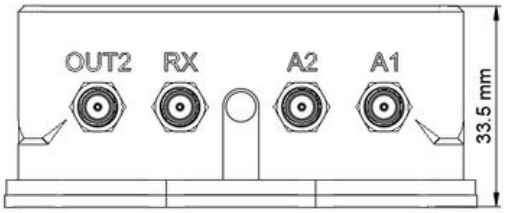
General measurements



Single Band



Dual Band



Product specifications

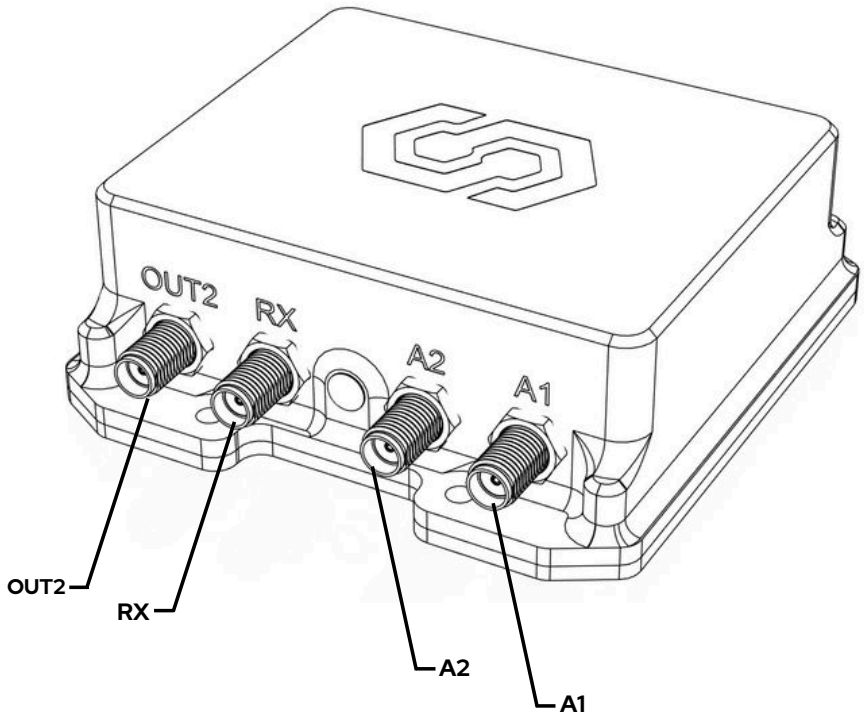
Product Dimensions		Performance		RF Interfaces	
Single Band	80x79x28 mm	Protected Frequency	One frequency band	Antenna (A1 | A2)	50Ω SMA 2.7-14VDC
	180g	Optional Secondary protected frequency	One frequency band		Max Current 40mA per connector | Gain: 15dB - 40dB
Dual Band	80x79x33.5 mm	Passthrough	2 GNSS Frequency bands	Receiver (RX)	50Ω SMA Female
	200g	Latency	100ns +/- 15ns (fixed)	Optional OUT2*	50Ω SMA Direct path to 2nd receiver | for Heading Calculations
Mounting	4 x M3 screw (Not Supplied)	Compression Point	-23 dBm	**Communication interface**	
Power		Path Gain	+/- 3 dB	UART	Maintenance/status interface. No built-in GNSS receiver.
Power Supply	6-32 VDC	**Environmental**		**Safety & Compliance**	
Average Consumption	Single band: 220 mA Dual band: 350 mA	Operating Temperatures	-40°C to 71°C	**FCC | CE | RoHS Compliant**	
		Waterproof Rating	IP65		

Interfaces

The GPSdome-SunStone module features various interfaces for easy integration with GNSS systems. This section covers the key connections for antennas, power supply, and signal outputs, ensuring straightforward installation and reliable performance.

RF connectors

Connector	Connector Type	Description
RX	SMA Female	Protected output for GNSS receiver
OUT 2	SMA Female	Unprotected auxiliary output (OUT2) provides a direct signal path to a secondary GNSS receiver, e.g., for heading calculations.
A1	SMA Female	Primary antenna input, 50Ω, for active antennas with 15dB to -40dB gain, configurable voltage range of 2.7VDC to 14VDC
A2	SMA Female	Auxiliary antenna input, 50Ω, for active antennas with 15dB to -40dB gain, configurable voltage range of 2.7VDC to 14VDC



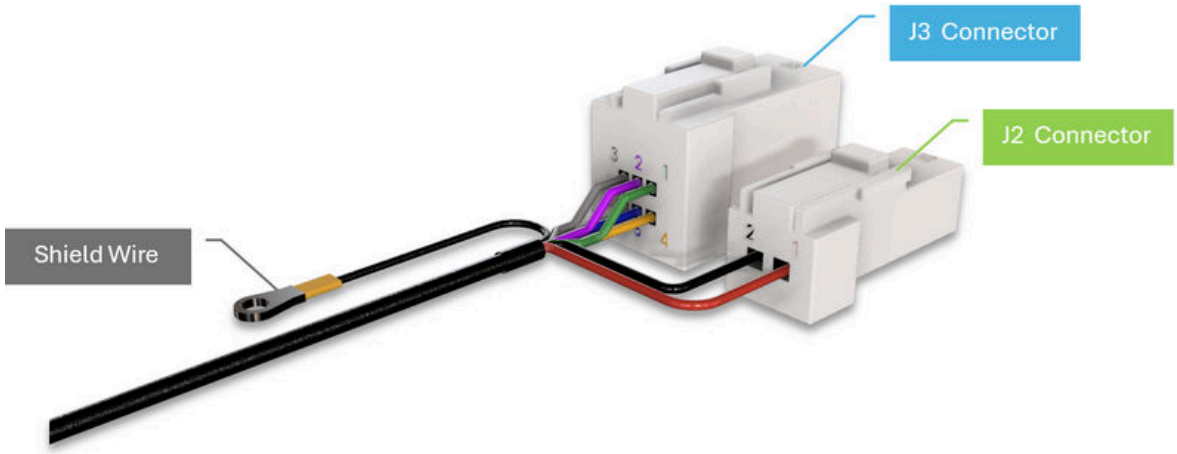
Safety Instructions for SMA Connector Removal

- Ensure that the system is powered off before removing the SMA connector.
- Inspect both the connector and the port for any debris or damage before connecting.

Electrical Interference

The GPSdome-SunStone features a wiring harness connected to the rear panel. This harness allows you to power the GPSdome-SunStone, receive status updates, and connect external devices to receive jamming indications via the dry contact wires.

A cable extends from the rear panel of the GPSdome-SunStone, consisting of two connectors (J2 - 2 Pins | J3 - 6 Pins) and a shield wire (Pre crimped ring connector).



The following table describes the wiring details:

Connector	Function Wire	Wire Color	PIN	AWG	Info
J2 - 2 Pins	Power IN	Red	1	22	Power supply 6-32 VDC (+)
	GND	Black	2	22	Power supply GND (-)
J3 - 6 Pins	Dry Contact -	Green	1	26	Dry contact: jamming indication (-)
	Dry Contact +	Purple	2	26	Dry contact: jamming indication (+)
	UART RX	Gray	3	26	UART Maintenance RX
	UART TX	Yellow	4	26	UART Maintenance TX
	UART GND	Blue	5	26	UART GND
	UART VCC	White	6	26	UART VCC 5 VDC (+)
pre crimped wire	Shield	Black	-	22	Shield - pre crimped Ring Terminal

The GPSdome-SunStone does not include a built-in GNSS receiver.

Connectors

The GPSdome-SunStone is supplied with two matching male connectors, compatible with the female connectors integrated into the device's cable harness. Additionally, 10 new Pin terminals are provided, which can be crimped onto the user's wires using a suitable crimping tool (Suitable for 22-26AWG wires).

The following table provides detailed information regarding the connectors parts:

GPSdome-SunStone Side			User Side		
ID	Manufacturer PN		ID	Manufacturer PN	
	Connector	Pins		Connector	Pins
J2	JST 02R-JWPF-VSLE-S	JST SWPR-001T-P025	J2	JST 02T-JWPF-VSLE-S	JST SWPT-001T-P025
J3	JST 06R-JWPF-VSLE-D		J3	JST 06T-JWPF-VSLE-D	

Recommended Crimping Tools

The supplied pins are recommended for crimping onto 22–26 AWG wires using crimping tools specifically designed for JST connectors.

Single pin Hand crimping tool	JST WC-JWPF	
Series hand crimping tool	JST YRS-980	

Installation Guide

Pre-Installation Checklist

Before beginning the installation, ensure you have the following equipment and tools:

Item	Description
GPSdome-SunStone	GPSdome-SunStone unit.
GNSS Antennas	2 x Identical Active GNSS antennas (50Ω, 15dB-40dB gain, 2.7VDC to 14VDC). Antennas cables must be identical lengths within a 10mm tolerance.
RF coaxial cables	SMA coaxial cable, High quality, low attenuation. The ends of the cable should be compatible with your equipment. Recommended shielding RG-174 | 316
GNSS Receiver	For optimal performance, we recommend using the U-blox F9P GNSS receiver.
Power source	6-32 VDC, Average consumption Single Band: 220 mA | Dual Band: 350 mA
Mounting screws	4 x M3 Bolts | M3 Washers
Tool	SMA torque spanner set to 1Nm (8.85 in-lbs)

Unpacking and inspecting equipment

Unpack the Equipment

Carefully remove the GPSdome-SunStone and all accessories from the packaging.

Inspect for Damage:

Make a visual inspection for evidence of damage incurred during shipment:

- Visually inspect all items for any signs of damage.
- Verify that the SMA connectors are not damaged, and the threads are complete.
- Ensure the external cable or connector is intact.
- Ensure that the unit is free of dents, loose parts, or any visible damage.

Site Preparation

Choosing the Installation Location:

- Ensure the location provides sufficient airflow and cooling.
- The installation location should allow for the GNSS antennas to be installed such that the cable lengths are equal. The optimal situation is to have the cables as short as possible (see Antenna Installation section).

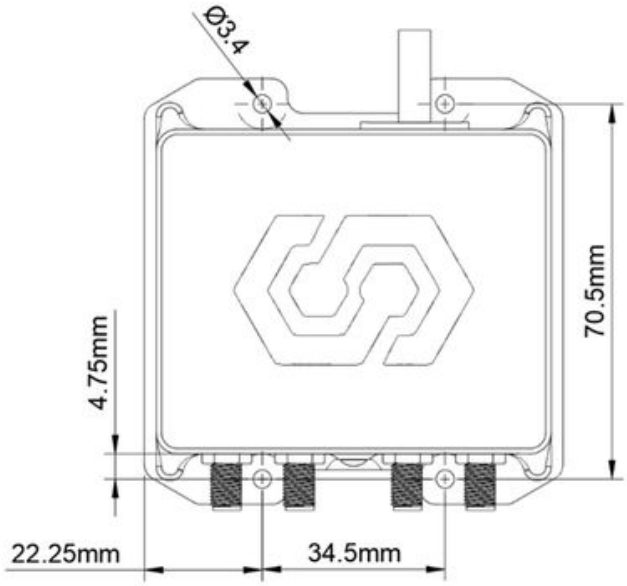
Environmental Considerations

- In case of installing GPSdome-SunStone OEM near your GNSS antennas - Ensure the GNSS antenna's installation site is free from obstructions and has a clear view of the sky for optimal GNSS signal reception.
- Avoid placing the device near sources of interference or radiating antennas.

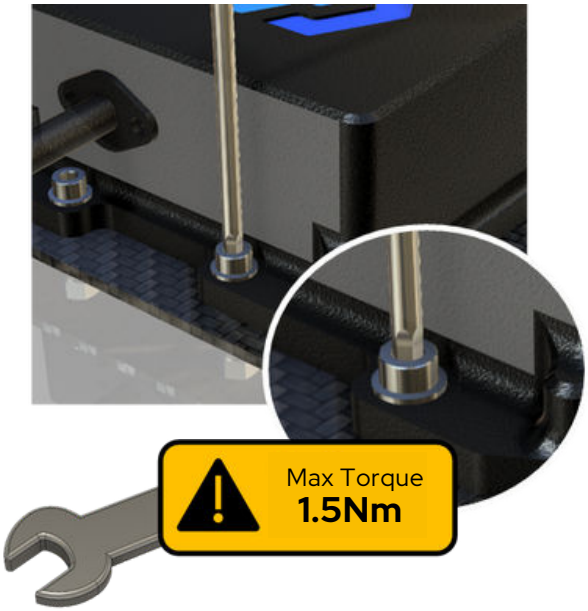
Mounting GPSdome-SunStone OEM

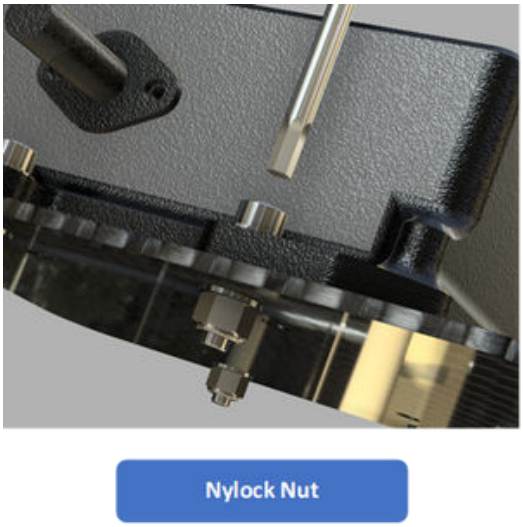
- Mark and drill four holes suitable for M3 screws.
- Use M3 washers for all screws.
- Tighten screws using a torque wrench. For DIN912 screws, apply a torque of 1.5 Nm.

Screws holes drawing



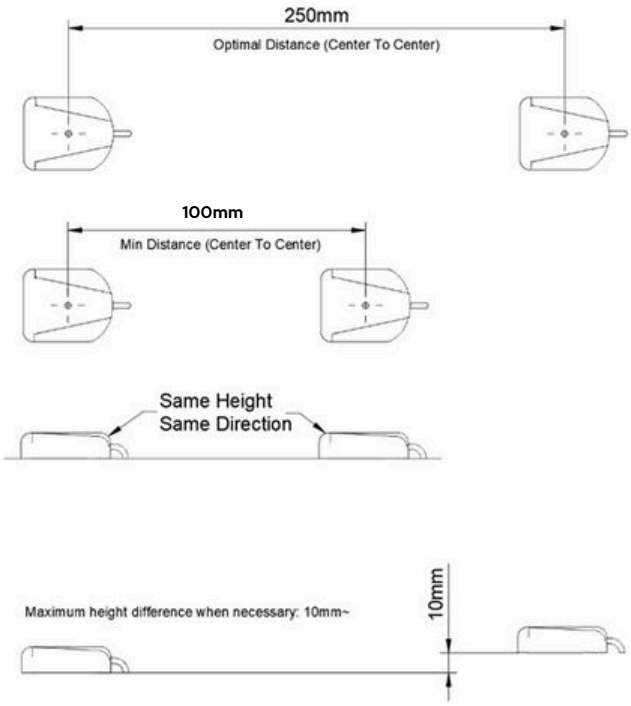
- If the GPSdome-SunStone is mounted on a surface with access to the opposite side, it is recommended to use Nylock nuts and washers.
- Position and secure the GPSdome-SunStone, ensuring the cable is appropriately sized to reach the power source.
- Ensure the antenna cables are of equal length to maintain adequate separation and proper connection to the GPSdome-SunStone.

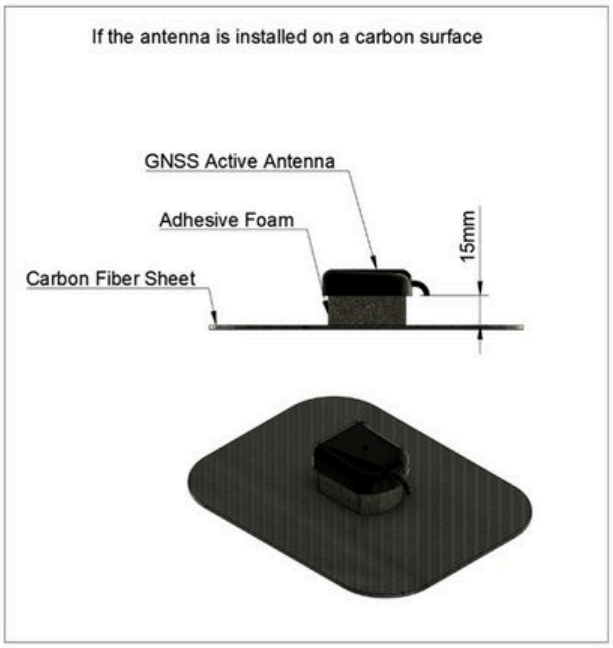




Installing Antennas

- Locate the antennas in a suitable area on a horizontal surface that always faces the sky, e.g. on the roof area.
- Ensure all antennas are oriented in the same direction.
- Ensure that there is a distance of at least 10cm between the two antennas. Optimal distance = 25 cm.





- Avoid placing the antennas near obstacles including roof racks, other transmitting antennas such as AM/FM and cell phone or air-conditioning devices that could block a clear view of the sky, preventing the satellite signals from reaching the antenna.
- Use cables of equal length between the antennas and GPSdome-SunStone (tolerance up to 10mm).
- Route the antenna cables away from moving parts, under carpet and behind plastic trim, to the GPSdome-SunStone module location.

The antennas installation guidelines provided here represent the recommended optimal configuration. If alternative configurations are required, please contact our technical support team. We will gladly provide guidance and assistance to ensure optimal performance tailored to your specific installation needs.

Wiring Diagram

RF wiring Diagram

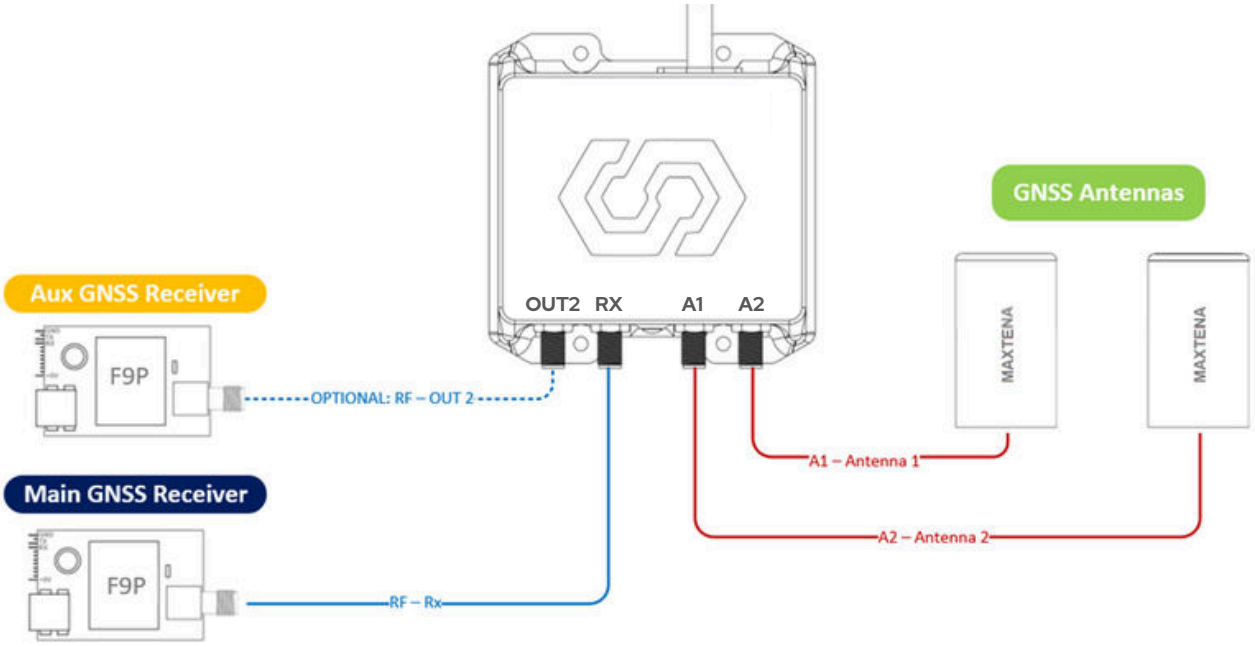
The GPSdome-SunStone OEM module can be integrated into a static or dynamic platform.

- The two antenna ports on the GPSdome-SunStone unit are labeled A1 and A2. These connectors are SMA female, so the antenna cables must be terminated with SMA male connectors. If your antennas do not have SMA terminations, appropriate adapters should be used.

- The GPSdome-SunStone unit also provides two RF output connectors labeled RX and OUT2. These are SMA female as well, and require cables with SMA male connectors.

    - RX: This is the primary RF output and should be connected to the GNSS receiver. It delivers a protected GNSS signal.

    - OUT2: This is an optional secondary output. It delivers an unprotected GNSS signal, and can be used if an additional signal is needed (e.g., for heading computation with a secondary receiver).



Connecting Coaxial (RF) Cables

Secure Connections

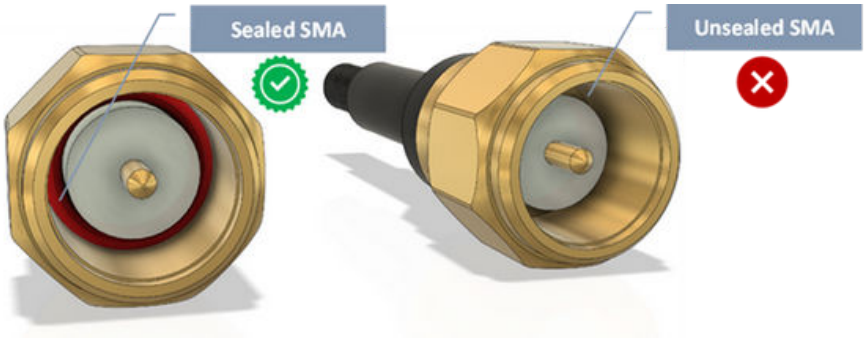
- Before connecting an SMA connector, check for damage, such as a bent or missing center pin, or cracks in the female connector. Ensure the threads are complete



- Conformally route the antenna cables away from any moving parts.
- Avoid placing the RF cabling near EMI noise generators or components likely to cause EMI interference at all costs.
- Prevent any damage to your RF cable assemblies: ensure cables are not bent, deformed, or snagged to cause damage to the internal wiring or the connector ends.
- For SMA connectors please use an SMA torque spanner set to 1Nm (8.85 in-lbs).



- To prevent the risk of moisture ingress, it is recommended that a cable with high-quality sealed SMA connectors (see figure below)

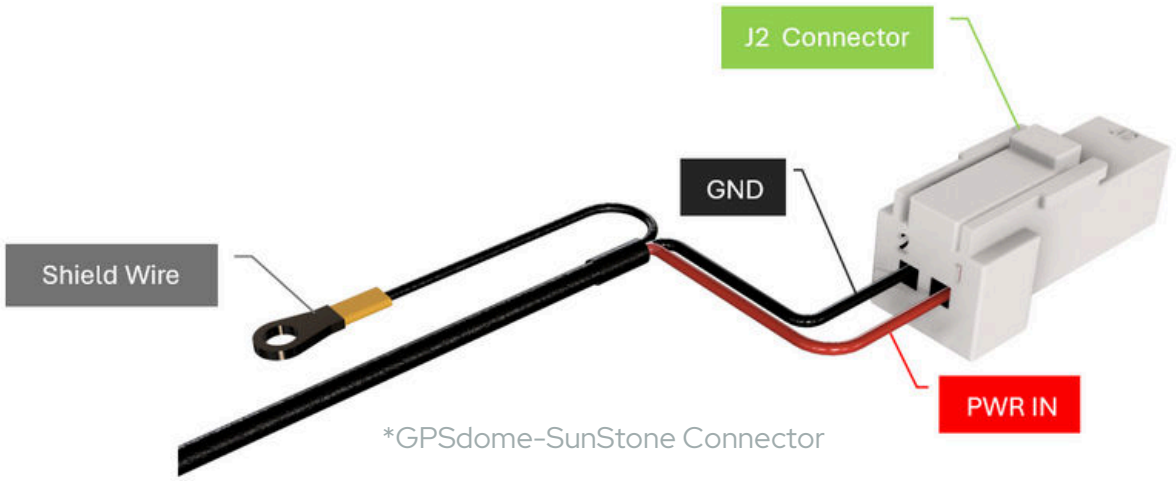


Power Supply Connection

Connect Power

- Ensure the power supply voltage output is 6 - 32VDC.
- Connect the **positive** terminal of the power supply to **PWR IN** Pin (J2 Connector).
- Connect the **negative** terminal of the power supply to the **GND** Pin (J2 Connector).
- Coil and secure any excess antenna cable or power wires.
- Connect the **shield wire** (ring terminal) to a grounding point on the chassis or user system ground. Proper grounding is essential to ensure optimal system performance and to minimize electromagnetic interference (EMI).

> Caution: Always verify wire polarity to prevent reverse polarity damage.



Final Step

Coil and secure any excess cables and wires to prevent damage or interference.

- Ensure all connections are secure.
- Power on the GNSS receiver and the GPSdome-SunStone unit.

Operational Guidelines

GPSdome-SunStone operates automatically without the need for manual intervention. The device continuously monitors and mitigates GNSS jamming signals.

LED Indicators

At the center of the GPSdome-SunStone, there is an LED indicator that displays the system status as long as the unit is receiving power. The following table describes all the LED states and their meanings:

Led State	System status
Flashing Green	Standby mode, Bypass mode
Steady Green	Stop mode (Service)
Flashing Green/Orange	System active, jamming detected
Flashing Orange	Hi power Jamming detected
Red	Error state

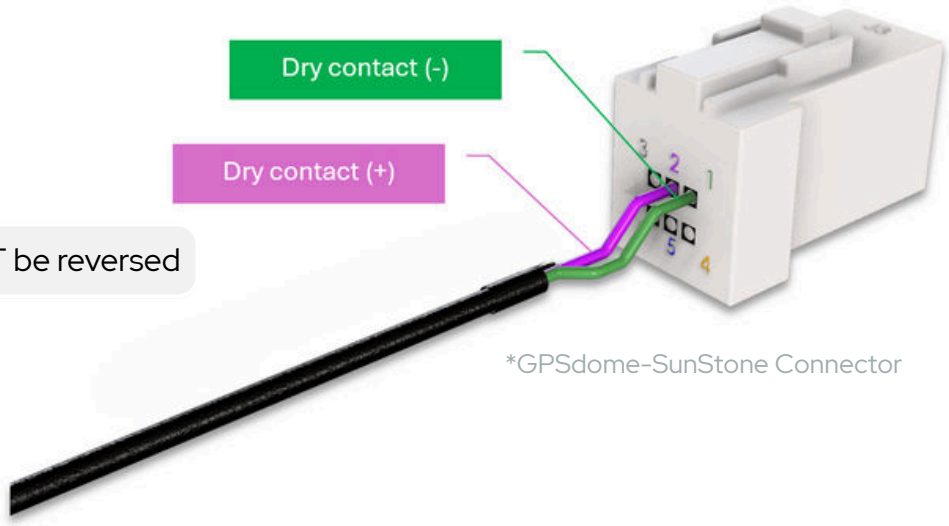


Dry Contact

When the system detects jamming, the internal circuit of the dry contact wires is closed. When no jamming is detected, the external circuit remains open. You can connect a custom circuit according to the following specifications:

- Opto-coupler
- Maximum Voltage: 32V
- Maximum Current: 50mA

Caution: Polarity can NOT be reversed



*GPSdome-SunStone Connector

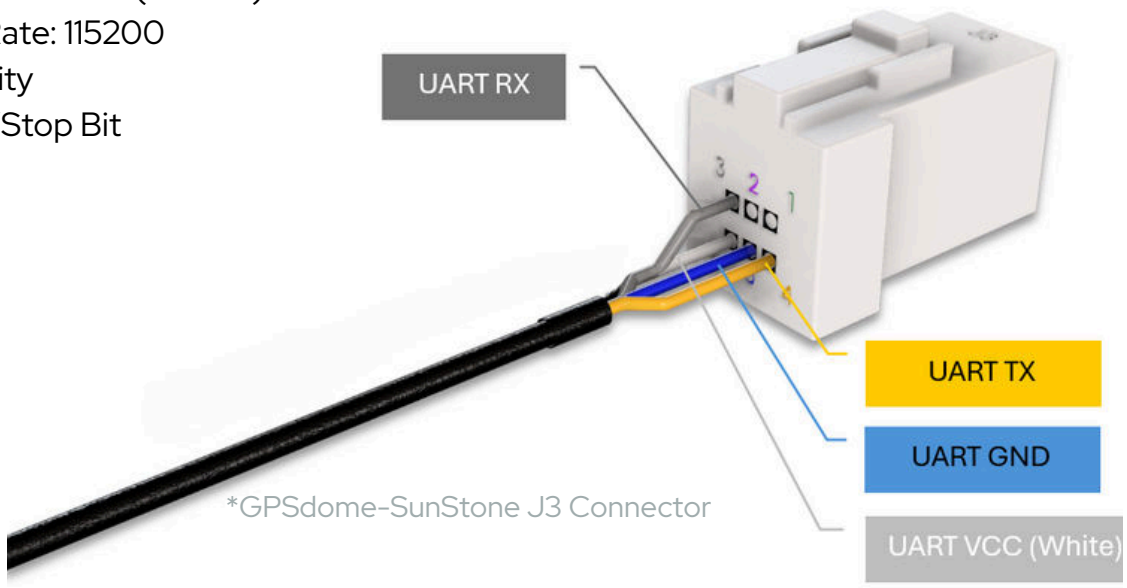
UART TTL Communication

By using UART TTL communication with the GPSdome-SunStone unit, you can receive a variety of status messages and configure certain features. To enable this functionality, connect the UART wires (J3 connector) to your UART adapter, according to the wiring table provided on page 5 of this manual.

The UART interface is intended for maintenance. It does not include a built-in GNSS receiver

TTL information:

- Voltage: **5 VDC** (LVTTL)
- Baud Rate: 115200
- No Parity
- 1 Start/Stop Bit



Important Notes When Using the UART Connection:

- UART communication requires both the UART VCC (5 VDC) and UART GND pins to be connected to a valid power source. Without proper power, UART functionality will not be available.

- If the UART power source shares a common ground with the main power supply of the GPSdome-SunStone unit, carefully verify wire polarity before making the connection. Incorrect wiring may result in system damage.

Caution: When GND is shared, reverse polarity may cause damage

System Status Messages

The GPSdome-SunStone automatically transmits several information messages about the system's status. After initialization, GPSdome-SunStone sends a Built-In Test (BIT) indicating the system's health, including:

- System version
- The frequency protected bands that are installed in the unit.
- System usability status

Every 5 seconds (configurable), a text string is sent via UART containing:



Messege Parameters Description

Parameter	Description
PD1	Peak Detector signal strength recorded in each frequency band over the last 5 seconds.
PD2	Peak signal strength recorded at the antennas input over the last 5 seconds.
Jamming Status	No Jammer = Jamming not detected.
	Jammer Exist = Jamming detected.
Temp	System temperature

Troubleshooting

Common Issues and Solutions

If GNSS Receiver Does Not Acquire Position Lock:

1	Check for Obstructions: • Ensure there are no buildings, tunnels, or other obstructions around or above the application. • Move to another location if necessary.
2	Isolate Internal Jamming Sources: • Switch off other electronic devices to reduce potential interference.
3	Inspect Cable Connections: • Check for any damage, excessive bending, or loose connections. • Ensure all cables are correctly secured.
4	Test GNSS Receiver and Antennas: • Verify the GNSS receiver functions correctly when connected directly to one antenna. • Repeat the test with the other antennas. • If both antennas work correctly, reconnect the GPSdome-SunStone
5	Verify Antenna Connections: • Ensure antennas are connected to GPSdome-SunStone A1| A2 connectors. • Ensure the SMA connectors are properly secured
6	Verify RF Output Connection: • Ensure the GPSdome-SunStone OEM 'RX' connector is connected to the GNSS receiver. • Ensure the SMA connectors are properly secured
7	Check GNSS Receiver Compatibility: • Confirm the GNSS receiver matches the frequency bands installed in GPSdome-SunStone.
8	Power Supply Check: • Ensure 6 - 32VDC external power is connected. • Verify power source output. • Verify power source polarity.
9	LED Indicator Check: • Ensure the green LED is ON when an active GNSS receiver is connected.

TIPS

- Keep the cable between the GPSdome-SunStone and the GNSS receiver short.
- Locate the GNSS antennas as far away from other RF jamming sources as possible.
- There are significant variations in the performance of GNSS receivers supplied by different manufacturers. GPSdome-SunStone adds an anti-jam capability to all receivers, but the overall anti-jam performance of the combined system will depend on the performance characteristics of the receiver.
- GPSdome-SunStone reduces jamming signals that enter the receiver through the antenna port. However, a poorly - designed receiver can also absorb the jamming signal through the receiver's body. A good receiver will have EMC shielding to prevent leakage of RF radiation through its sides, if this is not the case and a better receiver cannot be used, install the receiver in a shielded case.
- If possible, increase the distance between the GPSdome-SunStone antennas and any jamming source. For example, if a jammer operates from the cigarette lighter socket in a car, locate the antennas towards the vehicle's rear.
- If GPSdome-SunStone is installed in a complex environment, such as a vehicle, experiment with the placement and orientation of the antennas for best results. Due to the complex propagation environments within vehicles, different installation options may produce higher or lower performance.

Antenna Parameters

Item	Description	Value			Units
Type	Receiver DC line	Min.	Typ.	Max	n/a
Elements			2		n/a
Gain		15	26	40	dB
Noise Figure			2	2	dBi
Supply Voltage			2.75	14	Volt
Supply Current		2	10	40	mA

Help and Support

Maintenance

GPSdome-SunStone does not contain any user-serviceable parts and has no moving parts. Therefore, concerning the CAUTIONS on page 4, no maintenance is required apart from examining all the cable assemblies for a secure connection, damage, and corrosion.

Additional Support

Please scan for further assistance:

Website