



Optimus-1 EX - FTS Mast Assembly Procedure



OPT1-M-104

Rev.01

07-05-2019



AIROBOTICS

This document has been prepared for the exclusive use of Airobotics Ltd. ("Airobotics") under the direction and authority of Airobotics and shall, at all times, remain the property of Airobotics. The holder hereof acknowledges and agrees that this document contains or may contain trade secrets, copyrighted material and commercial and proprietary information, privileged and confidential, and the holder hereof further agrees that this document may not be reproduced, distributed or copied, in whole or in part, without the express prior written consent of Airobotics. In the event this manual is sold or distributed to any other party, no warranty or guarantee, expressed or implied, is made as to the accuracy, sufficiency or suitability of the materials contained herein or of any revision, supplement or bulletin hereto, and Airobotics shall not be responsible for providing revisions for this manual to any third-party to whom this document is sold or distributed to. It is understood and agreed to by such other party that it shall release, indemnify, and hold Airobotics, its officers, employees and agents harmless against any and all claims or actions of whatever nature which may arise or claim to arise from the use hereof.

Table of Contents

1	General Information.....	6
1.1	Abbreviations	6
1.2	Applicable Documents	6
2	Introduction to FTS.....	7
2.1	About this Document	7
2.2	About the FTS.....	7
3	FTS Mast Unit Mechanical Assembly.....	8
3.1	The Location	8
3.2	FTS Mast Unit Parts List.....	9
3.3	Preparing the Antennas for Assembly	10
3.3.1	Preparing the Main Antenna for Assembly	10
3.3.2	Preparing the Taoglass Antennas for Assembly.....	11
3.4	Mounting the Antennas on the Mast	12
3.5	Mounting the FTS Unit Box on the Mast	13
4	FTS Mast Unit Electrical Assembly	15
4.1	SIM Card Installation	15
4.2	Battery Installation.....	18
4.3	FTS Electrical Assembly	21
4.3.1	Connecting the Antenna Electrical Cables	21
4.4	DC Electrical Panel Modifications.....	24
4.4.1	Disconnecting Wires and Cables.....	25
4.4.2	Installing POE Injector	28
5	FCC Compliance Statement	33




Table of Figures

Figure 1	The FTS Mast Unit box, mounted on the upper mast	8
Figure 2	FTS Main Antenna bracket mounting	10
Figure 3	Taoglass RF antennas bracket mounting	11
Figure 4	Connecting the V-bracket sub-assemblies to the mast.....	12
Figure 5	The location of the FTS Mast Unit cabinet on the mast.....	13
Figure 6	Attach the hold hanging (metal pole clamp) brackets to the mast	14
Figure 7	Attach the plate holders to the brackets and cabinet back	14
Figure 8	Open the lid of the FTS mast unit box	15
Figure 9	Open the lid of the RV50 cellular modem box	16
Figure 10	The SIM Card holder lid.....	16
Figure 11	The orientation of the SIM cards in the SIM Card holder	17
Figure 12	The battery holder and its 4 screws	18
Figure 13	The battery socket	19
Figure 14	The Power LEDs	19
Figure 15	Antenna types	21
Figure 16	Cable connections in the FTS mast unit back panel.....	22
Figure 17	The FTS mast unit back panel.....	22
Figure 18	The mast unit interfaces cover panel.....	23
Figure 19	The mast unit interfaces panel.....	23
Figure 20	The Mast main power switch	24
Figure 21	The LAN cable from MOXA Port 4 (POE) to the 2SP4 module.....	25
Figure 22	The wire connecting the 2J4 connector to the 2F17 fuse	26
Figure 23	Electrical diagram of the Mast (V1 EX) DC electrical panel	27
Figure 24	The location of the POE-162 Injector after installation.....	28
Figure 25	Mount the POE-162 Injector on the DIN mounting rail	29
Figure 26	The POE+ Injector power input wiring panel terminators	29
Figure 27	Connect the 48V+ wire via the 1A fuse 2F17.....	30
Figure 28	Connect the injector power into the POE+ unit	30
Figure 29	Connect cables into the RJ45 interfaces	31
Figure 30	The P1 and POE In-Use indicator LEDs	32

Table of Tables

Table 1	Parts list for assembling the FTS Mast Unit box on the mast.....	9
Table 1	Parts list for assembling the FTS main antenna on the bracket.....	10
Table 1	Parts list for assembling the Taoglass antennas on the bracket.....	11
Table 4	Parts list for the SIM card/s.....	16
Table 4	Parts list for the SIM card/s.....	18
Table 6	Parts list for antenna cables.....	21
Table 7	Parts list for DC electrical panel modifications.....	24
Table 8	POE+ Injector power input wiring panel terminators.....	29

1 General Information

System	Mast		
Subsystem	FTS system		
Component	FTS Communications Box		
Action/Trigger	Emergency Landing (ELS)		
Maintenance authority minimum level	"I" Level		
Time evaluation for the entire work (in hours)	N/A		
	Name	Date	Signature
Composed by	Itay Levitan	30/04/2019	
Edited by	Etay Vider	30/04/2019	
Approved by	Doron Krauss	30/04/2019	

1.1 Abbreviations

Term	Meaning
ELS	Emergency Landing Site
FTS	Flight Termination System
ROC	Regional Operations Center

1.2 Applicable Documents

#	Document Title	Document No.	Rev.	Date
1.	Optimus-1 EX - FTS User Guide	OPT1-D-094	01	xx/05/2019
2.	Mast Deployment Guide	OPT1-M-076	01	10/10/2018
3.	MA02 - Mast V2 DC Electrical Panel drawing	OPT1-W-056	02	13/02/2019

2 Introduction to FTS

2.1 About this Document

This document provides instructions for assembling the **FTS Mast Unit Box** (and related equipment) to the Optimus-1 EX Mast. The FTS Mast Unit is the FTS system component responsible for communications link between the *FTS Control Box* and the UAV.

2.2 About the FTS

The FTS system enables to manually terminate the UAV's flight by sending a command to Land on Spot. The FTS (Flight Termination System) is a system that consists of three main sub-systems:

- **ROC Control Box** – this control box is located inside the ROC
- **Mast Unit Box** – this unit located on the Mast and communicates with the UAV.

This user guide deals with the assembly of the *FTS Mast Unit Box* (and its related equipment). The installation of the ROC Control Box is described in a separate document (refer to the *FTS ROC Installation Procedure* document).

IMPORTANT NOTES:

1. Two people are needed to assemble the FTS Mast Unit on the mast.
 2. Only professional Airobotics personnel can assemble, install and maintain the FTS Mast Unit equipment.
 3. This procedure should be performed only after the mast is standing erect in its designated place, and the first section has been raised and locked into place.
-

3 FTS Mast Unit Mechanical Assembly

3.1 The Location

The FTS Mast Unit box is assembled on the upper mast, as illustrated in Figure 1.

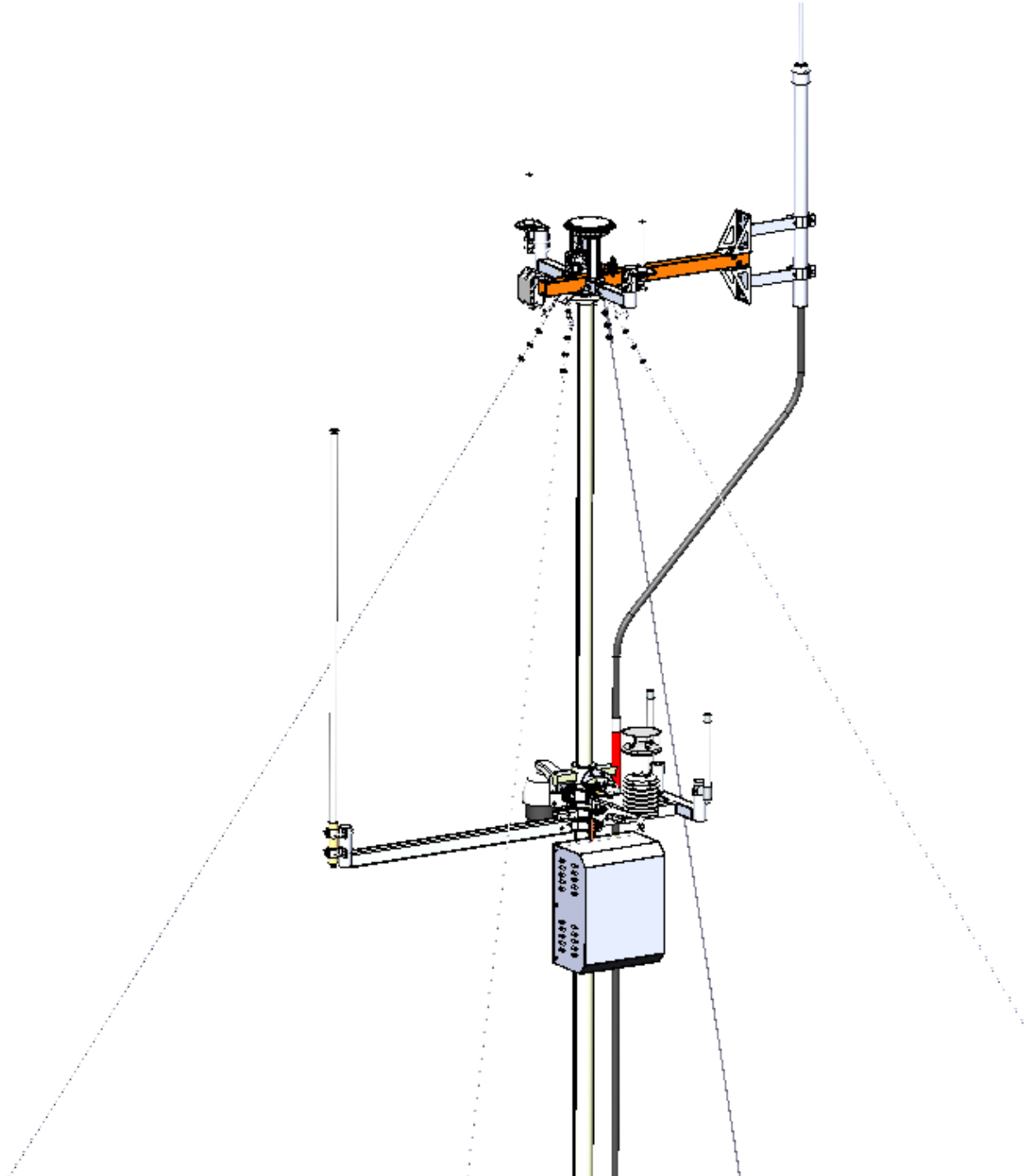


Figure 1 The FTS Mast Unit box, mounted on the upper mast

3.2 FTS Mast Unit Parts List

The FTS Mast Unit requires the following items for assembly on the mast (see Table 1).

PLM ID	Description	QTY	Image
MM05114	FTS Cellular Antennas Bracket	1	
MM05112	FTS Main ANT Bracket	1	
100108	Laird #FG9026	1	
100109	Extruded Aluminum Mounting Bracket	2	
100112	TAOGLAS #OMB.6912.03F21	2	
MO05199	FTS Mast unit assembly	1	
MO05346	FTS Mast Plate Holder	4	
100107	Hold hanging with rubber	2	
	DIN 912 M6x40 zinc (screw)	4	
	DIN 912 M6x16 zinc (screw)	4	
	DIN 125 M6 st.st (washer)	4	
	DIN 985 M6 st.st (Nylock nut)	4	

Table 1 Parts list for assembling the FTS Mast Unit box on the mast

3.3 Preparing the Antennas for Assembly

3.3.1 Preparing the Main Antenna for Assembly

To prepare the antennas for assembly on the mast, assemble them to the antenna bracket, as illustrated in Figure 2.

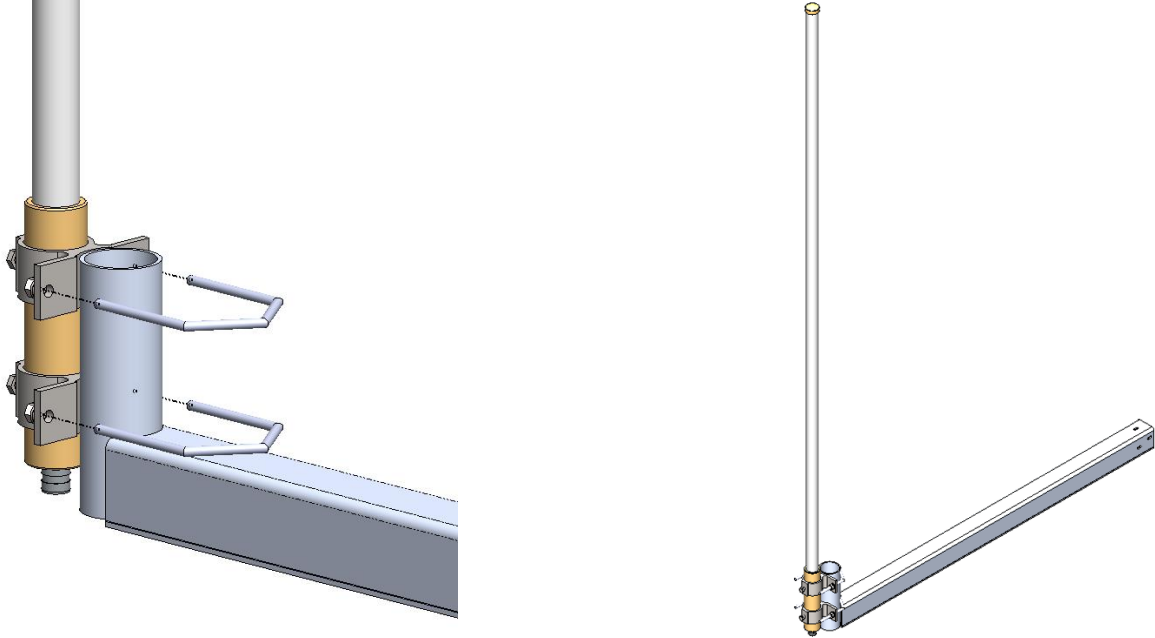


Figure 2 FTS Main Antenna bracket mounting

PLM ID	Description	QTY	Image
MM05112	FTS Main ANT Bracket	1	
100108	Laird #FG9026Omnidirectional Antenna	1	
100109	Extruded Aluminum Mounting Bracket	2	

Table 2 Parts list for assembling the FTS main antenna on the bracket

3.3.2 Preparing the Taoglass Antennas for Assembly

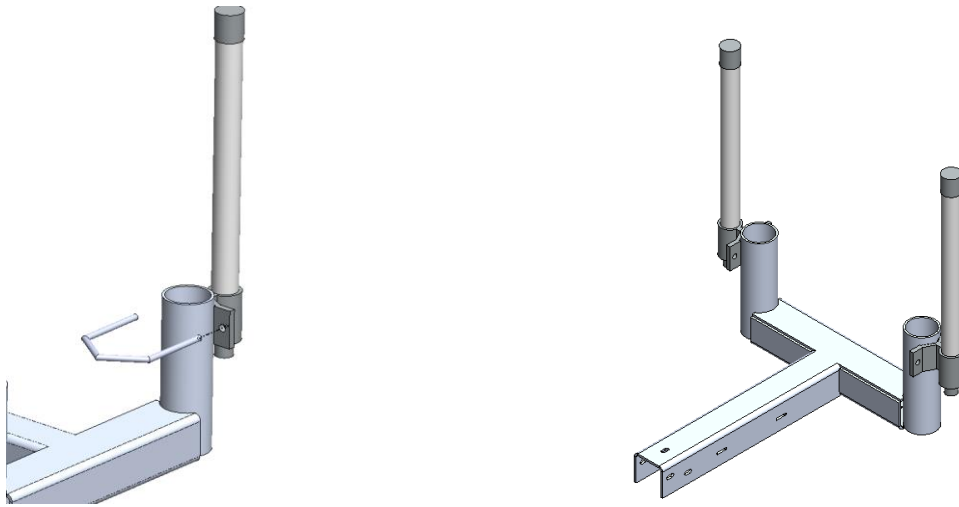


Figure 3 Taoglass RF antennas bracket mounting

PLM ID	Description	QTY	Image
100112	TAOGLAS #OMB.6912.03F21	2	
MM05114	FTS Cellular Antennas Bracket	1	

Table 3 Parts list for assembling the Taoglass antennas on the bracket

3.4 Mounting the Antennas on the Mast

➔ To mount the antennas on the upper mast, do the following:

1. Connect the Main antenna bracket to the V-bracket that's located below the camera/whether station V-bracket (see Figure 4).

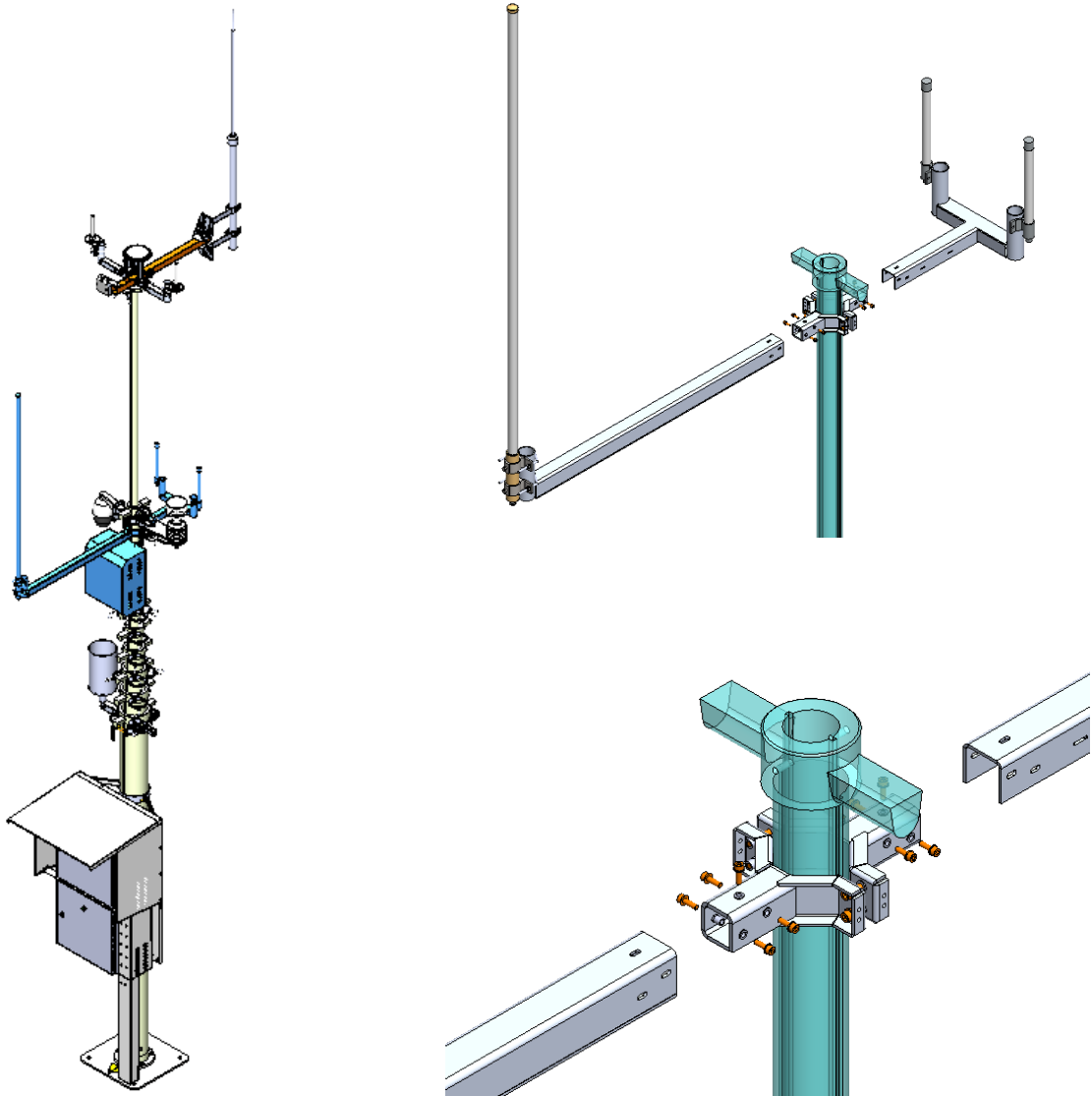


Figure 4 Connecting the V-bracket sub-assemblies to the mast

NOTE:

Before proceeding to the next stage of the FTS assembly procedure, raise the second section of the mast by a height of **80 cm** (just **below** the point where it reaches its locking position).

3.5 Mounting the FTS Unit Box on the Mast

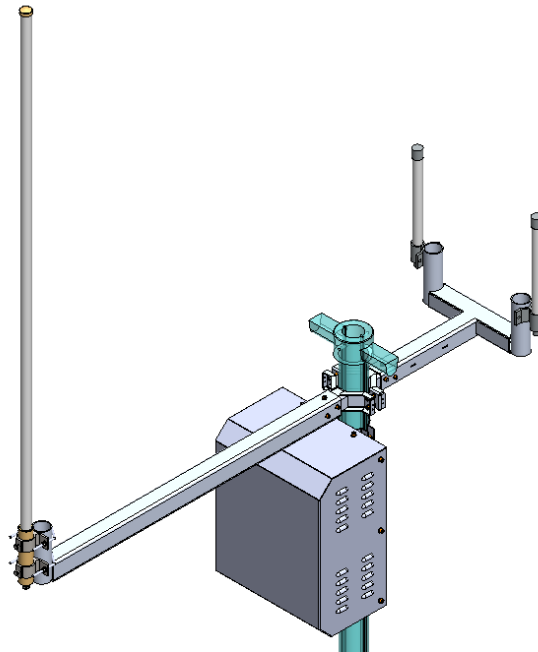


Figure 5 The location of the FTS Mast Unit cabinet on the mast

➤ To mount the FTS Mast Unit Box on the mast, do the following:

1. Attach the FTS cabinet to the mast with hold hanging (metal pole clamp) brackets, using the screws that were prepared in advance (see Table 1 and Figure 6).
2. Attach the Plate Holders to the cabinet walls and to the clamps using the screws, washers and Nylock nuts that were prepared in advance (see Table 1 and Figure 7).

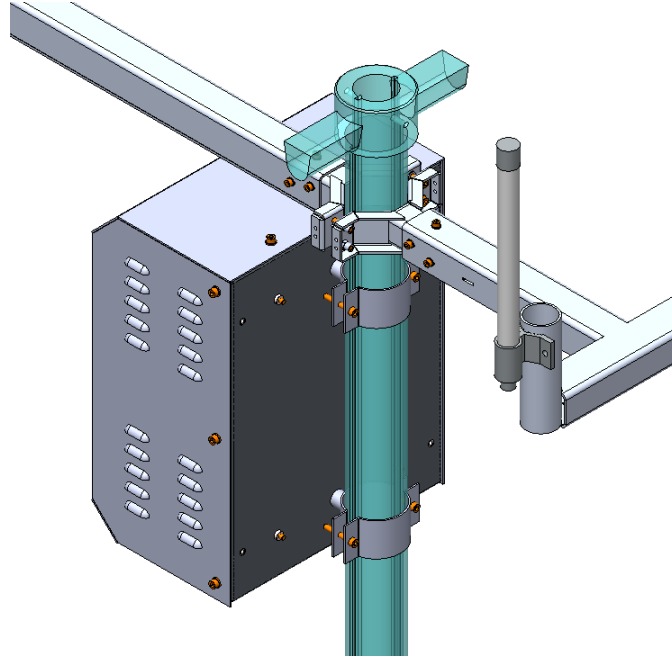


Figure 6 Attach the hold hanging (metal pole clamp) brackets to the mast

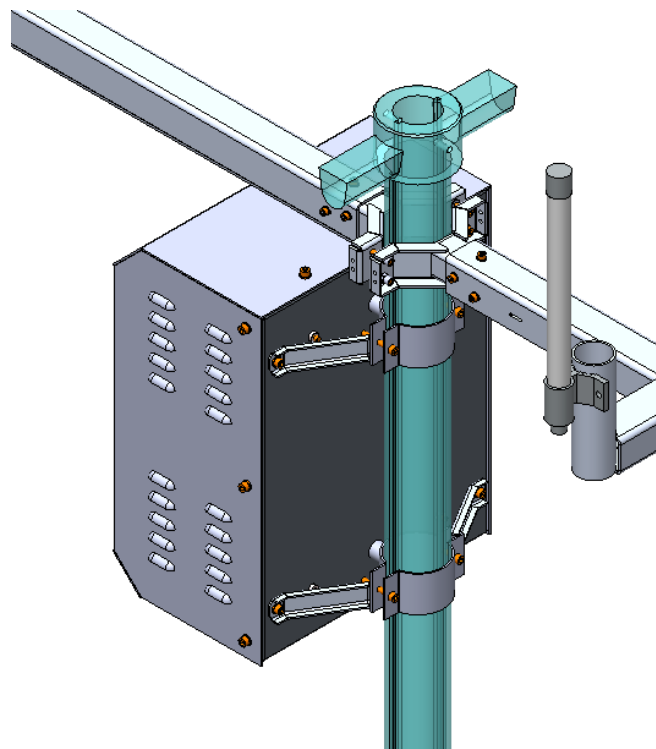


Figure 7 Attach the plate holders to the brackets and cabinet back

4 FTS Mast Unit Electrical Assembly

4.1 SIM Card Installation

➤ To install the SIM card into the FTS mast unit box, do the following:

1. Make sure that the FTS unit isn't connected to any power source, neither AC (via POE port) or Battery power.
2. Unscrew the 4 screws from the lid of the FTS box and open the FTS cover (see Figure 8).

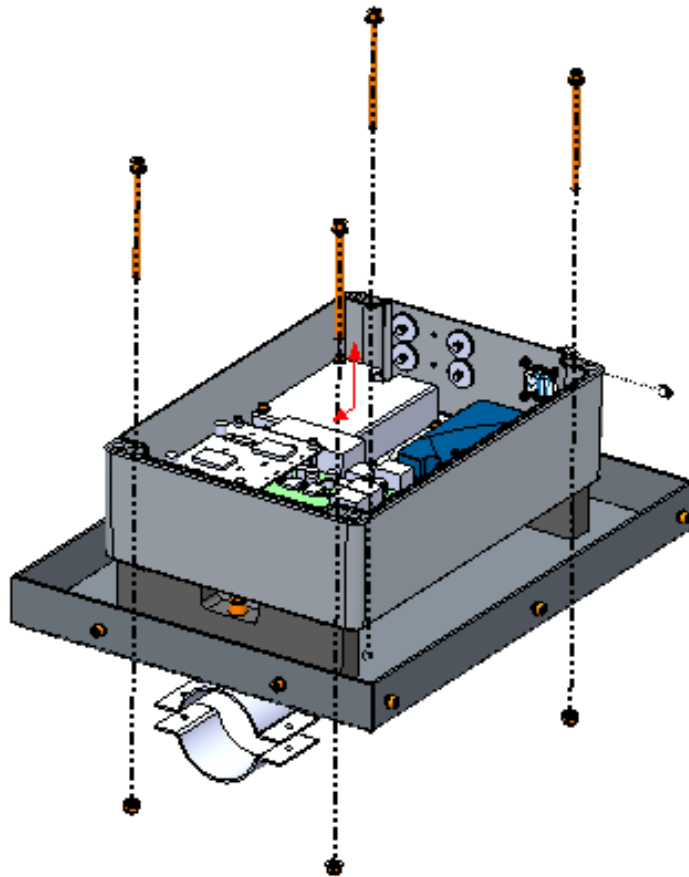


Figure 8 Open the lid of the FTS mast unit box

- Unscrew the two screws that anchor the RV50 cellular modem (see Figure 9).

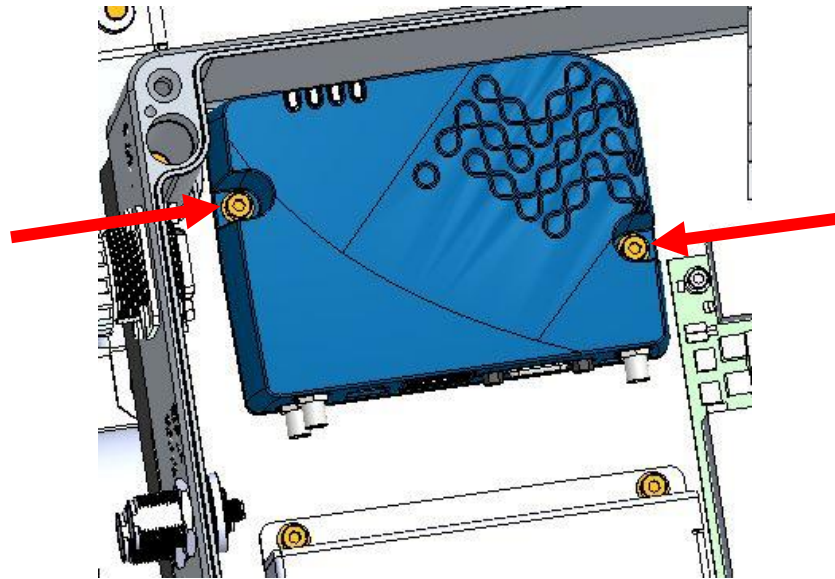


Figure 9 Open the lid of the RV50 cellular modem box

- Lift the RV50 modem, and rotate it so that the SIM card holder opening is accessible (see Figure 10)

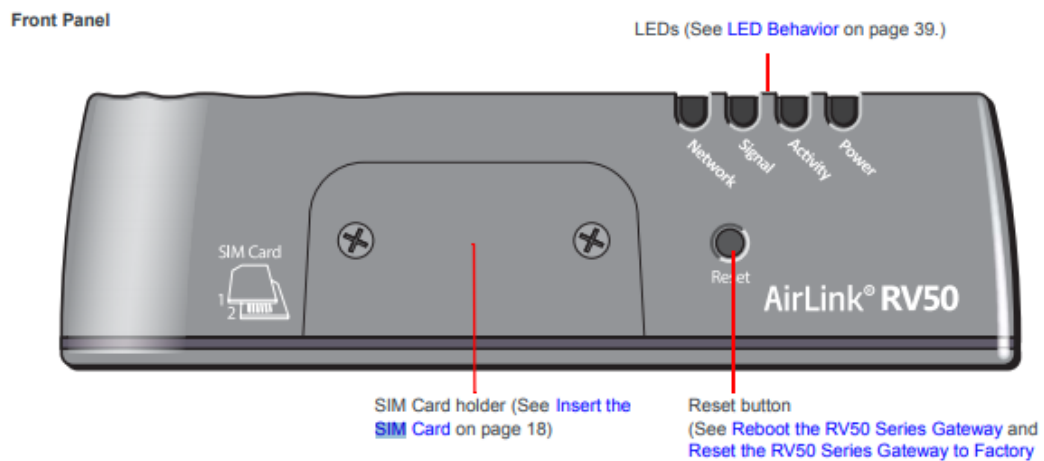


Figure 10 The SIM Card holder lid

- Open the 2 Philips screws of the lid for the SIM Card holder.
- Insert either 1 or 2 SIM cards. Orientation should be as illustrated in Figure 11.

PLM ID	Description	QTY	Image
100269	4G SIM Card	1 or 2	

Table 4 Parts list for the SIM card/s

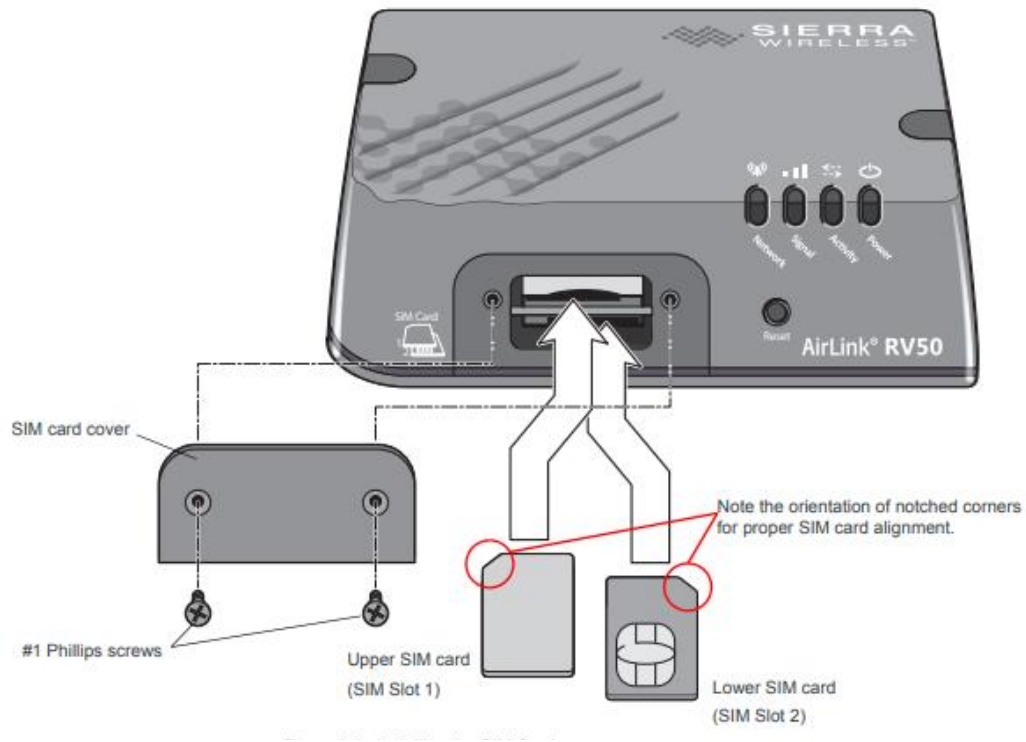


Figure 11 The orientation of the SIM cards in the SIM Card holder

7. Close the cover of the SIM card holder and screw its screws back on.
8. Screw on the RV50 modem back into the panel of the FTS mast unit box, and then close the cover of the box, with the screws.

4.2 Battery Installation

➔ To install the battery into the FTS mast unit box, do the following:

1. Unscrew the 4 screws of the battery holder (see Figure 12).

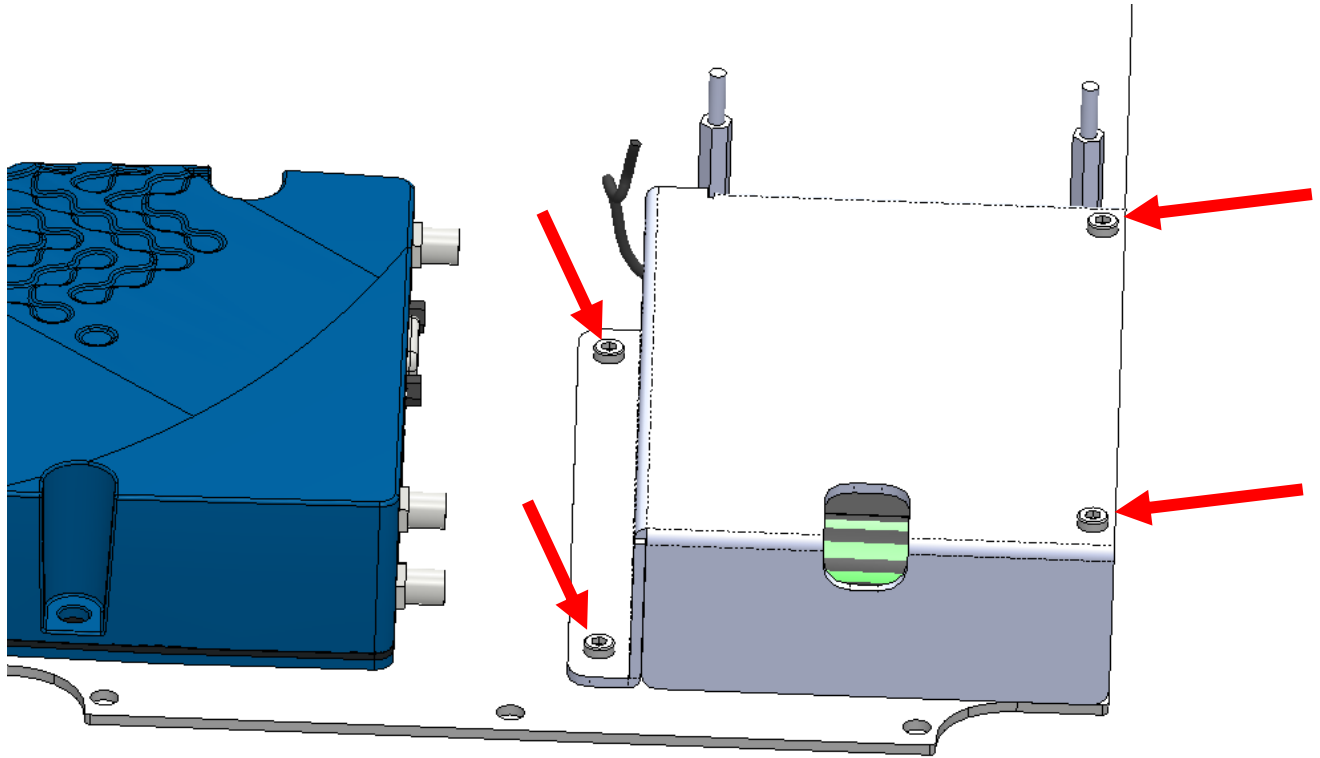
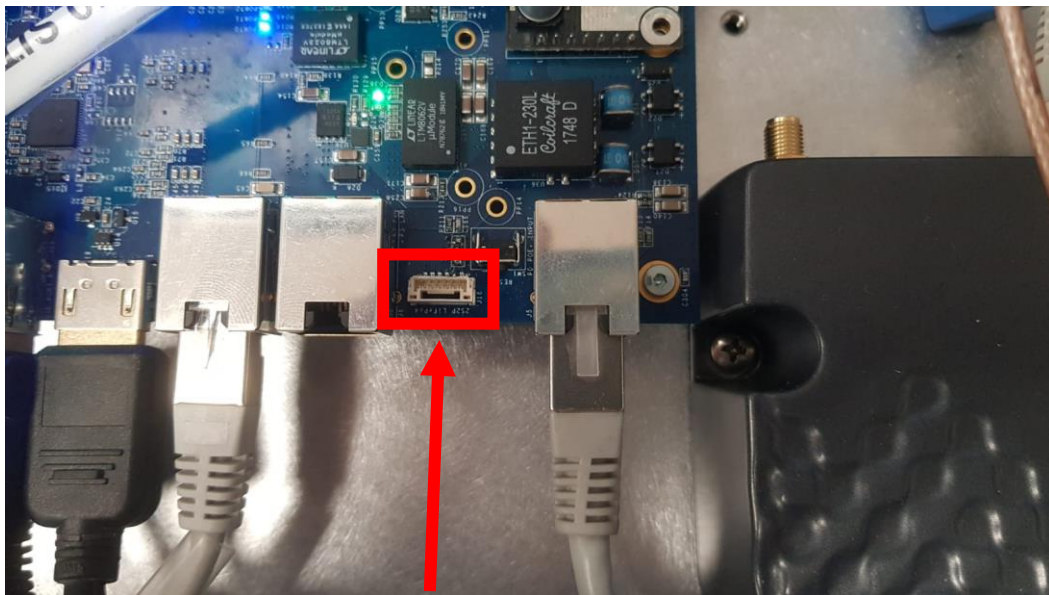


Figure 12 The battery holder and its 4 screws

PLM ID	Description	QTY	Image
E005124	LiFePo4 2S2P FTS battery	1	

Table 5 Parts list for the SIM card/s

2. Place the battery in its socket (see Figure 13), and in the correct orientation.
3. Close the M005202 battery cover with the 4 screws (M4X12 DIN912).



2S2P LiFePo4 Battery

Figure 13 The battery socket

4. Connect the battery lead connector into the FTS_V1EX_MAIN_PCB (E005016) connector J16 (see Figure 13).

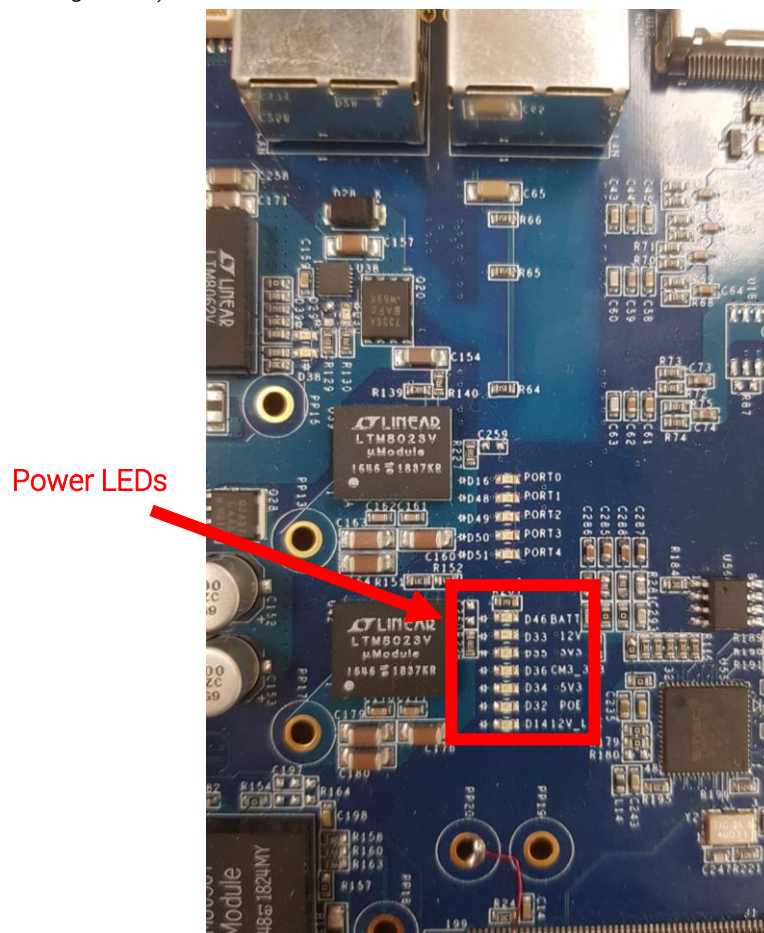


Figure 14 The Power LEDs

5. If the battery was connected correctly, then all the power LEDs (except D32 "POE" LED) should be turned on (see Figure 14).
6. Close the FTS unit, make sure to have the cover 4 screw firmly tightened.

4.3 FTS Electrical Assembly

4.3.1 Connecting the Antenna Electrical Cables

PLM ID	Description	QTY	Image
100266	CBL Assy N-TYPE PLUG LMR 400 6'	2	
MM05114	CBL FTS 15m POE + Cable	1	

Table 6 Parts list for antenna cables

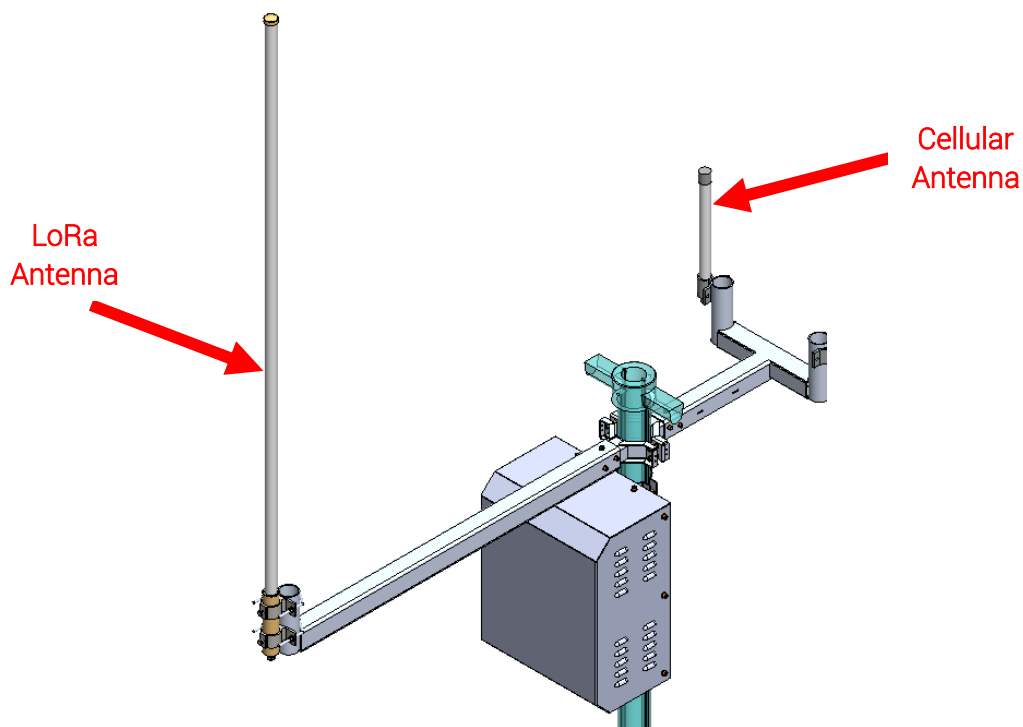


Figure 15 Antenna types

➡ To connect the antennas to the FTS mast unit box, do the following:

1. Connect the cellular antenna cable LMR400 (PN: 100266) from the cellular antenna (001238) to the "CELL MAIN" N TYPE connector (see Figure 16 and Figure 17).
2. Connect the LoRa antenna cable LMR400 (PN: 100266) from the LoRa antenna (001181) into "FTS MAIN" N TYPE connector (see Figure 16 and Figure 17).
3. Add the CAT7 15m (E005277) cable into the mast cable protection sleeve.
4. Connect the CAT7 15m (E005277) from the mast panel connection (2J10) to the FTS box POE + connector (see Figure 16 and Figure 17).
5. Connect the FTS ground cable into the mask ground bar.

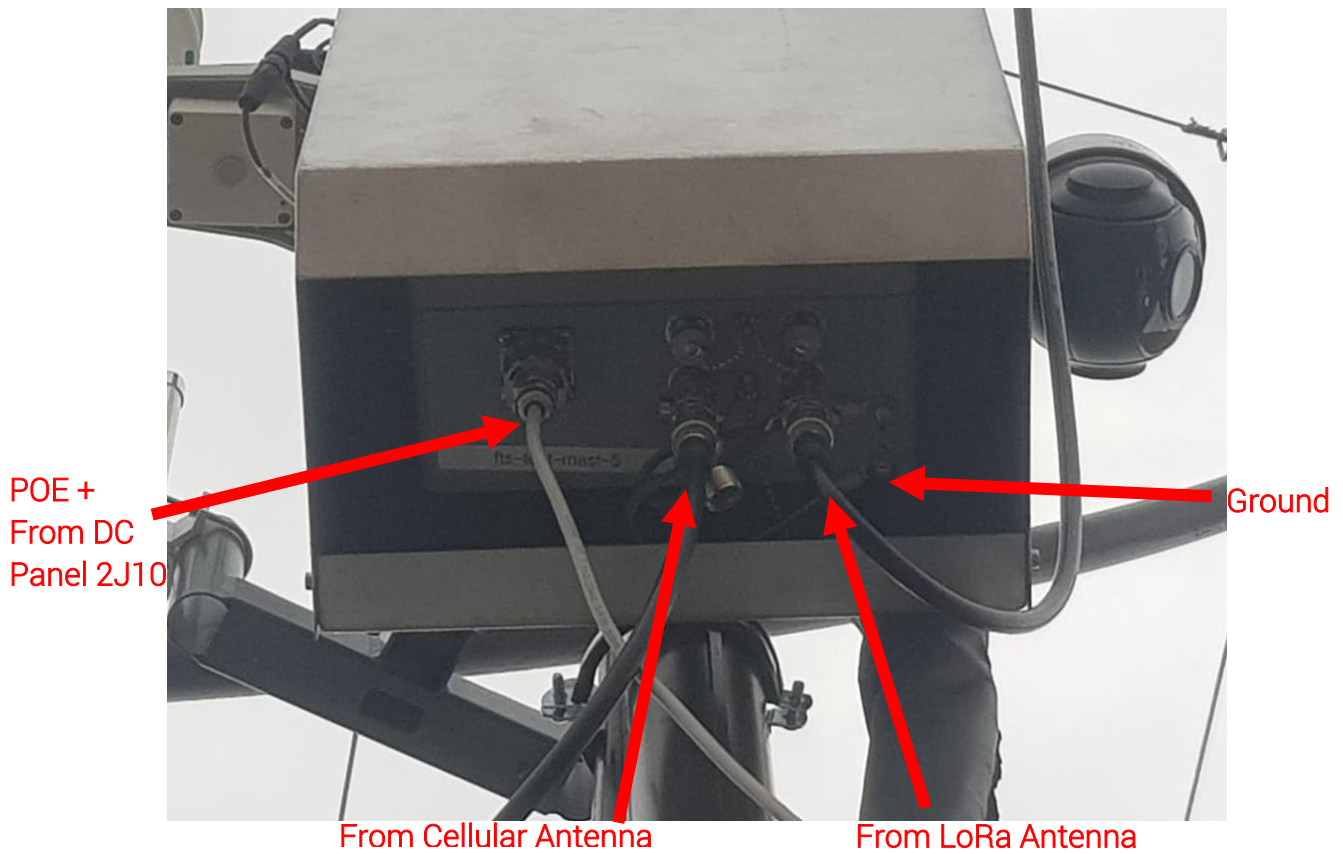


Figure 16 Cable connections in the FTS mast unit back panel

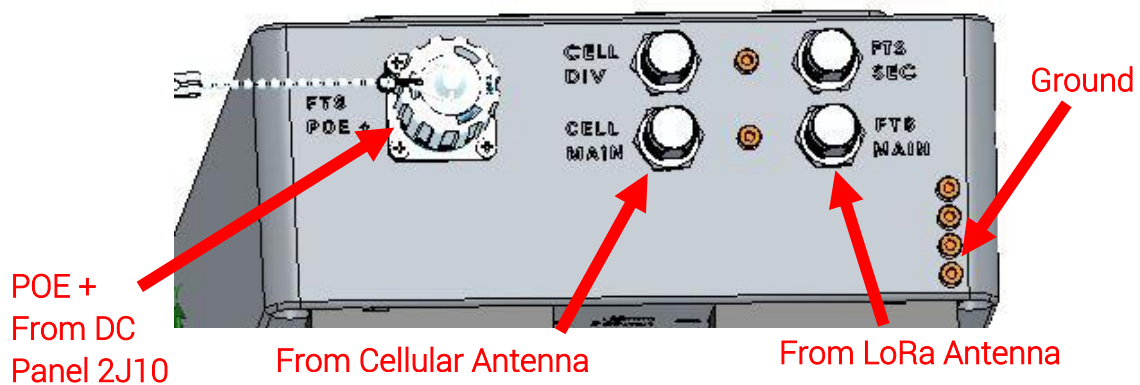


Figure 17 The FTS mast unit back panel

6. Connect the POE+ port from the FTS unit to the DC panel external connection marked as port 2J10 using the E005277 CAT7 15m cable (see Figure 16).
7. Open the mast output interfaces cover panel (unscrew the 5 Philips head screws).



Figure 18 The mast unit interfaces cover panel

8. Connect the CAT7 15m cable into the FTS port 2J10

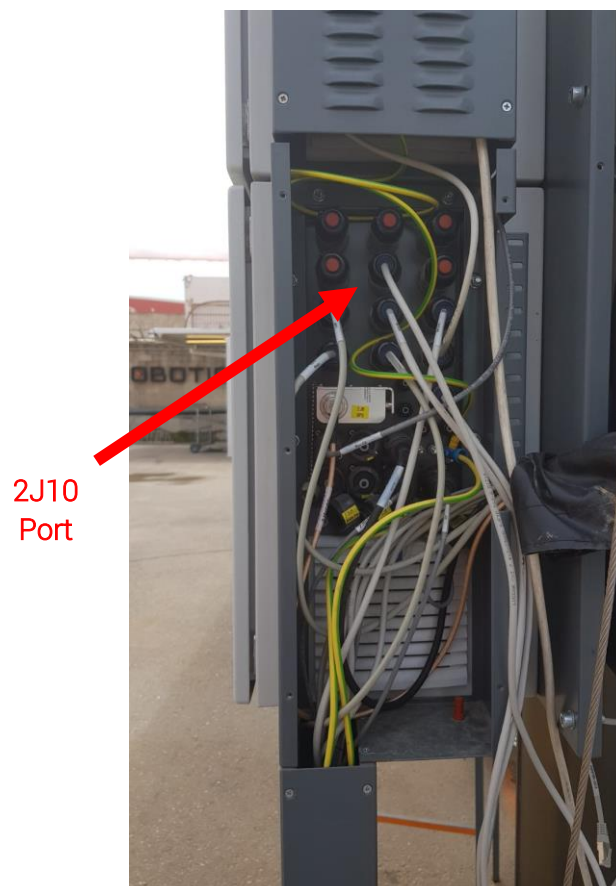


Figure 19 The mast unit interfaces panel

9. Close the mast output interfaces cover panel (using the 5 Philips-head screws).

4.4 DC Electrical Panel Modifications

IMPORTANT NOTE:

Before performing any work on the DC/AC mast electrical panels, make sure to turn OFF the Mast Unit's main power switch, and the internal UPS switch (inside the AC cabinet)!!!



Figure 20 The Mast main power switch

PLM ID	Description	QTY	Image
001187	POE+ Injector	1	
000140	LAN CAT6 Cable 0.3m	1	
004150	Wire, 22AWG, 300V, Red, UL	1m	
004151	Wire, 22AWG, 300V, Black, UL	1m	
000217	Insulated Ferrule	6	

Table 7 Parts list for DC electrical panel modifications

4.4.1 Disconnecting Wires and Cables

➔ Perform the following wiring modifications to the DC electrical panel:

1. Disconnect the LAN cable that connects **Port 4** from the MOXA to the **2SP4** surge protection module (see Figure 21).

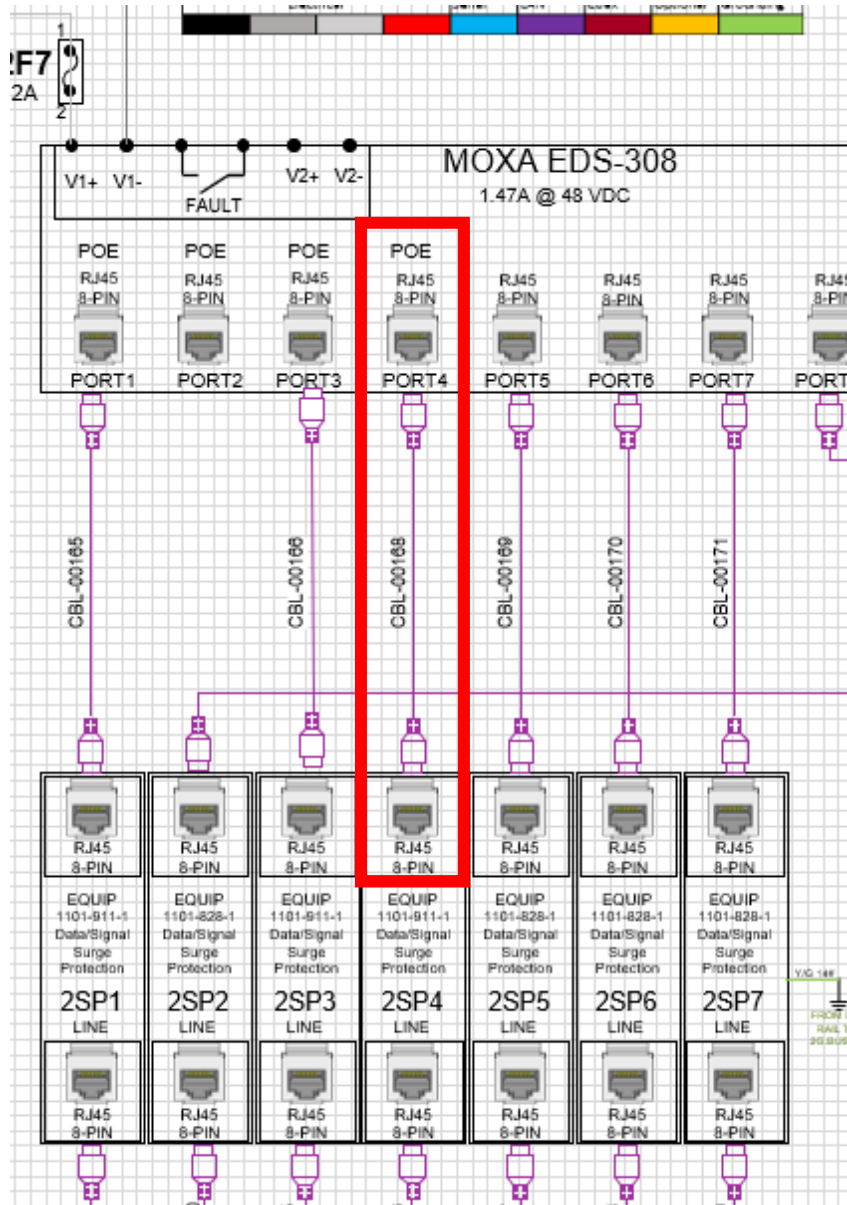


Figure 21 The LAN cable from MOXA Port 4 (POE) to the 2SP4 module

2. Disconnect the wire that connects the 2J4 connector to the 2F17 fuse (see Figure 22).

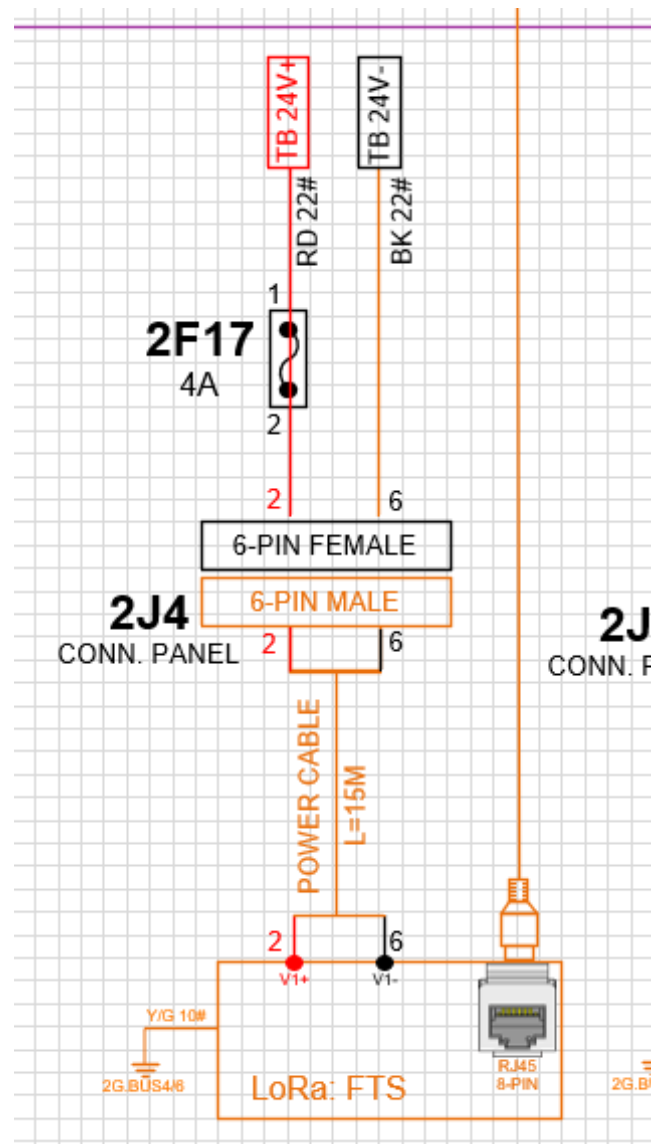


Figure 22 The wire connecting the 2J4 connector to the 2F17 fuse

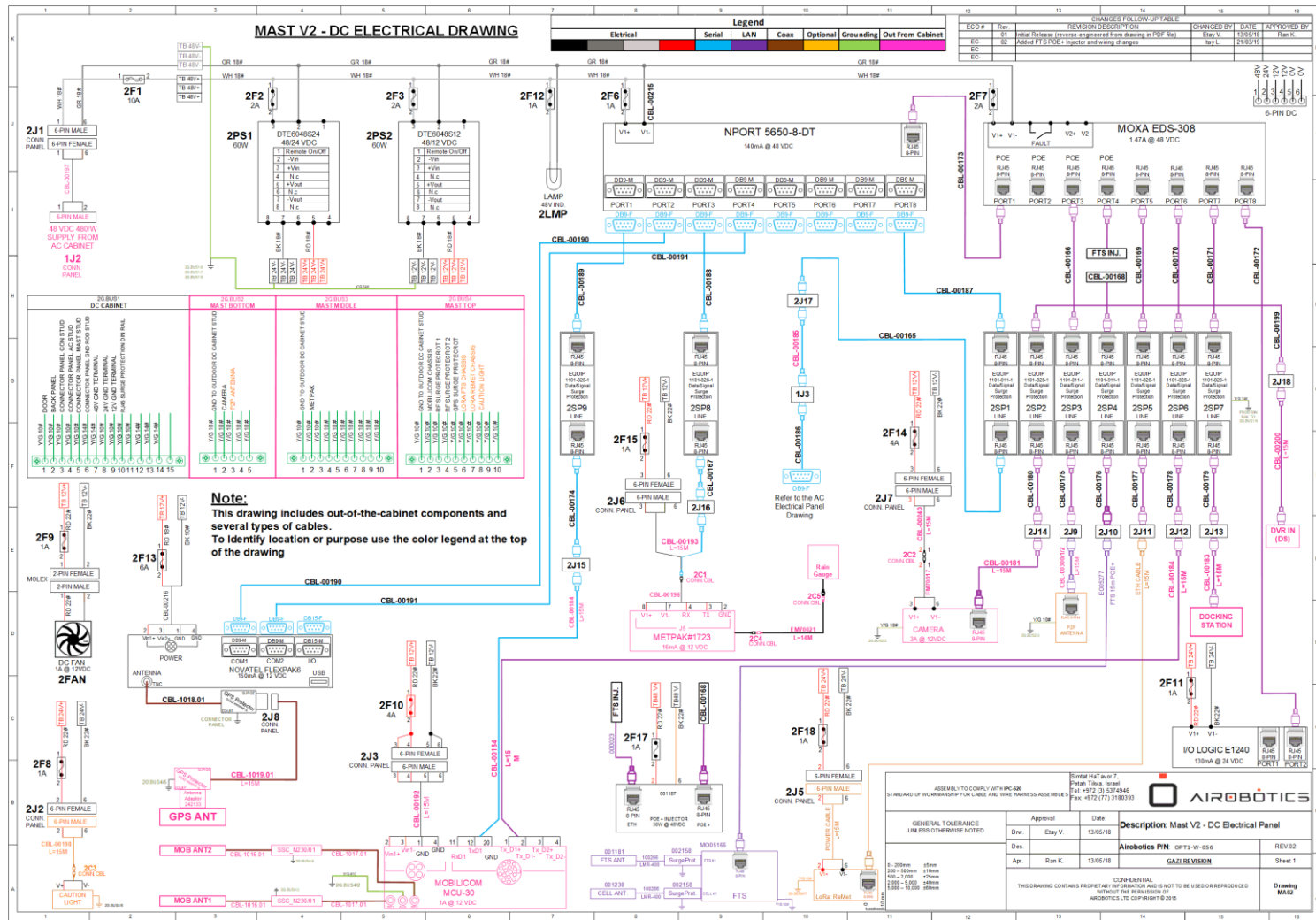


Figure 23 Electrical diagram of the Mast (V1 EX) DC electrical panel

NOTE:

Figure 23 illustrates an electrical diagram of the Mast's DC electrical panel, after the modifications have been completed.

4.4.2 Installing POE Injector

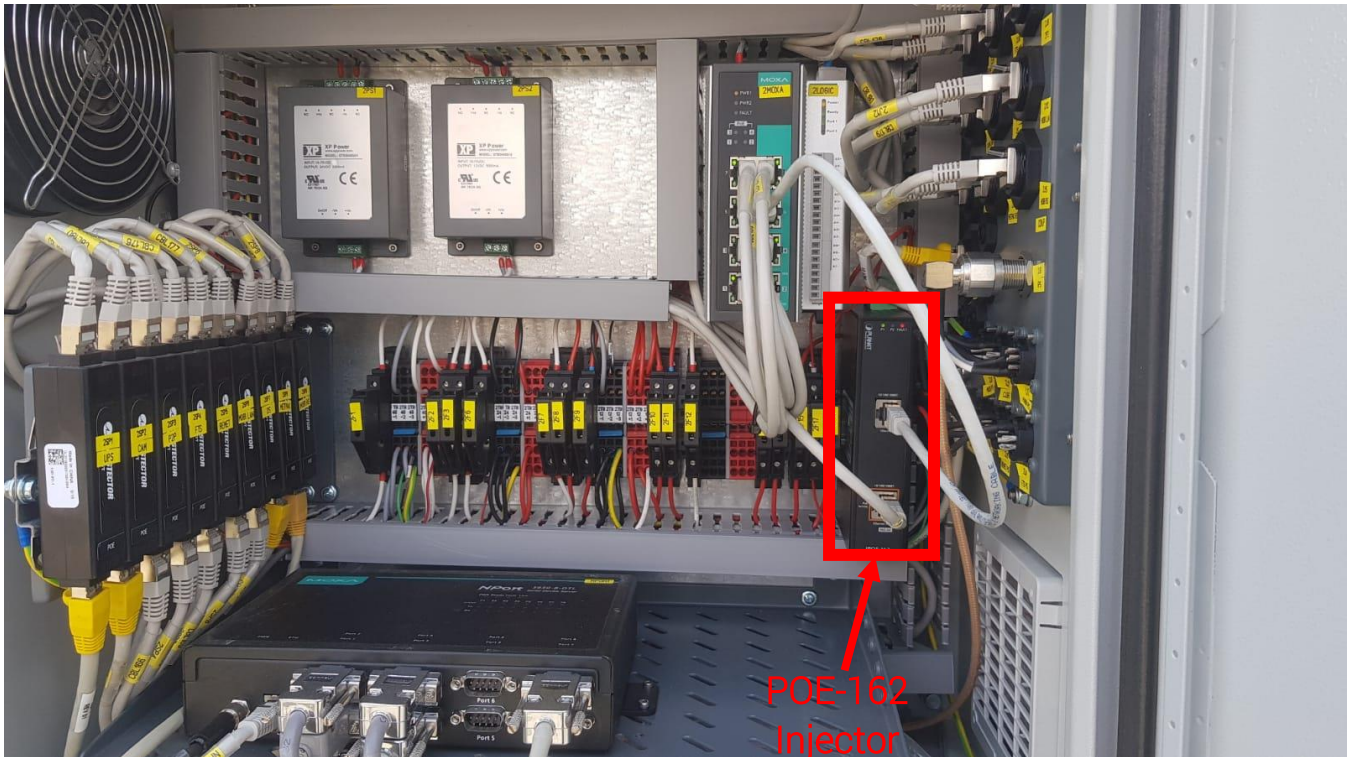


Figure 24 The location of the POE-162 Injector after installation

NOTE:

If the designated location of the POE is not clear, contact the Mechanical Engineering team.

➔ To install the POE-162 Injector into the DC electrical circuits box, do the following:

1. Mount the POE on the metal DIN mounting rail (see Figure 25).



Figure 25 Mount the POE-162 Injector on the DIN mounting rail

2. Connect the power input wires into the POE+ injector connector panel as shown in Figure 26 and as specified in Table 8.

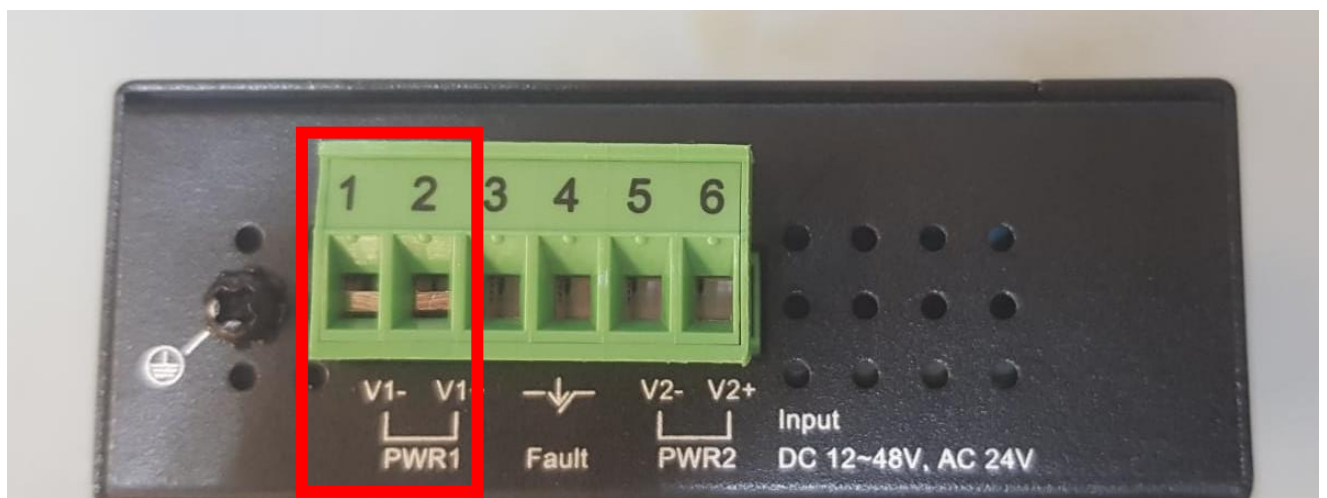


Figure 26 The POE+ Injector power input wiring panel terminators

3. Connect the power input wires into the POE+ connector panel as follows:

Pin Number	Description	Comments
1	48V+	Connect via 1A fuse 2F17 (see Figure 27)
2	48V-	GND

Table 8 POE+ Injector power input wiring panel terminators

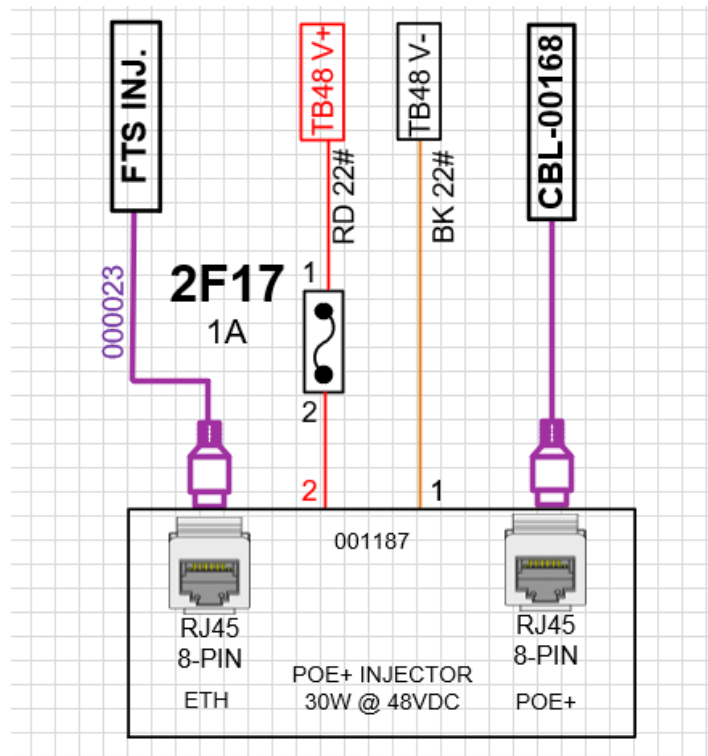


Figure 27 Connect the 48V+ wire via the 1A fuse 2F17

4. Connect the injector power connection into the POE+ unit (see Figure 28).

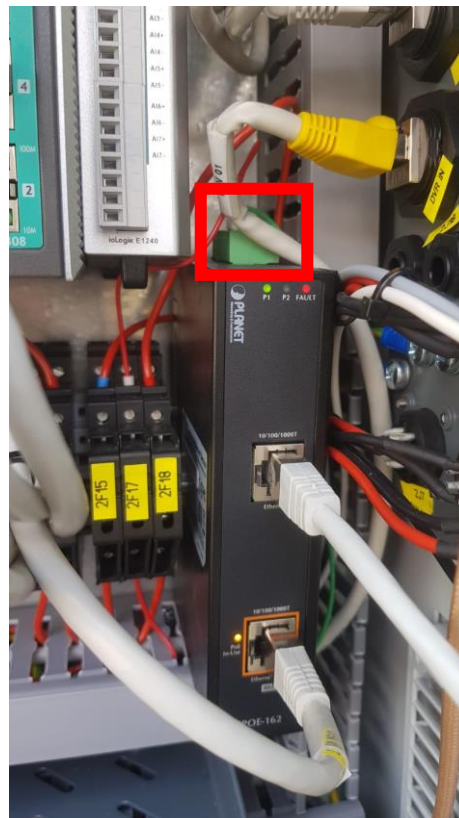


Figure 28 Connect the injector power into the POE+ unit

5. Connect the POE+ Ethernet + DC port (POE port) into CBL-00168 cable (connected into Surge protector "2SP4") (see Figure 29).
6. Connect the POE+ Ethernet port (10/100 port) into the MOXA at port 4 with short CAT6A cable (0.5m) (see Figure 29).

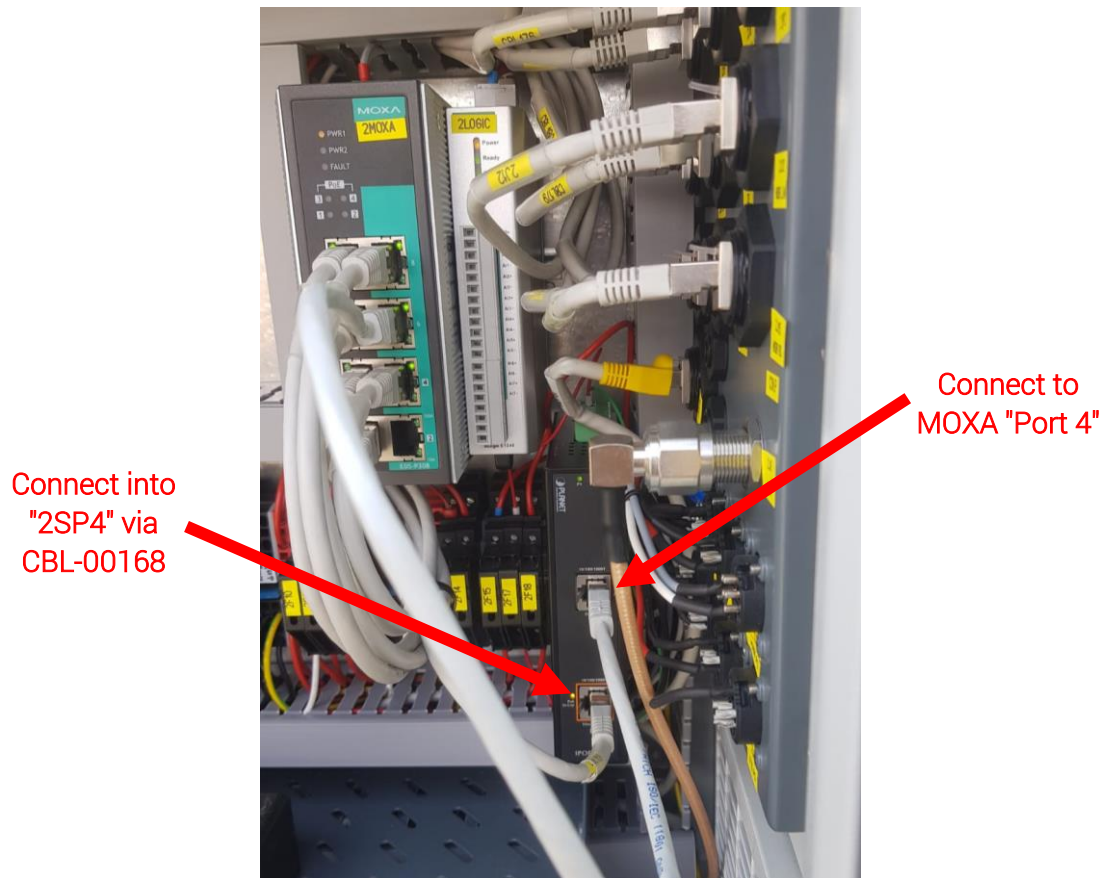


Figure 29 Connect cables into the RJ45 interfaces

7. Turn ON the Mast main power switch (see Figure 20).
8. Make sure that the POE injector Green LED "P1" is turned on (see Figure 30).
9. Make sure that the POE injector Orange LED "POE IN-USE" is turned on (see Figure 30).

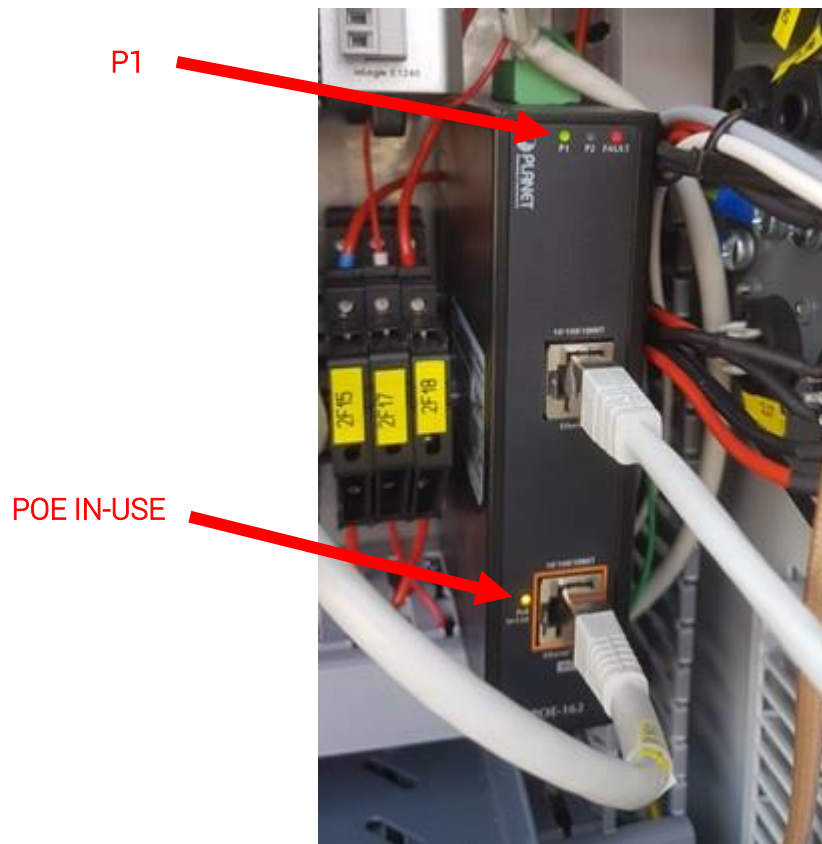


Figure 30 The P1 and POE In-Use indicator LEDs

10. The FTS Mast Unit has been successfully installed.

5 FCC Compliance Statement

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio and television reception.

However, there is no guarantee that interference will not occur in a particular installation. If this device does cause such interference, which can be verified by turning the device off and on, the user is encouraged to eliminate the interference by one or more of the following measures:

- Re-orient or re-locate the receiving antenna.
- Increase the distance between the device and the receiver.
- Connect the device to an outlet on a circuit different from the one that supplies power to the receiver.
- Consult the dealer or an experienced radio/TV technician.

WARNING! Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

WARNING! A distance of at least 20cm should be maintained between the antennas and all persons during the operation of the of this device