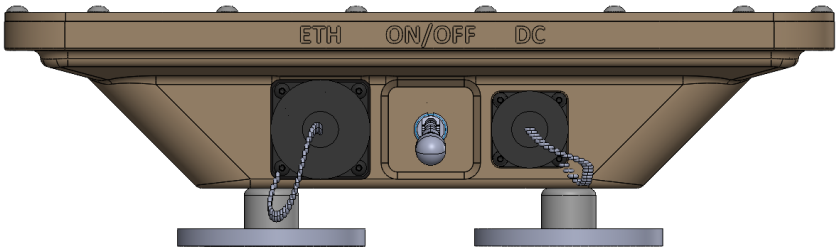

STORM MINI User Manual

Revision A

For the most current revision to this document please contact support@copasat.com

Prepared by:

COPASAT, LLC
2020 Wild Acres Rd - Unit D
Largo, FL 33771
support@copasat.com
Support +1 (727) 647-6110

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Introduction

This document contains important details for the safe and effective operation of a STORM MINI terminal.

This manual may contain errors and may be revised without notice. It is the responsibility of the user to always use their best judgement and to consult with technical support for the most current information.

Configuration Overview

The STORM MINI is an upgrade kit for the commercially available StarLink and the DoD version StarShield MINI antenna designed and manufactured by SpaceX. The antenna is embedded into a metallic enclosure without modification. The STORM MINI enclosure provides an environmental seal for all the components. Military standard connectors and gaskets are used for all external electrical interfaces.

To identify which configuration you have refer to the part number on the ID label. The six-digit number indicates which configuration and kit you have.

Variant	Six-digit unique identifier	Antenna Type
MINI BASE KIT	CS-G1-030600	StarShield
	CS-G1-030605	StarLink
MINI 2590 KIT*	CS-G1-030610	StarShield
	CS-G1-030615	StarLink

*Batteries not included

The terminal that is part of a BASE KIT and a 2590 KIT are the same (for each respective antenna type). The only differences in the kits are the accessories (transit case and cabling).

Part numbers that end in zero are StarShield antennas and part numbers that end in five are StarLink antennas.

Table 1: STORM MINI Kit Comparison

Variant	Terminal	Mounts	AC Cable	DC Cable	Transit Case	Battery Cable
BASE KIT	STORM MINI	Magnets (Included) Vacuum (Optional)	AC to DC Wall adapter to Terminal Interface	Terminal to 5/16” Ring Terminal (Car battery interface)	Case w/out 2590 slots	Not Included
2590 KIT*					Case with slots for 2 2590 batteries	Dual 2590 battery to STORM cable

*Batteries not included

Table 2: Variant Network Interfaces

Variant	Satellite Antenna	Cellular	SD-WAN Device	SIM Card Size	# Ethernet Ports	Wi-Fi
STORM MINI	MINI	N/A	N/A	N/A	1	802.11a/b/g/n/ac (Wi-Fi 5)

Table 3: Variant Physical Properties

Variant	Weight (lbs.)	Length (in)	Width (in)	Height (in)
MINI (Terminal Only)	6.8	13	11.5	2.73
MINI BASE KIT Transit Case Loaded	TBD	TBD	TBD	TBD
MINI 2590 KIT Transit Case (w/out batteries)	TBD	22.3	18	8.3
MINI 2590 KIT Transit Case (with batteries)	TBD	22.3	18	8.3

* May vary based on cabling or accessories packed.

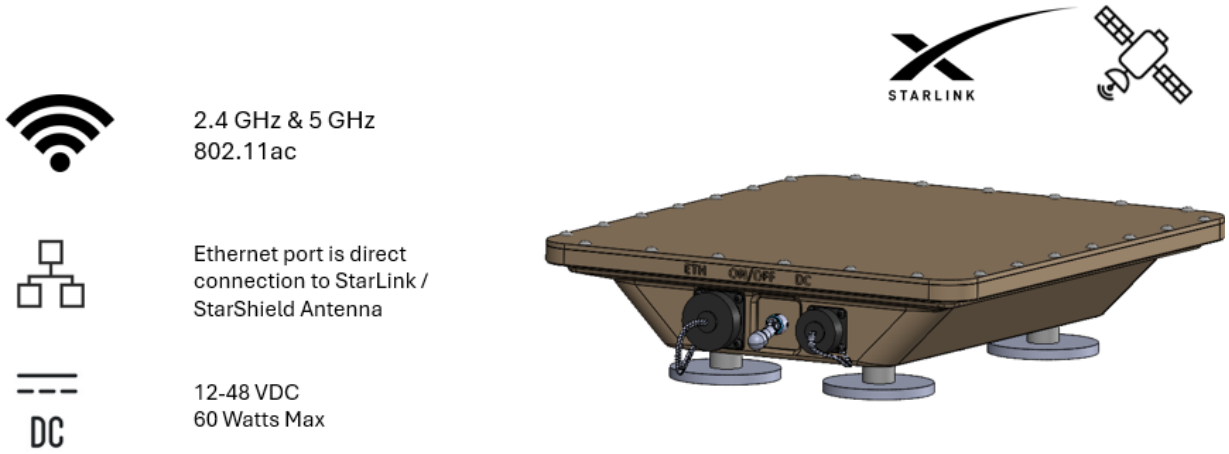


Figure 1: Interface Overview

STORM MINI

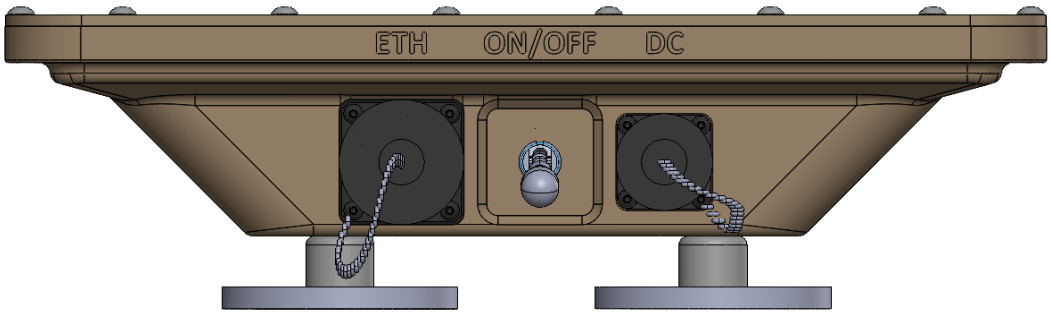


Figure 2: STORM MINI Front View (Tan)

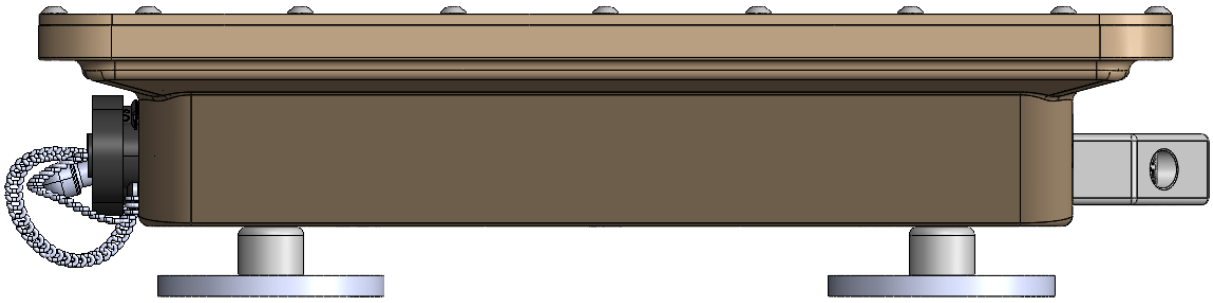


Figure 3: STORM MINI Side View (Tan)

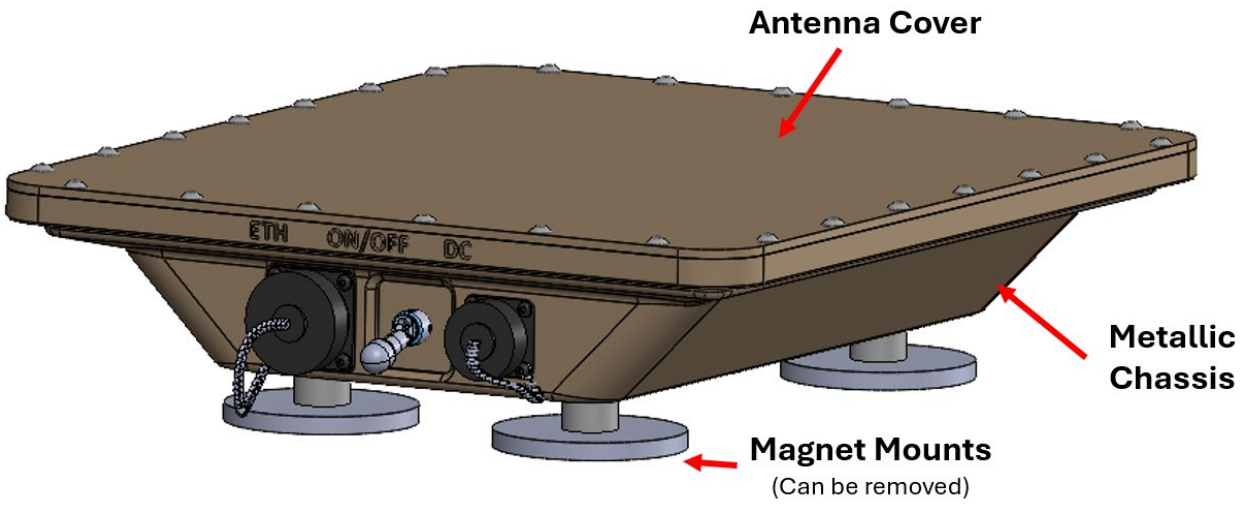


Figure 4: STORM MINI Isometric View (Tan)

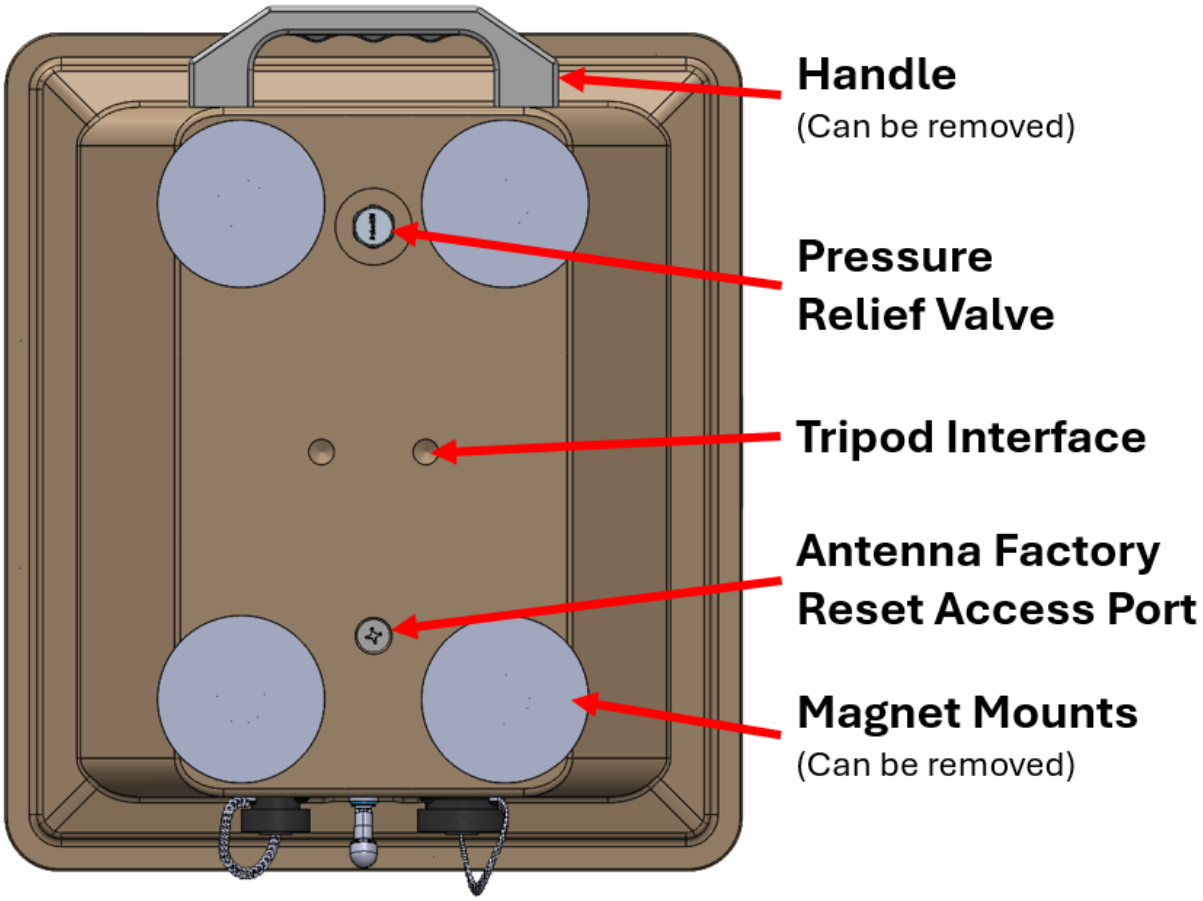


Figure 5: STORM MINI (Bottom View)

Universal hardware features

A pressure relief valve ensures that adverse temperature or rapid depressurization environments do not compromise the environmental gasket between the antenna and the enclosure. The pressure relief valve has a rating of IP68.

The chassis is aluminum. If the paint is damaged the chassis will not adversely corrode and does not require paint repair except for aesthetic preferences.

STORM Color Options

Color	Color Code	Chip Number per FED-STD-595	Color Description per FED-STD-595	Color Type
Gray	GY	36231	International Gray	Camouflage / Lusterless (Flat)
Tan	DT	33446	TAN 686A	Camouflage / Lusterless (Flat)
Green	OG	34094	Green 383	Camouflage / Lusterless (Flat)
White	WH	37925	-	Camouflage / Lusterless (Flat)
Black	BK	37038	Black International	Camouflage / Lusterless (Flat)

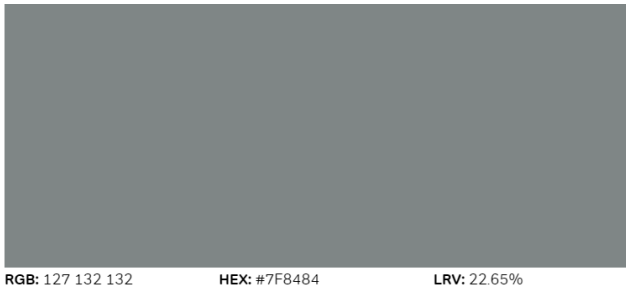


Figure 6: Gray 36231

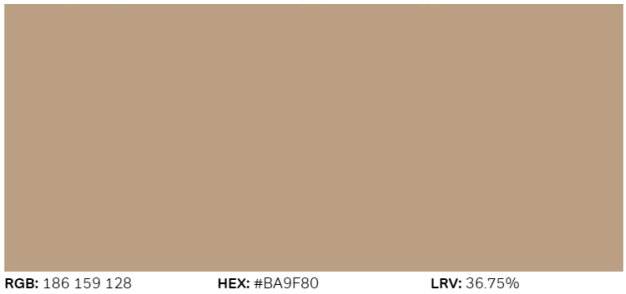


Figure 7: Tan 33446

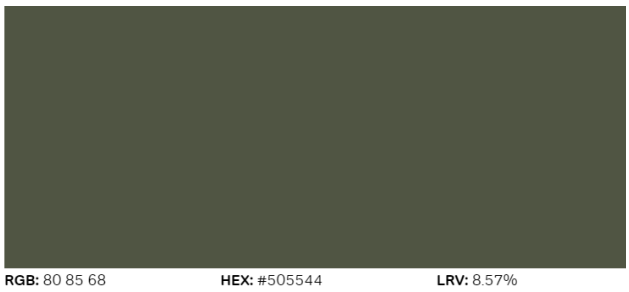


Figure 8: Green 34094

Figure 9: White 37925

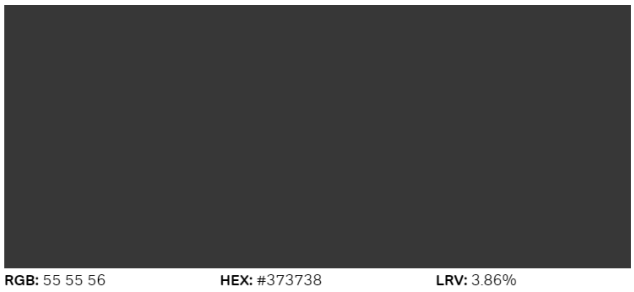
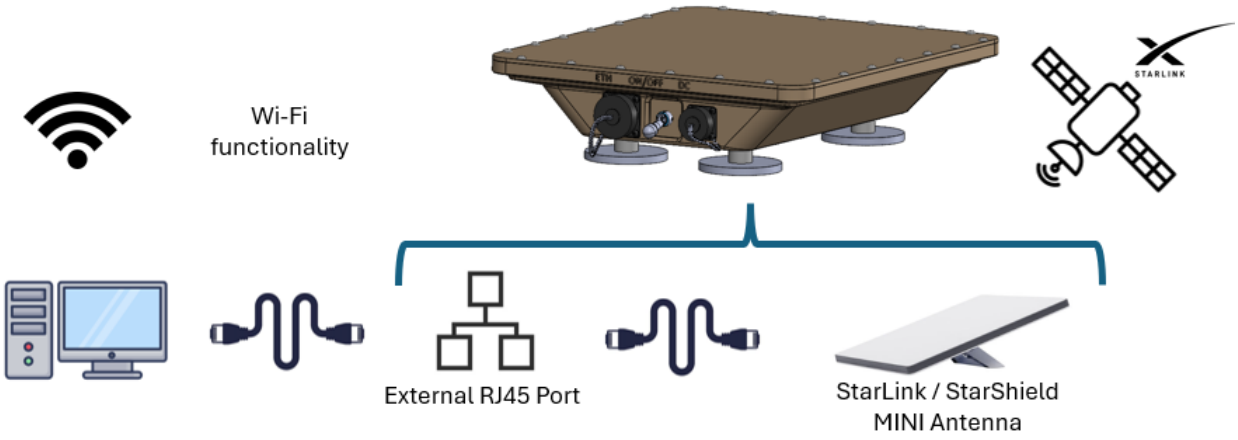


Figure 10: Black 37038

Quick Setup Guide – MINI



1. Connect Power Source

System Voltage	12-48 VDC
Power	20 watts Nominal 45 watts Acquisition 60 watts Max

2. Place the ON/OFF switch in the ON position (up)

3. StarLink/StarShield boot up timeline:
   a. 5 minutes for the antenna to orient and connect to the StarLink network
   b. 15 minutes for the connection to stabilize and achieve maximum available data rates

4. Connect to the network via Wi-Fi or the ethernet port

   Wi-Fi Default:

   - SSID: STORM MINI
   - Password: P@55w0rd!
     - Note: Demo & Leased Units Password is copasat!

Installation Best Practices

- Orient towards North (0 degrees); pointing between 15 and 35 degrees from being pointed straight up
- Separation from the ground or other structure will minimize heat affect if in a warm ambient conditions
- Minimizing physical obstructions between the terminal and the sky will result in higher data rates

Configuration Guide – MINI

StarLink / StarShield Configuration

1. Log into STARLINK account
2. Identify the terminal you want to work with
3. Click on Manage

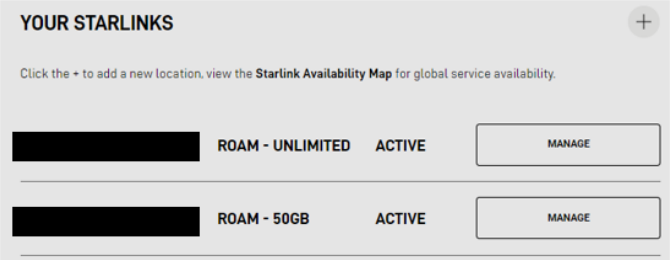
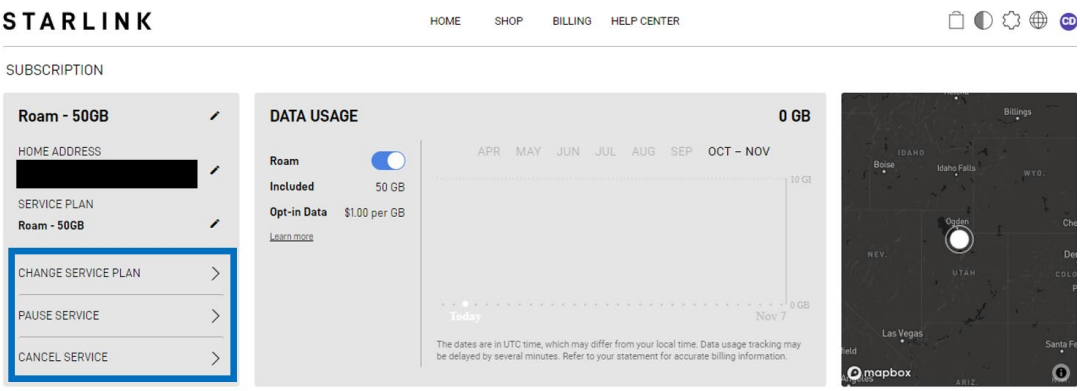


Figure 11: StarLink Account Antenna Selection

4. Under the Subscription options to configure the service plan (blue box). Depending on your account type this may or not be available.



5. Under the DEVICES when selected the antenna tab (red box) the options to REBOOT, STOW, or TRANSFER (green box) are available.
    a. REBOOT
        i. Reboots the antenna
        ii. Terminal must be powered on and connected to the satellite constellation
    b. STOW
        i. Legacy functionality with the original articulating StarLink.
        ii. This feature is not used with the MINI.
    c. TRANSFER
        i. Used to transfer the antenna to another account for service. Transferring is generally restricted 120 days since purchase and 90 days after activation.

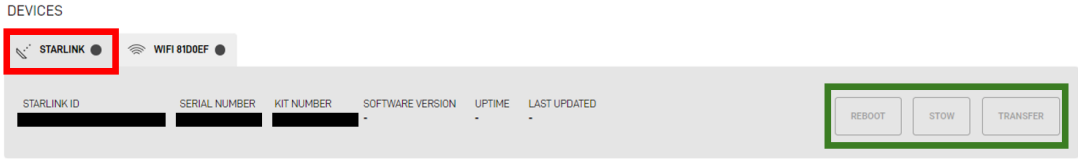
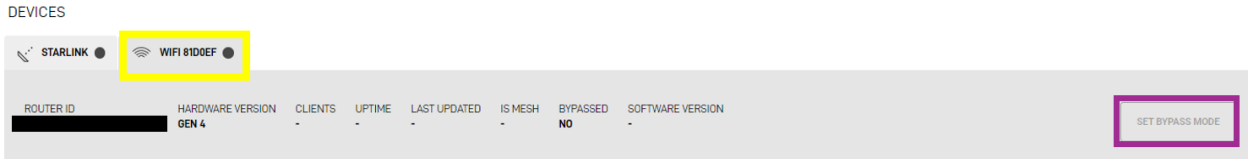


Figure 12: StarLink Account Configure Selection

6. Under the DEVICES when selected the WIFI tab (yellow box) the options to SET BYPASS MODE (purple box) are available.
    a. BYPASS MODE is used when you want to disable the integrated Wi-Fi and router functionality
    b. Factory reset is the only way to turn off BYPASS MODE

REBOOT



Environmental Limits

The StarLink / StarShield MINI antenna is designed and manufactured by SpaceX. The antenna is not modified by CopaSAT and is used as is within the STORM V3 assembly. As such the operating temperature limits are limited to the antenna's operating range.

Snow Melt Capability	Up to 75mm / hour (3in / hour)
Operating Temperature	-30°C to 50°C (-22°F to 122°F)
Environmental Rating:	Designed to IP68 (formal verification pending)
Wind Rating	Installation specific

Mechanical Interfaces

STORM MINI Mechanical Interfaces

Mechanical Interface Control Drawing: CS-11-030600 Mechanical ICD.pdf

Standard Mounting Provisions

- Thread anti-seize (Loctite LB 8150 or equivalent) is recommended for accessory mounts
- Thread locker (Loctite 242 or 262 with Primer 7471) is recommended for permanent installations
- Max torque: 55 in-lbs.

Dimensions are in inches:

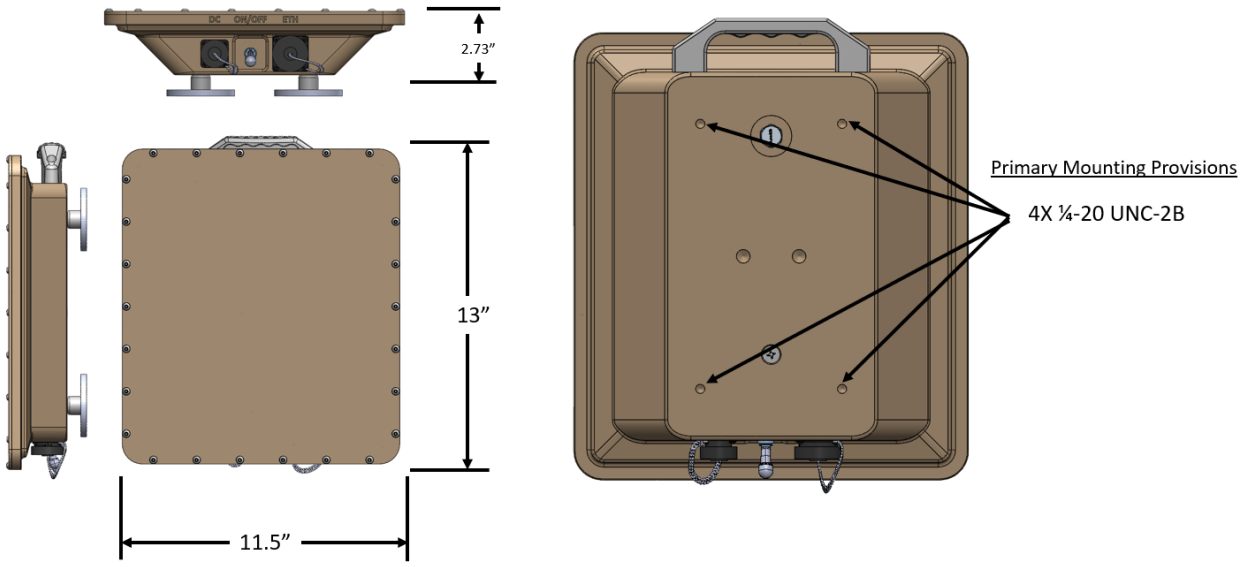


Figure 13: MICD

Electrical Interfaces

Voltage Requirements & Current Limits

Table 4: Voltage Requirements

Connector	Voltage	Current (Amps)
DC IN	12 – 48 VDC	5A Max

Notes:

- Supplied voltage needs to be within range under load.

Power Requirements

Table 5: Power Requirements

Power Consumption Budget		
Description	**Nominal**	**Max**
Antenna Acquisition	-	40
Antenna Steady State	20	-
Snow Melt	-	15
Wi-Fi	5	5
Total Power Requirement	**25**	**60**

Approximate Run Times (Hours)	
Single 2590 Battery	TBD
Dual 2590 Battery	TBD
DeWalt 2AH Battery	TBD
DeWalt 12AH Battery	TBD
Car Battery	TBD

Connector Mechanical Interface Summary

Table 6: Terminal Connector Interfaces

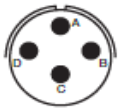
Description	Manufacturer PN (Terminal)	Mating PN (External Harness)	Vendor
DC IN	PT02E-12-4P	PT06E-12-4S-SR	Amphenol

A – POS (+)

B – POS (+)

C – NEG (-)

D – NEG (-)



Insert Arrangement	12-4
Service Rating	I
Number of Contacts	4
Contact Size	16

DC Panel mount connector

- CopaSAT Part Number: CS-44-010235
- Amphenol connector: PT06E-12-4S-SR
- Ring Terminal size: 5/16”

2590 Battery Power Cable

- CopaSAT Part Number: CS-44-010240
- Amphenol connector: PT06E-12-4S-SR

AC Wall Adapter

- CopaSAT Part Number: CS-44-010230
- Amphenol connector: PT06E-12-4S-SR

Installation Considerations

The STORM MINI is a very compact and mobile satellite terminal. This is not intended to be a complete guide but is intended to give the user points to consider in order to optimize performance of the terminal.

Your STORM MINI achieves the fastest data rates and has the fewest network issues when it has a clear view of the sky so it can stay connected with satellites as they move overhead. Objects that obstruct the connection between your terminal and the satellite, such as a tree branch, pole, or roof, may cause service interruptions.

- The antenna has a 110-degree field of view.
- An angle (~8 degrees) will prevent water or snow from accumulating on the service which may degrade performance.
- Optimal performance is generally achieved by orienting the terminal North.
- Cabling considerations
    - Minimizing the cable length from the power source will limit voltage loss
- Thermal considerations
    - The terminal has no active cooling and therefore benefits from minimizing additional heat loading which may occur from the ground, other devices, the sun, etc.
    - An air gap under the terminal is recommended, particularly for non-mobile applications, the larger the separation from the terminal to other objects is ideal.
    - In extreme environments considerations may need to be taken to maintain the terminal's thermal profile within its design parameters. This may necessitate a trade of increased obstructions to limit solar loading.

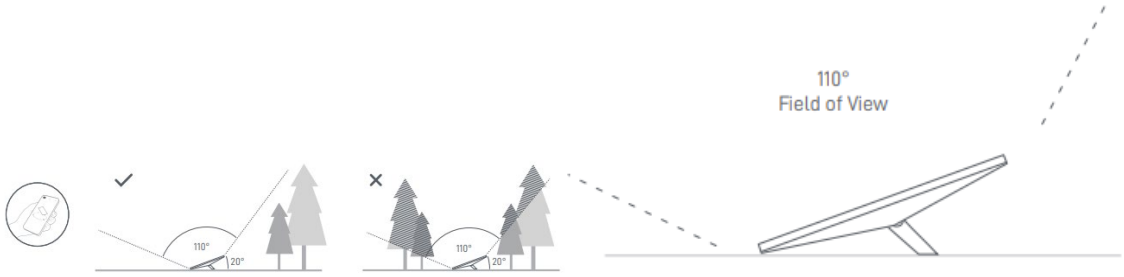


Figure 14: Installation Viewing Angles

Antenna Software Updates

https://starlink-enterprise-guide.readme.io/docs/software-updates

- Software updates are released approximately every two weeks but can be more or less frequent.
- Updates are not scheduled on specific days and are designed to rollout without disrupting service.
- Software updates are downloaded in the background and applied when the terminal reboots.
- Software updates do not count against service priority data limits. Starlink will "zero-count" the data used for updates and telemetry.

Software Update Reboots

- The StarLink will automatically reboot to apply software updates periodically at 3:00 AM local time +/- 30 minutes.
- Local time is based on the current physical location of the StarLink hardware.

Other Information

Static IP

- StarLink does not provide static IP addresses currently.
- The StarLink network is dynamic and from time-to-time IP addresses will change for resilience, as network capacity increases, or when new countries are added to the network.
- If your network is using an IPsec VPN, please configure a "dynamic peer" for the device connected to StarLink.
- Additional information at: https://starlink-enterprise-guide.readme.io/docs/ip-addresses

Service Plans

CopaSAT does not sell or manage service plans at this time. There are numerous service plans offered by SpaceX/StarLink. Generally, different options exist for stationary, mobile, maritime, antenna type (StarLink or StarShield) and network priority. CopaSAT is available to guide you to a subscription provider to support your terminal.

Cleaning

The terminal is best cleaned with warm water and a soft sponge or towel. Mild detergents may be used if required. Brushes with bristles should be avoided to avoid scratching the paint.

The connector caps should always be on when the connection is not used, including during cleaning operations.

Disposal

Proper disposal of this product is the responsibility of the user. Due to the varying nature of local regulations governing the disposal of electronic/hazardous/recyclable (as applicable) waste, CopaSAT, LLC cannot provide specific disposal instructions. Users must comply with all applicable federal, state, and local laws and regulations. This may include, but is not limited to, recycling, collection, and disposal programs. For disposal information, please contact your local waste management authority.

Disposal of Electronic Waste. This product contains electronic components. Do not dispose of this product in household waste.

Caution: This product contains lead and other hazardous materials.

Troubleshooting Connectivity

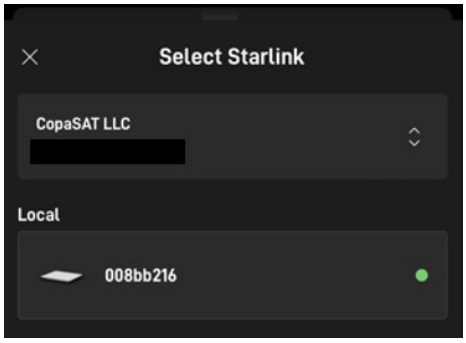
Hardware or Subscription?

The StarLink /StarShield antenna requires an active subscription to provide data services.

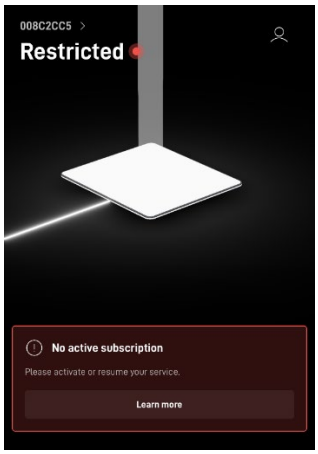
This next step will require a physical ethernet connection to the device. Ensure that all alternative network connections are disabled or are physically not connected (ex// Wi-Fi, other LAN devices), this is to ensure that you are able to troubleshoot the unit and not receive false indications of network access.

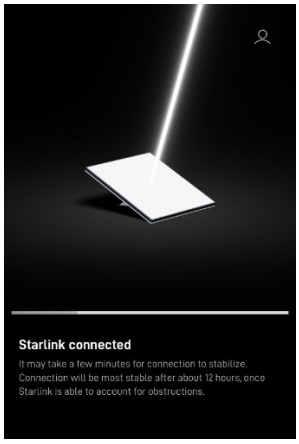
To assess if there is a hardware issue versus a subscription issue, with the terminal powered on and after sufficient time has elapsed from the initial boot up (approximately 5 minutes) attempt to reach www.StarLink.com. If you can reach www.StarLink.com but are unable to reach any other sites your unit does not have an active subscription. If you are unable to reach www.StarLink.com troubleshoot the hardware first.

Alternatively, if you are connected to the Wi-Fi and on a device with a StarLink app. Open the app and select “local device”.



Once connected to the terminal it will indicate if there is not an active subscription or online status. It may also indicate obstructions, software updates, optimizing connection, calculating orientation, or unable to reach satellites.





Obstructions

It can take up to one week for StarLink to create its obstruction map. As the obstruction map becomes more accurate, StarLink will choose to communicate with satellites in unobstructed parts of the sky when it can.

For best performance, we recommend setting up StarLink with a completely clear view of sky. Obstructions may cause outages when all available satellites are obstructed.

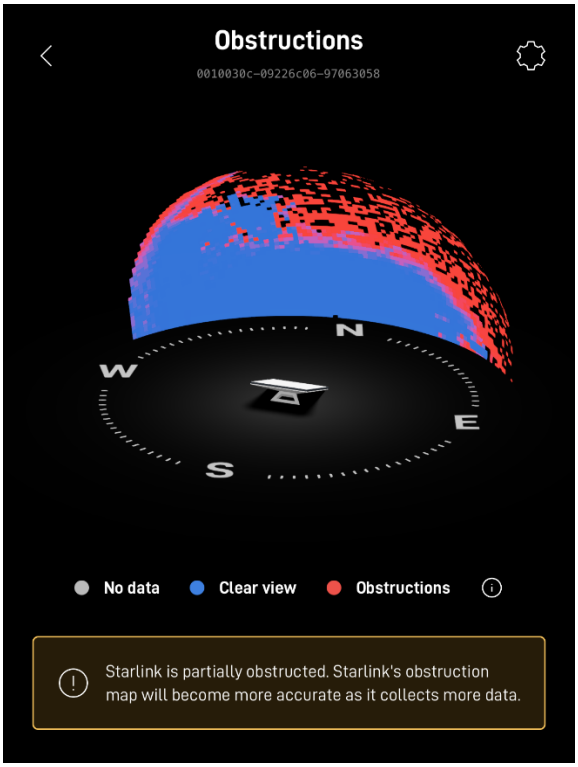


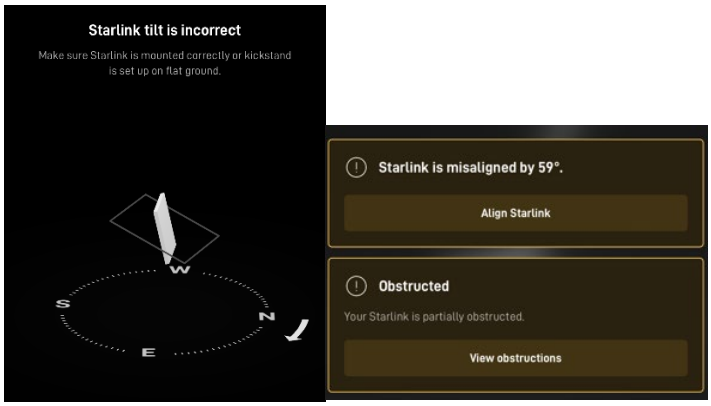
Figure 15: Obstructions Map

Orientation

The STORM MINI terminal will operate with some level of obstruction and significant misalignment from the optimal direction. On the move environments do not facilitate a static optimal alignment.

Maximize data throughput by placing the terminal in optimal alignment.

The StarLink app provides a real time image and instructions for aligning.

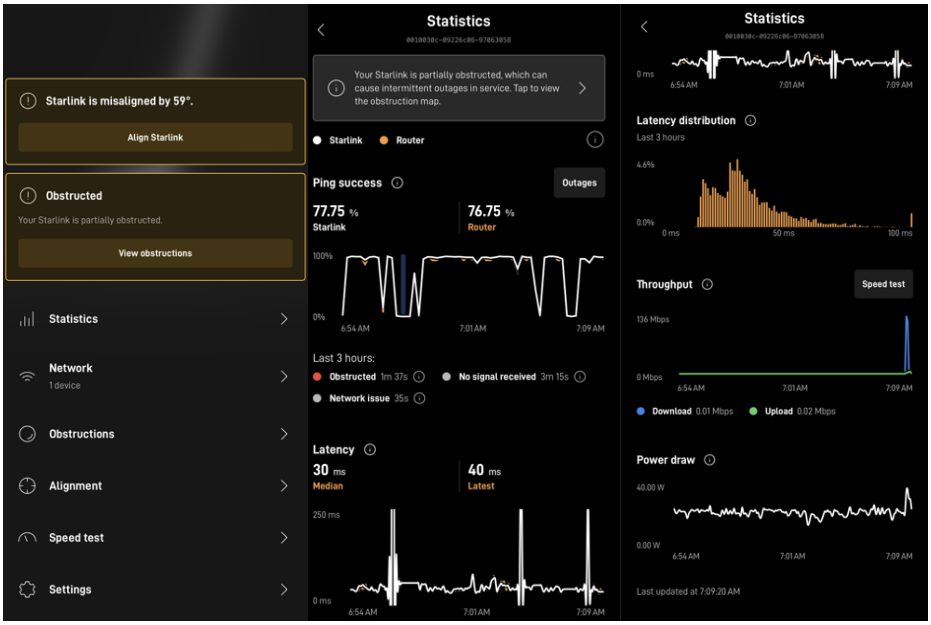


If access to the app is not available, a slight tilt from level (approximately 15 degrees) towards North is the optimal orientation.

Using the App to help troubleshoot

Once connected to the terminal via the StarLink app the app will indicate orientation misalignment and any significant obstructions.

Selecting Statistics will allow you to see recent performance: latency, power draw, throughput, etc.



Customer Support

support@copasat.com

+1 (727) 325-1426 (main)

+1 (727) 647-6110 (support)

www.copasat.com

Contacting Support Best Practices

1. Terminal identification information
    a. Part Number
    b. Terminal serial number
    c. Antenna serial number

2. Issue Description
    a. The more details the better support will be able to assist
    b. Items to consider when describing the situation
        i. Cabling (particularly any custom cables)
        ii. Power source (Type, Nominal Voltage, Current Limit, etc.)
        iii. Intermittent or Consistent
        iv. Screen Captures of App information
        v. Environmental conditions
        vi. Terrain type
        vii. Any off nominal electrical or physical anomalies that happened

3. Photo of the installation

4. Approximate location

5. Troubleshooting steps already performed

Additional Resources

Vendor Support

- https://support.starlink.com/
- Starlink Mini Guide – Scan QR Code

Figure 16: StarLink Mini Guide

Phone Applications

iOS

StarLink App by SpaceX

Speedtest by Ookla

Google Play

StarLink App by SpaceX

Speedtest by Ookla

Warranty

Warranty Overview

When you buy a STORM, you'll receive a 12-month manufacturer's warranty covering all hardware outlined in the original purchase agreement. Notably, this includes the StarLink or StarShield antenna, regardless of whether it was supplied to CopaSAT by the government or the customer. After the initial 12 months, any extended warranty will not cover government or customer-supplied equipment. Warranty coverage begins from the moment the product is shipped from the manufacturer.

Extended warrant periods are available for purchase prior to shipment.

Warranty Period Descriptions

Item / Part Number	Description	Warranty Period from the date of shipment
-	Standard Manufacturer Warranty	Through month 12 Example: Ship 1/1/2024, Warranty concludes 12/31/2024
CS-CSXW-MINI-02	CopaSAT STORM, Extended Warranty Year 2	Through month 24 Example: Ship 1/1/2024, Warranty concludes 12/31/2025
CS-CSXW-MINI-03	CopaSAT STORM, Extended Warranty Year 3	Through month 36 Example: Ship 1/1/2024, Warranty concludes 12/31/2026
CS-CSXW-MINI-04	CopaSAT STORM, Extended Warranty Year 4	Through month 48 Example: Ship 1/1/2024, Warranty concludes 12/31/2027
CS-CSXW-MINI-05	CopaSAT STORM, Extended Warranty Year 5	Through month 60 Example: Ship 1/1/2024, Warranty concludes 12/31/2028

Warranty and Exclusion of Warranty

The warranties stated herein are in lieu of all other warranties, express or implied, and of all other obligations or liabilities on the part of CopaSAT, and CopaSAT neither assumes nor authorizes any other person to assume for it any other liability. Buyer expressly waives any right, claim or cause of action that might otherwise arise out of purchase or use of CopaSAT's products or service. No product is warranted to be fit for any particular use or application. CopaSAT warrants its products to be merchantable and to be free from defects caused by faulty material or poor workmanship.

CopaSAT's liability under this warranty is limited to the obligation to repair, or, at its sole option, to credit Buyer's account with purchase price of, or to replace without charge F.O.B. factory and part of, any such product found to be defective under normal use and service within the period of time applicable to the particular product provided:

(a) CopaSAT is promptly notified in writing upon the discovery of any defects

(b) Buyer follows CopaSAT's instructions and applicable procedures as to the disposition or return of the products to CopaSAT, an authorized and designated CopaSAT licensee or service organization,

(c) Buyer assumes payment of all transportation charges,

(d) Exclusions from Warranty Coverage: This warranty does not cover damage or defects resulting from acts of nature, accidents, unauthorized modifications, improper installation, improper maintenance, misuse, abuse, neglect, or failure to follow CopaSAT's instructions and applicable procedures as outlined in the CopaSAT's Operating and Maintenance Manual.

(e) Products were not purchased under terms granted in lieu of warranty. Products not manufactured by carry the same warranty which CopaSAT receives from the manufacturer of the product and no other warranty. All ordered replacement parts or parts replaced during the warranty period assume the unexpired portion of the original parts warranty. After expiration of the original warranty period, ordered replacement parts manufactured by CopaSAT are warranted for ninety (90) days from shipment.

(f) Limitation of Liability for Consequential Damages: In no event shall CopaSAT be liable for any consequential, incidental, indirect, special, or punitive damages, including but not limited to loss of profits, loss of data, or interruption of business, arising out of or in connection with the purchase, use, or performance of CopaSAT 's products, even if CopaSAT has been advised of the possibility of such damages.