GPSdome2

Installation Manual

2024

infiniDome
NAVIGATION RESILIENCY

Version No 1

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Introduction

Welcome to the GPSdome2 Installation and Integration Guide!

Thank you for choosing GPSdome2, an advanced solution engineered to provide robust protection against GNSS jamming, ensuring uninterrupted navigation and operation even in the most challenging environments. This guide is designed to help you understand the features of GPSdome2, prepare for installation, and integrate it seamlessly into your system.

GPSdome2 offers exceptional protection against GNSS jamming, ensuring continuity of autonomous navigation and operation under jamming conditions. This compact, lightweight, and affordable device can be retrofitted easily onto a wide range of platforms, regardless of the receiver brand. It is designed to be installed inline between the GNSS antennas and the receiver, providing continuous jamming protection.

Safety and Compliance

General Cautions

- GPSdome2 module should be mounted on a flat surface (up to 70°C) or to cooling fins for constant air flow
- Secure GPSdome2 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)

  Avoid touching the device while it's operating as some surfaces may become hot. Allow time for cooling before handling.

Electrical Safety

- During installation ensure there is NO power applied to the module.
- If you use GPSdome2 with a connector, please add a ferrite core for noise filtering.
- The length of the power cable should not exceed 3 meters.
- Please make sure that the GNSS receiver is powered off.

Power Requirements for vessel Installation

When installed on a ship, the unit must be powered by an external source providing 32Vdc and a maximum of 20W. This external power source must be safety approved according to EN/UL 62368-1 standards, with a rated voltage of 32Vdc and a power limit of 100W (LPS).

External Lightning Protection

Please note that our unit does not include built-in lightning protection. Ensure you have external lightning protection measures in place for proper safety and device protection. The surge protector device must be safety approved and installed by a certified person. Also, please be aware that the CE certification is valid for vessel use only when external lightning protection is utilized.

Compliance Certifications

GPSdome2 meets all the required standards for:

- FCC Compliance
- RoHS Compliance
- CE Compliance

Technical Specifications

Physical Specifications	
Enclosure	99.4 x 95.7 x 56mm (excluding mounting legs)
Weight	500g
Mounting	4 x 8-32 bolts (not supplied)
Environmental Specifications	
Operating Temperature Range	-40°C to 71°C
Waterproof Rating	IP65
Power Requirements	
Supply Voltage	6V DC to 32V DC
Power Consumption	IP65
RF Interfaces	
Antenna Connectors (P/A)	50Ω SMA 2.7V~12V DC (Active antenna with a gain between 26dB to 32dB)
Receiver Connector (R)	50Ω SMA

Interfaces

RF Interface Specifications

Antenna Connectors (ANT1, ANT2, ANT3, ANT4):

Connects GPSdome2 and GNSS Antennas input:

- Type: 50Ω SMA
- Voltage: 2.7V to 12V DC
- Supported Antenna Gain: 26dB to 32dB

RF OUT - Receiver Connector (out):

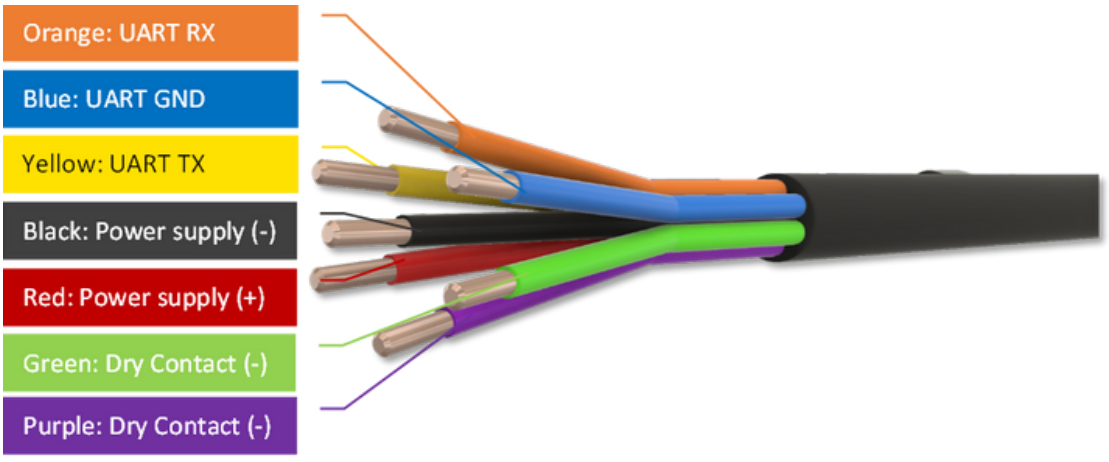
Connects GPSdome2 and GNSS receiver via a standard SMA connector:

- Type: 50Ω SMA

Electrical Interference

The GPSdome 2 has a wiring harness located at the front near the indicator LED. Using these wires, you can supply power to the GPSdome2, receive status messages (Note: GPSdome 2 does not contain a built-in GNSS receiver), and even connect your own device to receive jamming indications using the dry contacts wires.

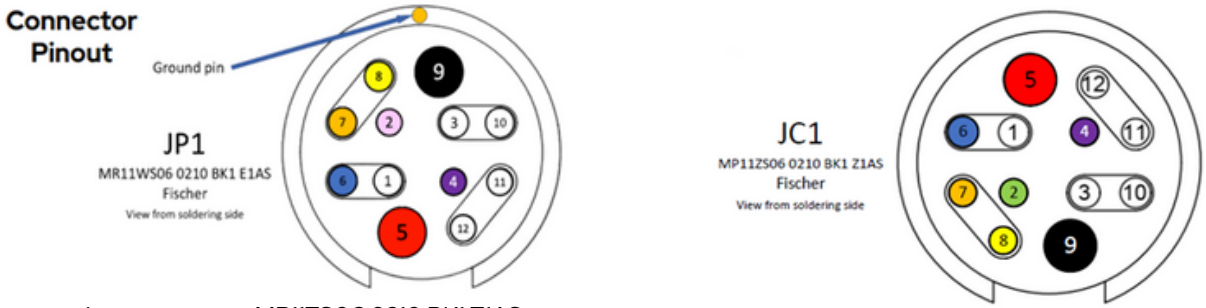
Function	Wire Color	Info
Power wires	Red	Power supply positive terminal (6vdc-32vdc)
	Black	Power supply negative terminal
Dry Contacts wires	Purple	Dry contact jamming indication – positive terminal
	Green	Dry contact –jamming indication – negative terminal
UART wires	Orange	UART RX
	Yellow	UART TX
	Blue	UART GND



Harness options

There are two configurations for how the harness connects to the GPSdome 2:

- Option 1: External Cable option (wiring table on the previous page)
- Option 2: Fischer Connector (wiring table below)



mating connector - MP11ZS06 0210 BK1 Z1AS

PIN num	Function	PIN num	Function
Pin 5	6vdc-32vdc	Pin 5	power supply positive terminal (6vdc-32vdc)
Pin 9	GND	Pin 9	power supply negative terminal
Pin 4	Dry contact +	Pin 4	Dry contact jamming indication – positive terminal
Pin 2	Dry contact -	Pin 2	Dry contact –jamming indication – negative terminal
Pin 7	UART RX	Pin 7	UART RX
Pin 8	UART TX	Pin 8	UART TX
Pin 9	GND	Pin 9	UART GND

Please note: If you use GPSdome 2 with a connector, you need to add **FERRITE** for noise filtering.

Installation Guide

Pre-Installation Checklist

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

- 1 x GPSdome2 unit
- 4 x identical active antennas (26dB to 32dB gain, 2.7V~12V DC, 50Ω)
- SMA coax cables (High quality, Low attenuation, identical length up to 10mm tolerance)
- GNSS receiver
- RF adaptors to SMA (if needed)
- 6VDC to 32VDC power source
- Mounting screws (8-32 bolts – not included).
- Drill and appropriate drill bits
- SMA torque spanner set to 1Nm (8.85 in-lbs)
- Multimeter for verifying power supply voltage

Unpacking and Inspecting Equipment

Unpack the Equipment

- Carefully remove the GPSdome2 and all accessories from the packaging.

Inspect for Damage:

- 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.
- Check that the GPSdome2 unit has no dents or deformities.

Site Preparation

Choosing the Installation Location:

- Select a flat metal surface that does not heat above 70°C for mounting the GPSdome2.
- 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:

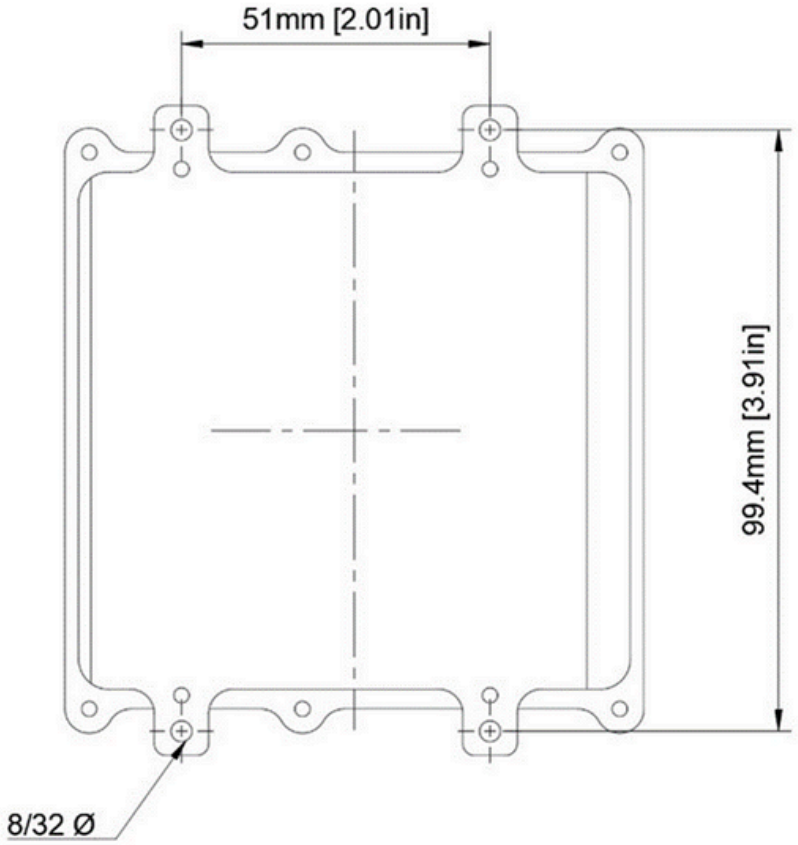
- In case of installing GPSdome 2 near your GNSS antennas - Ensure the GNSS antenna's installation site is free from obstructions and has a clear view of the sky for optimal GNSS signal reception.
- Avoid placing the device near sources of interference or radiating antennas.

Mounting GPSdome2

Prepare the Mounting Surface

- Mark and drill four holes suitable for 8-32 (US) screws.

• Screws holes drawing:

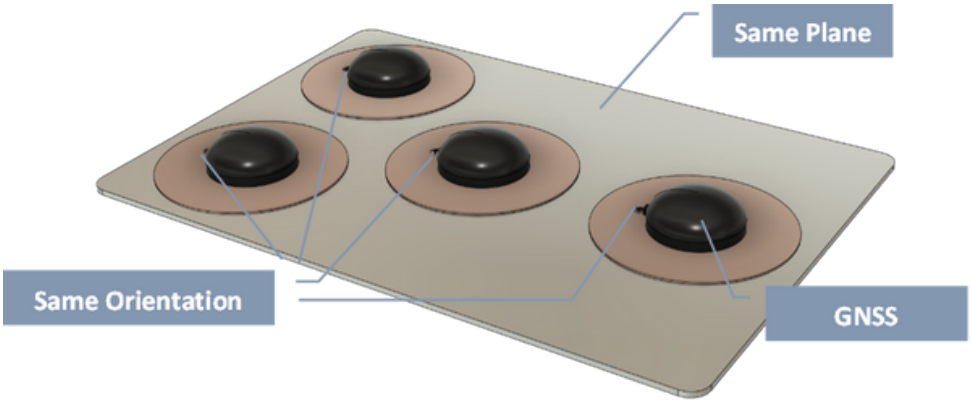


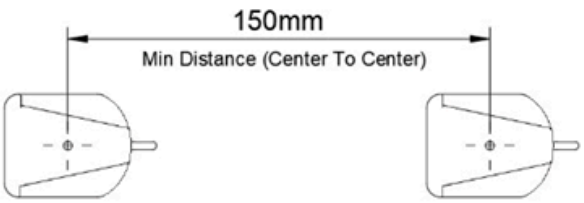
- Align the GPSdome2 with the drilled holes, Allowing for ease of cable connection.
- Secure the device using appropriate 8-32 screws (not included) .

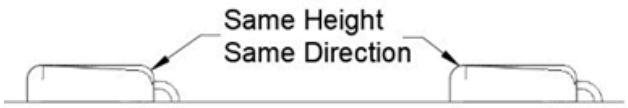
Installing Antennas

1.Placement:

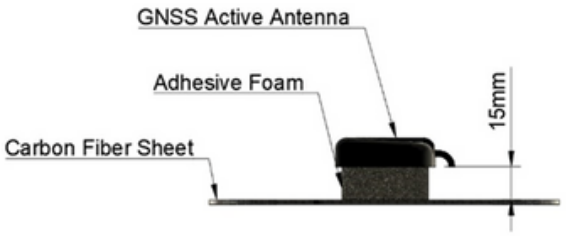
- The GNSS antennas should be arranged in a Y configuration as described in the diagram below and in the following sections. The system has been tested and optimized for optimal performance using this configuration.
- Place the antennas on a horizontal surface with a clear view of the sky.
- Ensure all antennas are oriented in the same direction.

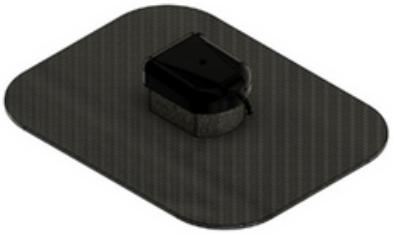






If the antenna is installed on a carbon surface



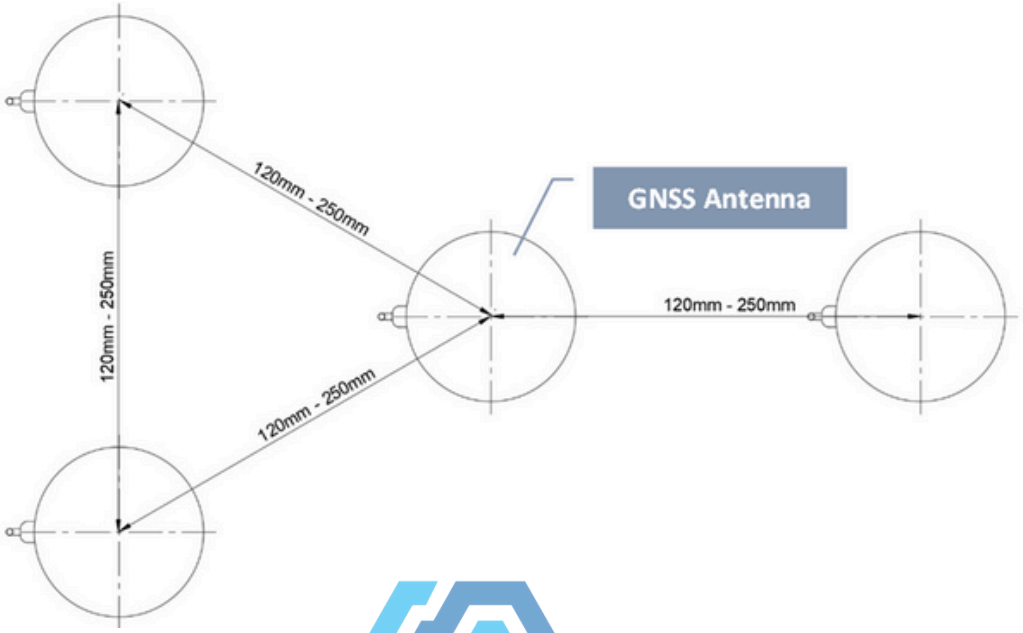


2. Cable Length:

- Use cables of equal length between the antennas and GPSdome2 (tolerance up to 10cm).

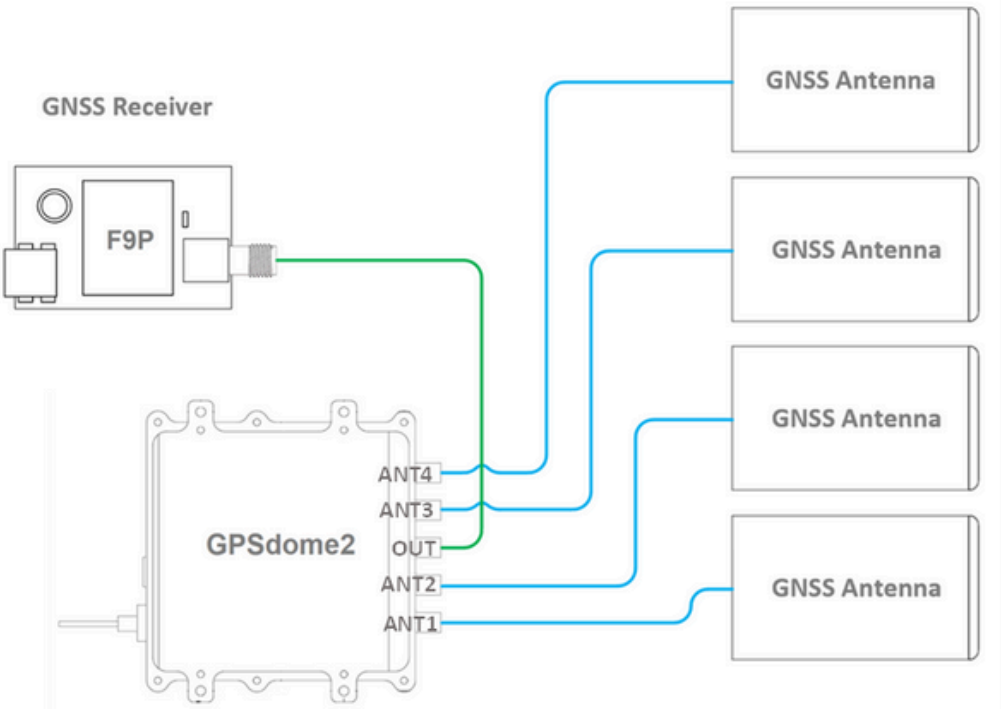
3.Separation Distance:

- Maintain a distance of at least 120mm between antennas (optimal deployment in a Y shape).
- Antennas should be aligned symmetrically (mounted with same direction)
- Avoid placing antennas near obstructions or radiating devices.



RF wiring Diagram

The GPSdome2 module can be integrated into a static or dynamic platform. As shown below, 4 x antennas are connected to the module via the 4 SMA input connectors (ANT1), (ANT2), (ANT3), (ANT4) while the GNSS receiver is connected to the RF out SMA connector (OUT).



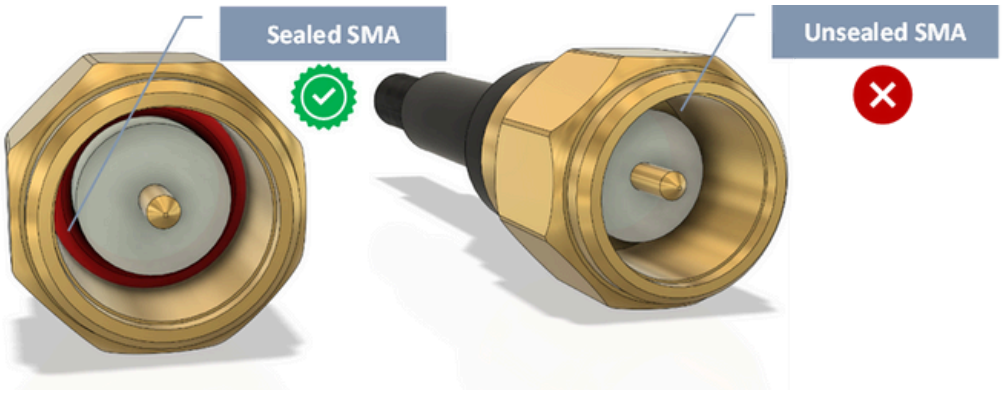
Connecting Coaxial (RF) Cables

Secure Connections:

- 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.
- Connect the four antennas to connectors ANT1, ANT2, ANT3, and ANT4 using an SMA torque spanner set to 1Nm (8.85 in-lbs).

- Connect the RF out connector (Out) to the GNSS receiver's RF antenna input.

- Please use high-quality sealed SMA connectors. To prevent the risk of moisture ingress, we recommend cables with high-quality sealed SMA connectors. Please use high-quality RF cables with double shielding with low attenuation (loss).



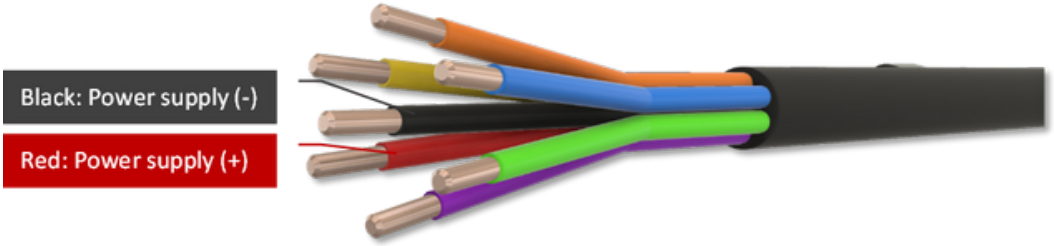
Power Supply Connection

1. Cable Length:

- Ensure the power supply voltage output is between 6VDC and 32VDC and can provide at least 16W of power.

2. Connect Power:

- Connect the positive terminal of the power supply to the red wire of GPSdome2.
- Connect the negative terminal of the power supply to the black wire of GPSdome2.
- Coil and secure any excess antenna cable and power wires.
- **Caution:** Double check the Red and black wire to prevent reversed polarity.



Final Steps

Tidy Up:

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

Power On:

- Ensure all connections are secure.
- Power on the GNSS receiver and the GPSdome2 unit.

Operational Guidelines

General Operation

1. Cable Length:

- GPSdome2 operates automatically without the need for manual intervention.
- The device continuously monitors and mitigates GNSS jamming signals.

LED Indicators

At the front of the GPSdome 2, near the wiring harness output, there is an indicator LED that displays the system status as long as it is connected to power.

The following table describes all the LED states and their meanings

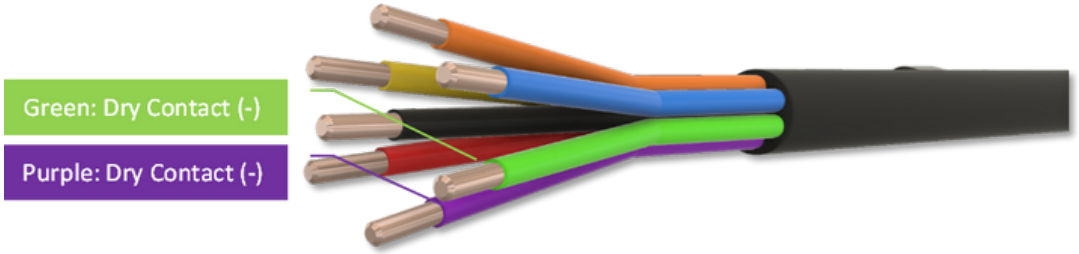
Led State	System status
Blinking RED	Initializing
Steady RED	Built-In Test (BIT) Error
Steady Green	System active, no jamming detected
Blinking Green/Orange	System active, jamming detected

Dry Contact

Dry Contact and TTL Communication

- Dry Contact:
- Opto-coupler
- Maximum Voltage: 32V
- Maximum Current: 500mA

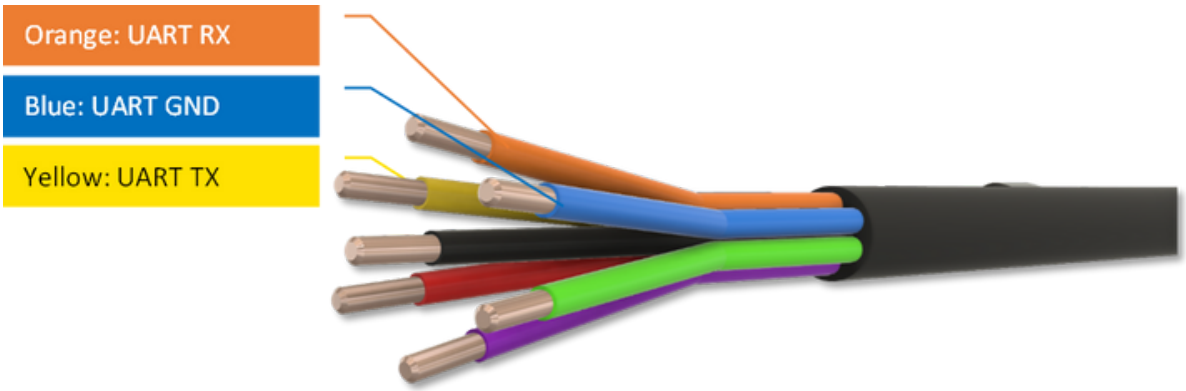
Note: Polarity can be reversed due to the full bridge rectifier at the dry contact input.



TTL Communication

TTL Communication information

- Voltage: 3.3V (LVTTL)
- Baud Rate: 115200
- No Parity
- 1 Start/Stop Bit



System Status Messages

The GPSdome 2 proactively or automatically transmits several information messages about the system's status.

1.After initialization, GPSdome2 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
- <bit> SYSTEM Ready or <bit> SYSTEM Error

2. Every 10 seconds, a text string is sent via UART containing:

- Maximum signal strength measured in each frequency band during the last 10-second period
- System temperature
- Jamming Status (0= Jamming not detected or 1= Jamming detected)

3. Request for information from the system

A binary request can be sent to the system for more information:

Request string	The value that the system will send back
uint8_t system status; //0	System Usability OK/Not OK
uint8_t Antennas Status; //1	The integrity of antennas in the system (information about working antennas and whether there are malfunctioning/not connected antennas)
uint8_t gnss_band1; //2	What GNSS frequencies are installed in the system
uint8_t gnss_band2; //3-	
	What GNSS frequencies are installed in the system 0- L1 1- L2 2- G1
uint8_t temperature_rfic_lsb; //12	System temperature

Troubleshooting

Common Issues and Solutions

Issue	GNSS Receiver Does Not Acquire position Lock
Solution	**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 GPSdome2. **5. Verify Antenna Connections:** • Ensure antennas are connected to GPSdome2 ANT1-ANT4 connectors. • Tighten SMA connectors. **6. Verify RF Output Connection:** • Ensure the GPSdome2 'Out' connector is connected to the GNSS receiver. • Tighten SMA connectors at both ends. **7. Check GNSS Receiver Compatibility:** • Confirm the GNSS receiver matches the frequency bands installed in GPSdome2. **8. Power Supply Check:** • Ensure 6VDC - 32VDC external power is connected. • Verify power source output. **9. LED Indicator Check:** • Ensure the green LED is ON when an active GNSS receiver is connected.

General Specifications and Antenna Parameters

General Specifications

Item	Parameter	Description/notes		Value		Units
Physical Operational Environmental			***Min.***	***Typ.***	***Max***	
Temperature range			-40	25	+71	˚C

Power Supply Specification					
Supply Voltage	Receiver DC line	*+6*		+32	Volts DC
power Consumption	Including antennas		9W		Watt
Antenna Bias	Voltage	2.7		12	Volts
	Current per o/p	2		25	mA

Antenna Parameters

Item	Description		Value		Units
Type	Receiver DC line	***Min.***	***Typ.***	***Max***	n/a
Elements			2		n/a
Gain			30		dB
Noise Figure			2		dB
Supply Voltage			2.75		Volt
Supply Current		2	10	20	mA

Help and Support

Additional Support

For further assistance, contact our support team:

- Email: info@infinidome.com
- Phone: +972-4-770-7700
- Web: www.infinidome.com

Maintenance

GPSdome2 does not contain any user-serviceable parts and has no moving parts. Therefore, concerning the CAUTIONS, no maintenance is required apart from examining all the cable assemblies for a secure connection, damage and cor