
T28 Hardware Manual

Release 2.5

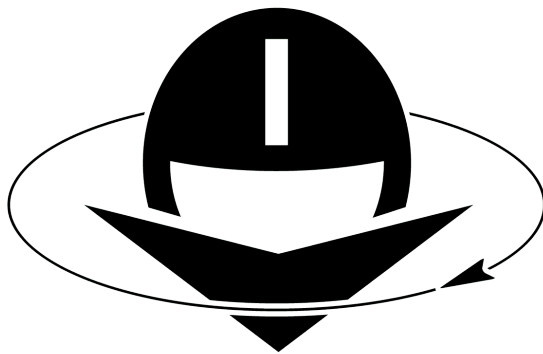
Embention

2024-05-29

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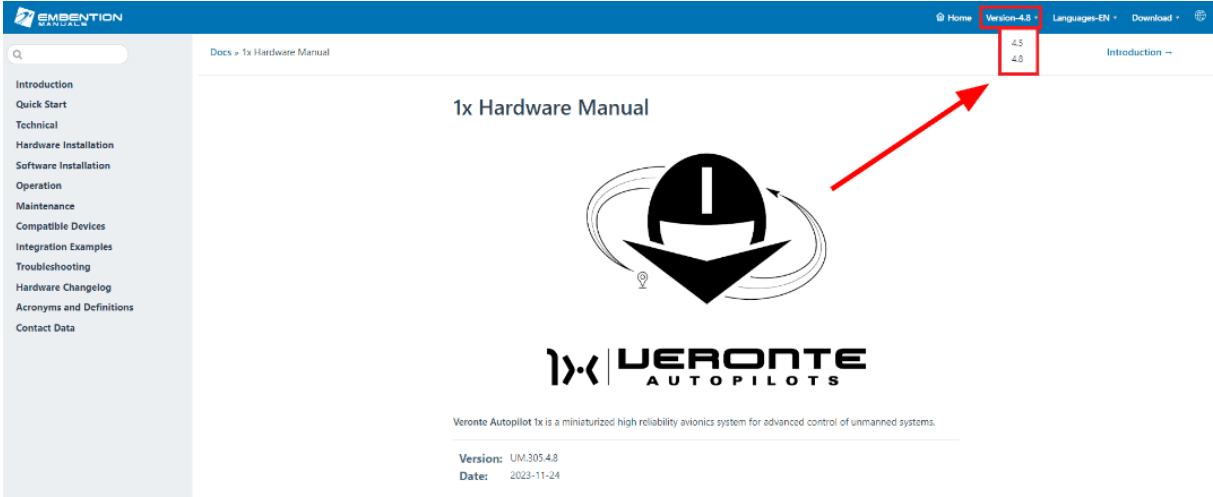
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T28 | VERONTE

TRACKING ANTENNAS

Warning: Select your version before reading any user manual. The following image shows where to select a version from any Embention user manual.



INTRODUCTION



Veronte T28 is a high-performance tracking antenna specifically designed for most demanding applications. Antenna kits for **T28** include directional and omnidirectional antennas. Both antennas are used to obtain the best operational performance. The omnidirectional antenna is used for short-range operations and the directional one for tracking the vehicle when it operates at high distances, so the **T28** points to the aircraft in real-time movement, operating at long range and not moving at short range.

The system can install any directional antenna for maximizing system operation capabilities. Embedded control actuators and installed encoders permits to automatically point to the antenna with unique precision. Height and

orientation given to the antenna makes the device perfect for long range operations.

Suitable for: UAVs, UASs, RPASs, UGVs, USVs and any other moving systems.

The platform is prepared to install different kind of antennas for video and data-link communications. Patch, yagi and parabolic grid antennas can be used within the system for best operational performance. Tripod is also interchangeable and custom tripods can be adapted.

QUICK START

2.1 ON/OFF

First of all, it is necessary to connect the **PCS Harness** to the **PCS** itself. Then, by pressing the switch of the **PCS Harness** for 2 sec the system will turn on and the light will shine blue.



Fig. 1: On / off switch

To turn **T28** off, the button shall be pressed for 2 sec (until the blue light turns off).

The button delay is implemented to avoid unwished disconnections.

Warning: Do not forget to turn off the system after use.

2.2 T28 Placement

- Make sure **T28** is placed in an open area to avoid screening, reflection and interference due to terrain or landscape elements.
- Make sure there is clearance around the antenna movement radius.
- Lay cables away from traverse areas.

2.3 Warnings

- Make sure not to put people or objects in the radius of movement of the antenna, it may cause damage.
- The distance between **T28** and other radio modules must be at least 5m to establish communications
- Guarantee that no obstacles will interrupt the LOS (Line Of Sight) radiolink.
- Do not break warranty seals. Please contact Embention's support team before doing it.
- Keep the PCS in a position where the GPS antenna is facing to the free sky for a better satellite view.
- Avoid shocks during transportation or operation, some of the components could suffer damage.
- Polarization can be horizontal or vertical and it is aligned with the direction of the antenna. The polarization of **T28** antenna should be the same as the polarization of the receiver, then adjust the **T28** antenna according to its corresponding polarization direction.

Warning: Do not forget to connect RF antennas before powering up!!!!

2.4 Requirements

- Personal computer.
- Control station: **Veronte PCS**.
- Software: depending on the **PCS** employed.
 - **Veronte Pipe** for **PCS** with version 6.4 or lower.
 - **Veronte Link, 1x PDI Builder** and **Veronte Ops** for **PCS** with version 6.8 or higher.

TECHNICAL

3.1 Part list

The system consist of a multiple components listed below.

- PAN-TILT Unit
- PCS connection cable
- Extendible mast up to 3m
- Rugged transport box for motion platform
- Bag for tripod

3.2 Features

- Ready for operation with **Veronte PCS**.
- Real time tracking.
- Data, Telemetry and Video Link Communication.
- Tripod or Telescopic Mast Mount.
- Directional and omnidirectional antenna combination.
- Compatible with Veronte MCS or third party computers.
- Easy to install.
- 360° free rotation.
- Easy maintenance.
- Robust and reliable construction.

Warning: T28 needs Veronte PCS to operate.
--

3.3 Mechanical Specifications

Pan-tilt unit Weight	17 kg max (without antennas and Veronte PCS)
Mast Weight	21 kg
Operating temperature	-20 to 60°C
Environmental protection	IP54
PAN-TILT Transport case	Rugged plastic case, quad track wheels, pressure purge valve, side handles and carry handle
Tripod Transport bag	High quality transport bag

3.4 Electrical Specifications

T28 DC input	24 VDC
PCS power	80 to 130 W (depending on mounted antennas)
Pheripheral I/O Ports	1x USB, 2x CAN ports, Ethernet, 16x PWM, PPM, 4x ADCs and 1x I2C (From Veronte PCS)

3.5 Dimensions

Below you can find a dimensions drawing of **T28**.

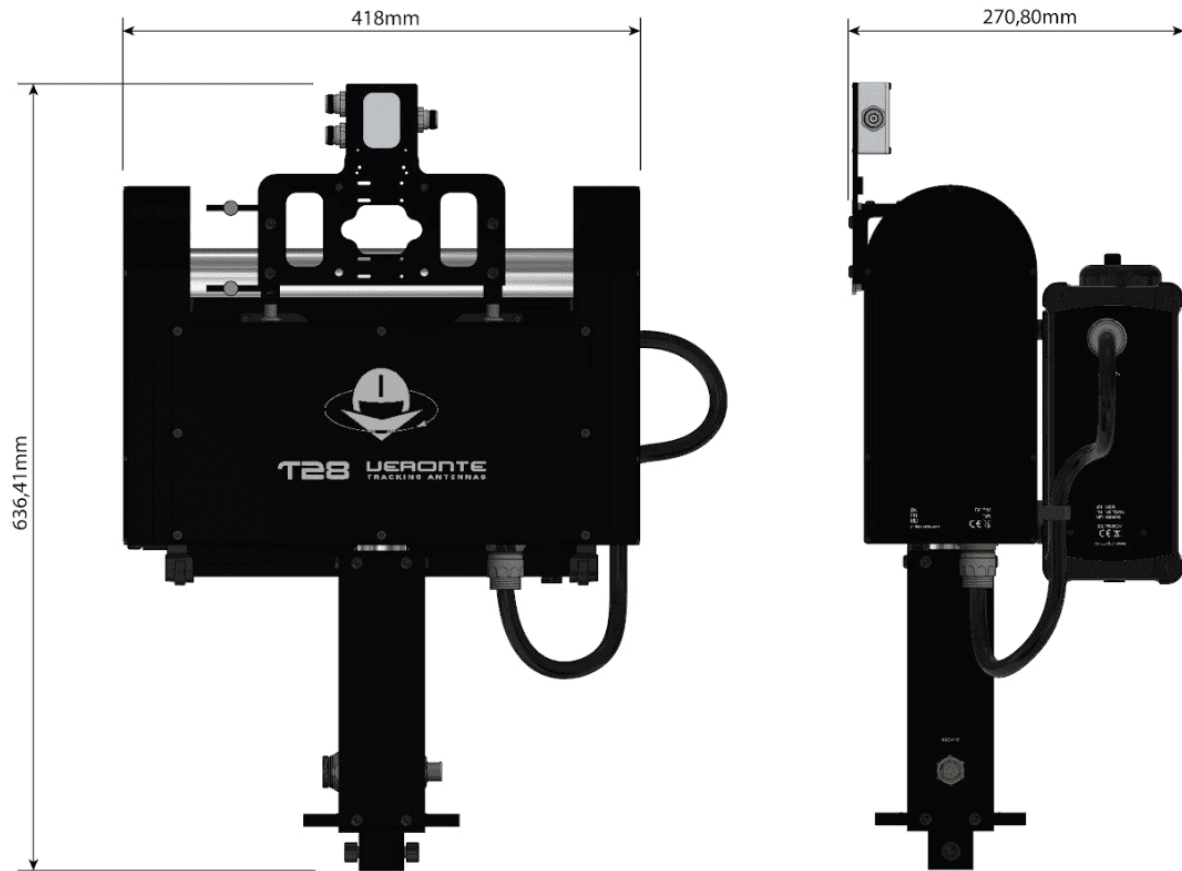


Fig. 1: Veronte T28 dimensions

T28 is supplied together with a telescopic foldable mast that can be extended up to 3.8m. Maximum and the minimum dimensions of the system are defined as follows.

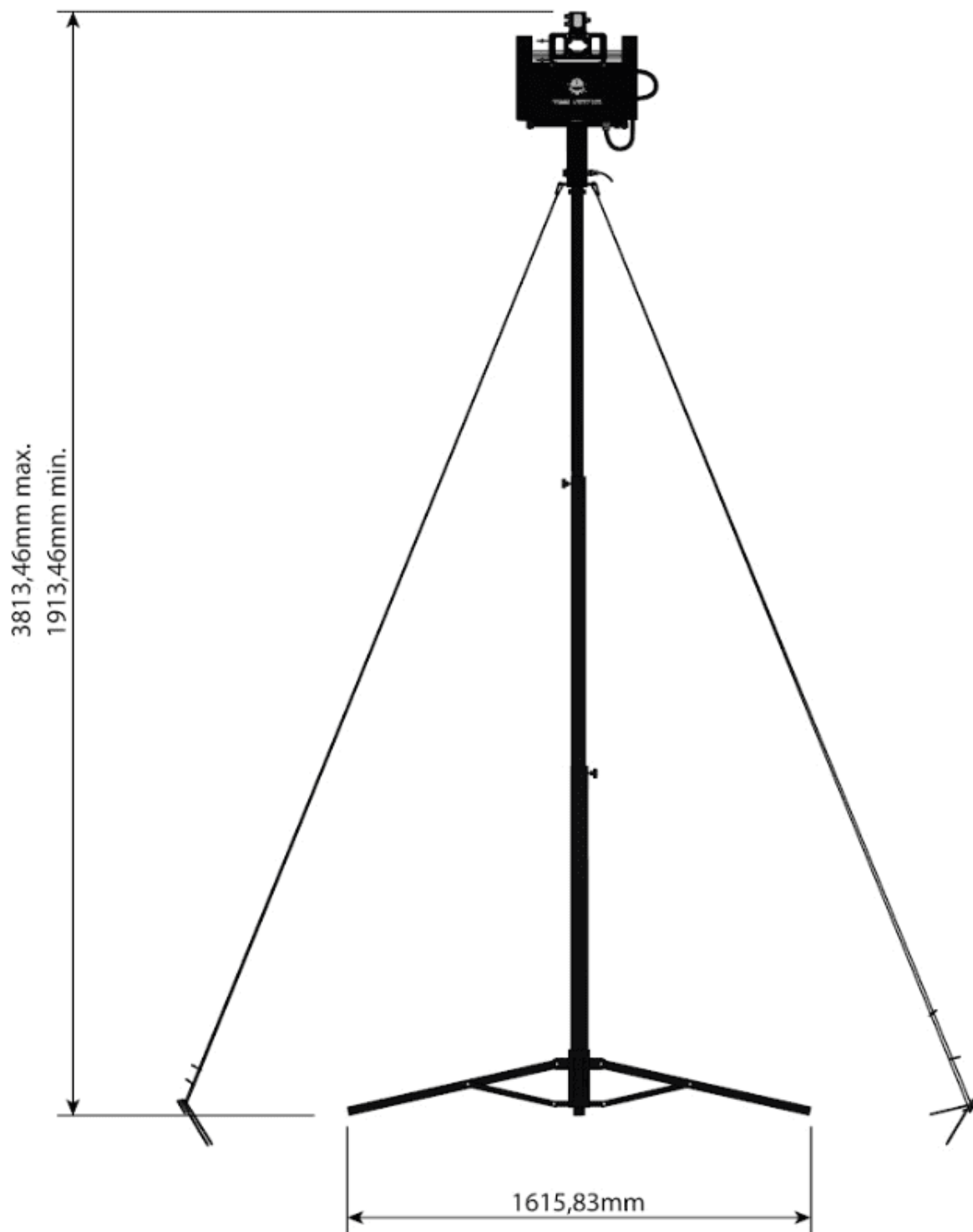


Fig. 2: System Dimensions

3.6 Antenna Kits

Embention offers different antenna kits for **T28** and **PCS**. They are available with different configurations in order to fit all operational requirements. To read any antenna datasheet, click on your Datasheet below. To know how to install any kit, read the section *Tracker Antenna Kit Installation*.

Antenna kit	Part number	Directional antenna	Omnidirectional antenna	Compatible Datalink kits
Kit A (2.4 GHz Parabolic) 1.0	P005461	Parabolic HG2427G  Datasheet	HGV2458-05U  Datasheet	• Datalink Kit A - Veronte SDL • Datalink Kit H - MicroHard
Kit B (900 MHz Yagi) 1.0	P005459	Yagi HG914YE-NF-BLK  Datasheet	HG903UP-NF  Datasheet	• Datalink Kit A - Veronte SDL • Datalink Kit B - Veronte SDL • Datalink Kit H - MicroHard • Datalink Kit I - MicroHard
Kit C (400 MHz Yagi) 1.0	P005460	ZDADJ450-12YG  Datasheet	ANT-433-CW-QW  Datasheet	• Datalink Kit A - Veronte SDL • Datalink Kit C - Veronte SDL • Datalink Kit H - MicroHard
Kit D (Wideband Parabolic) 2x 1.0	P008035	Parabolic TS242601  Datasheet	HGV2458-05U  Datasheet	• Datalink Kit F - Silvus • Datalink Kit G - Silvus
Kit F (DT 2.4 GHz Parabolic) 1.0	P008965	Parabolic HG2427G  Datasheet	HGV2458-05U  Datasheet	• Datalink Kit D - DTC

3.7 Interfaces

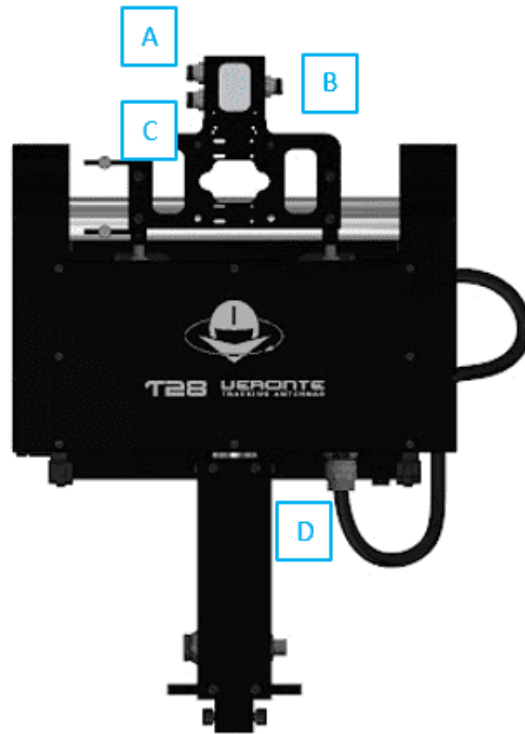


Fig. 3: Veronte T28 Interfaces - Parts identification



Fig. 4: Veronte T28 Interfaces - Parts identification

ID	Connector	Mating connector
A	Antenna connection	N-Type
B	To Veronte PCS LOS connector	
C	Antenna connection	
D	T28 harness connection	Lemo with 68 pins Embention reference: P007922
E		

Warning: Use **T28** harness connection.

T28 can only be powered through the Power Connector.

HARDWARE INSTALLATION

4.1 Basic Connection Diagram

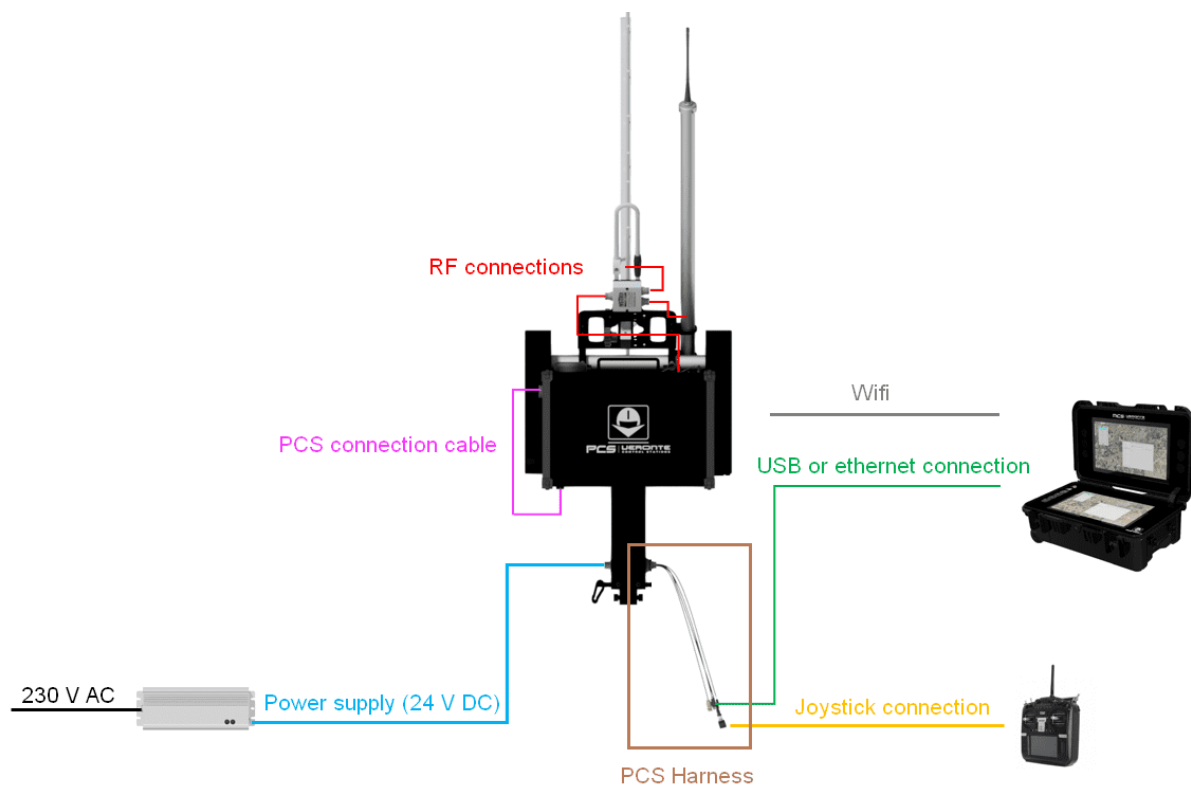


Fig. 1: Connection Diagram

4.2 Pinout

4.2.1 PCS Harness

The **PCS** pinout can be read in the **section Pinout - Hardware Installation** of the **PCS user manual**. (remember to select the product version on the webpage). Nonetheless, the following pins of **PCS** should not be used when a **T28** is connected, since they have not internal connections:

NOT USED PINS			
17	I/O 16	46	UARTA_RX
22	Analog 4	48	VCC
27	24 V	50	OUT_RS485_P
34	3.3 V	51	OUT_RS485_N
36	5 V	52	IN_RS485_N
37	GND	53	IN_RS485_P
42	FTS1_OUT	54	RS-485_GND
43	FTS2_OUT	62	USB_GND
44	24 V	67	VCC
45	UARTA_TX	68	

Since power supply is disabled in the harness connector, it is established with the *power connector*. RS-485 bus is used by default by the **Veronte BCS** for Ethernet communications.

Warning: Compatible only with PCS harness. Do not attach other type of harness, please contact Embention before doing it.

Warning: CAN A is used for internal propouses and is already equipped with two CAN termination resistors. No extra termination resistor shall be added to the CAN A bus. CAN B has no CAN termination resistors, user shall add them based on its own wiring design. We recomend to use CAN B for customer inplementation and CAN A for internal propouses, although CAN A can also be used for customer implementations.

4.2.2 Power Connector

The connector installed in veronte T28 pole is the 71-533722-06P. Use PT06A-10-6S(005) as mating connector.

Next table describes the pinout of the power connector:

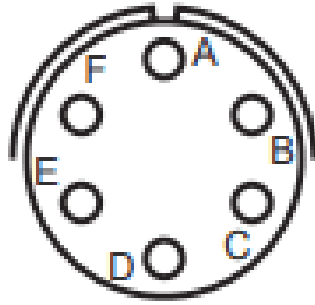


Fig. 2: Power connector pinout

Pin	Function
A	24V
B	24V
C	24V
D	GND
E	GND
F	GND

4.3 PAN-TILT Unit Installation

To install the PAN-TILT Unit on the Mast next steps shall be followed.

1. Insert PAN-TILT Unit into the Mast and insert the two M10 screws.

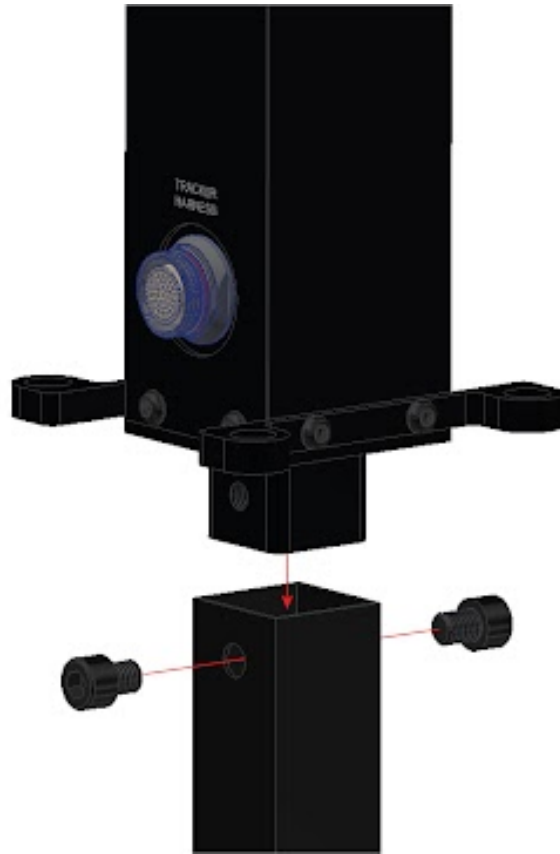


Fig. 3: **Insert PAN-TILT Unit into the Mast**

2. Fix two M10 screws with an 8 mm Allen wrench.



Fig. 4: Fix the T28 in to the mast

4.4 PCS Installation

Veronte PCS needs to have the Wall Mount accessory installed.

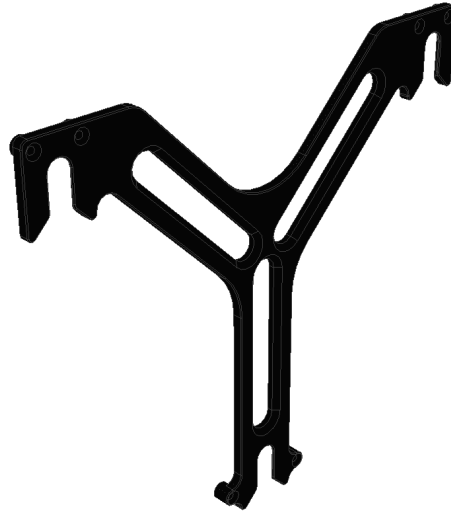


Fig. 5: Wall mount accessory

In the next picture hanging points are marked where **Veronte PCS** shall be installed.

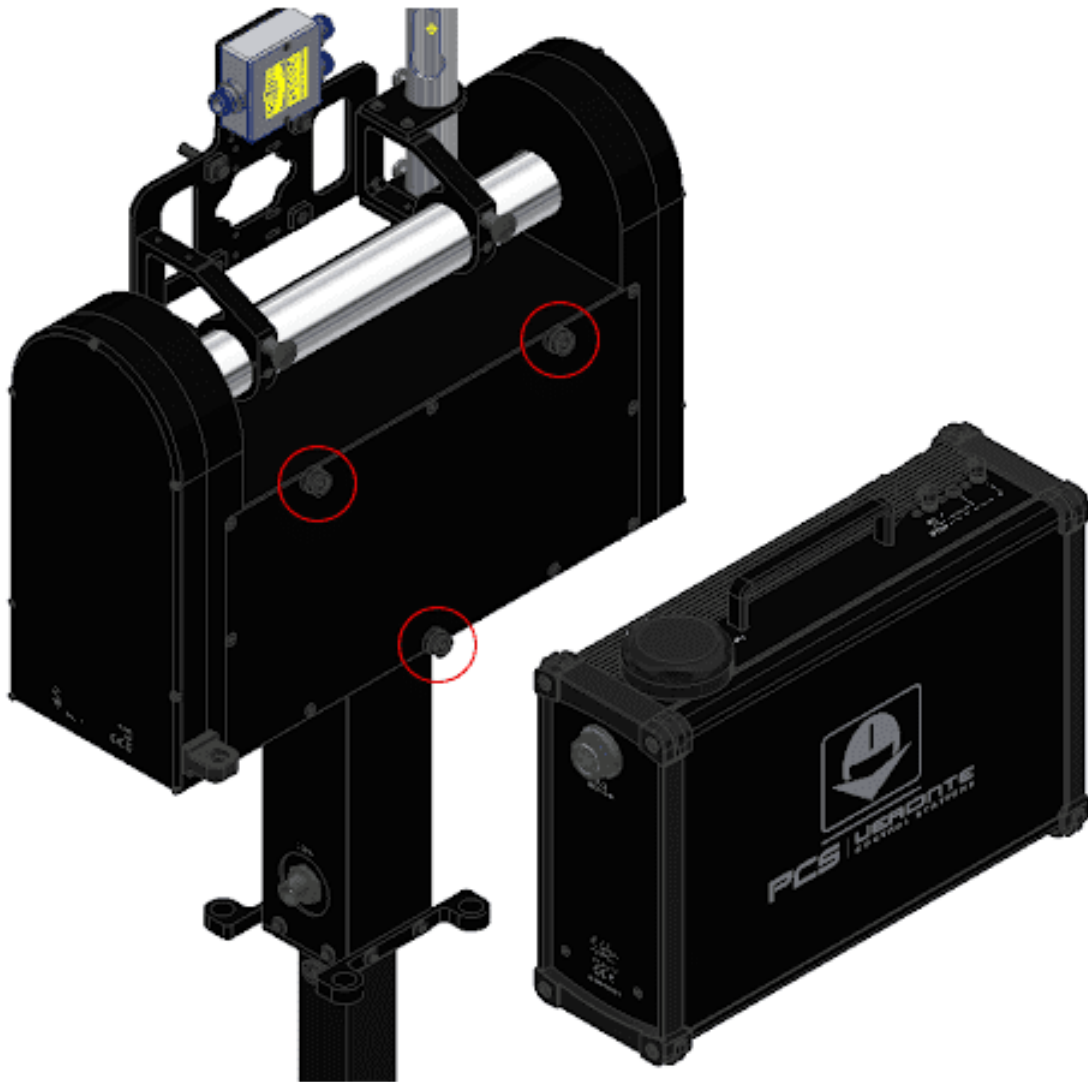


Fig. 6: Hanging points

Slide the **Veronte PCS** to the three hanging points.

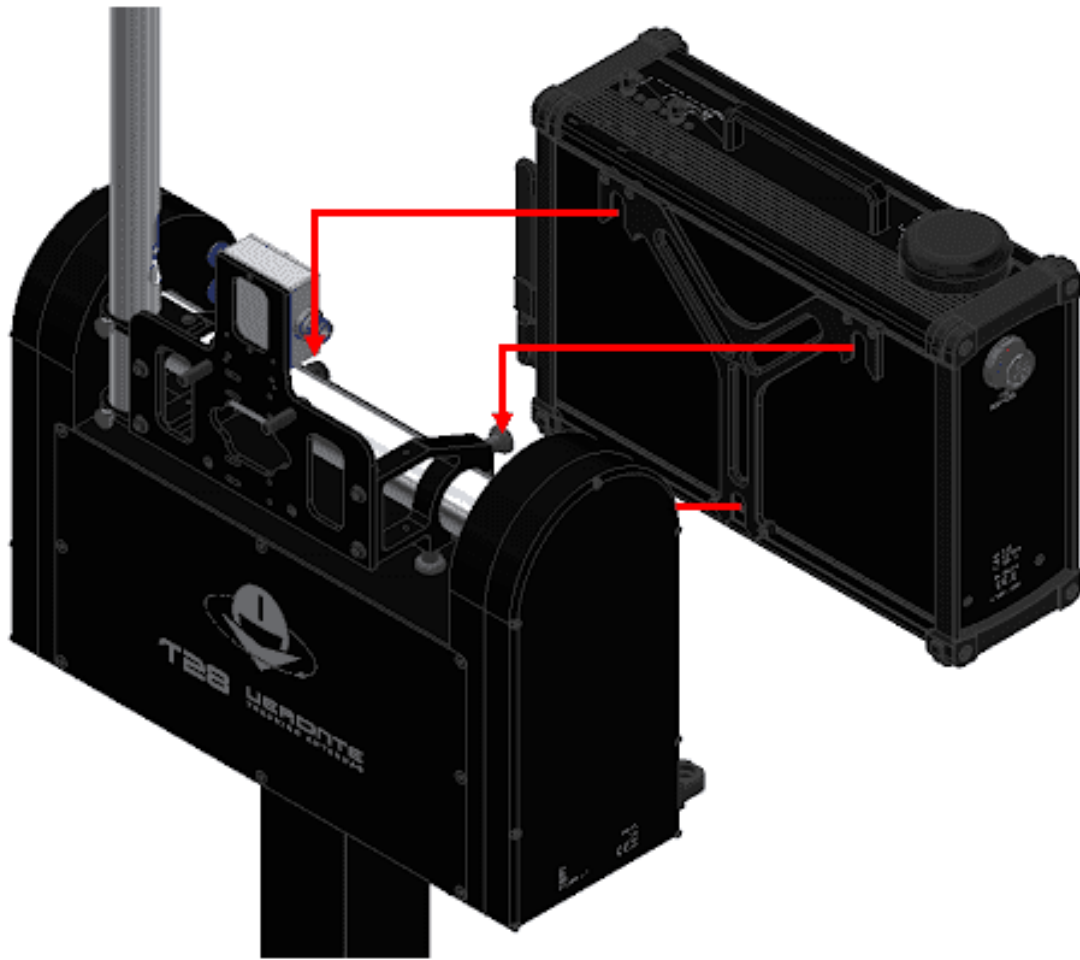


Fig. 7: Slide Veronte PCS

4.5 Mast Extension

To extend the mast, please follow next instructions.

1. Loose the Mast fasteners.



2. Turn the crank to adjust the height.



3. Lock the Mast fasteners.



4.6 Guy Cable

Veronte T28 is supplied with 4 guy cables and 4 stakes to provide extra stability when mounted.

The use of the guy cables is mandatory when **T28** rises more than 2.5 m although it is always recommended, even more in windy days.

1. Attach the carabiners as shown in the picture.



Fig. 8: Carabiners installation

2. Next picture defines the recommended distance between stakes.

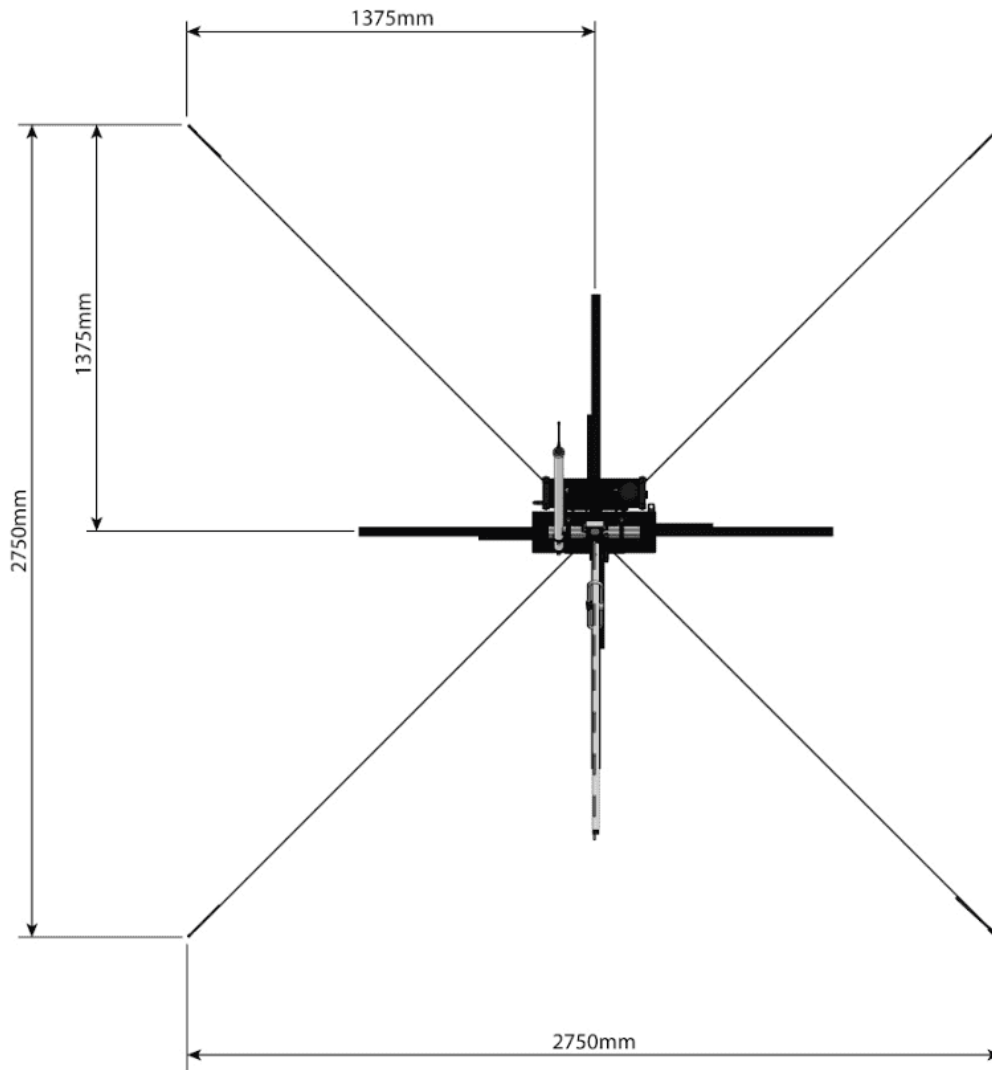


Fig. 9: Stakes distances

Once the stakes are installed, the guy cables need to be tightened.

3. The next image illustrates how to tight and lose a guy cable.

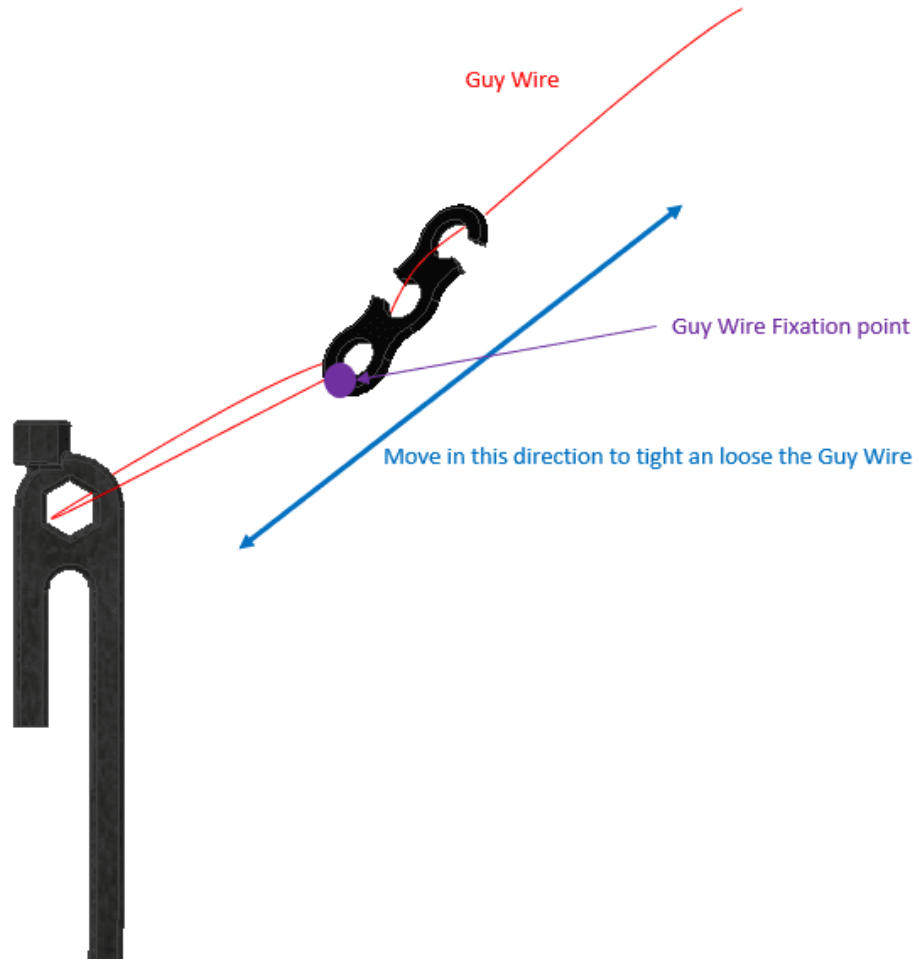


Fig. 10: Tight and lose guy cables

SOFTWARE INSTALLATION

The **T28** is controlled by the **Autopilot 1x** located in the **PCS**, so the only device which requires a configuration is the **1x**. Once delivered, the **Autopilot 1x** is already prepared for a standard operation with the default configuration. Nonetheless, the configuration can be changed as desired, to do it, first of all connect a computer to the **Autopilot 1x** according to the [Computer to Autopilot Connection](#) section of the **PCS user manual**.

Once the connection has been established, read the [T28 Software Manual](#) to configure it. In case of having troubles trying to establish connection, read its [Troubleshooting](#) section.

MAINTENANCE

Preventive maintenance is recommended to ensure an optimal state of operation of the **T28**.

6.1 Post-flight

1. Turn off the system by pressing the on/off switch (on the PCS harness) for 2 seconds, until the blue light turns off.



Fig. 1: On / off switch

2. Check all connectors, in case of abnormality or damage, please contact Embention's support team.
3. Clean the exterior with a soft cloth or compressed air.
4. It is a good praxis to clean all connectors with an appropriate contact cleaner after working in adverse conditions.
5. Store the system in the supplied rugged case.
6. Store it in a dry, clean, well-ventilated area at the recommended storage temperature range.

INTEGRATION EXAMPLES

7.1 Omnidirectional Antenna

1. Insert the Omnidirectional Antenna through the holes built for that purpose.



2. Fix the Omnidirectional Antenna with the two knobs.



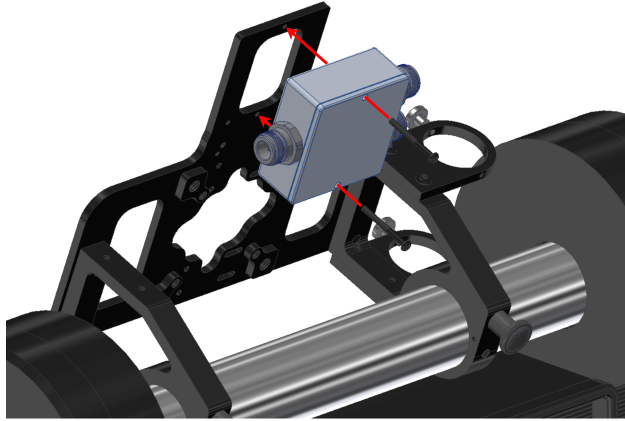
7.2 Tracker Antenna Kit Installation

To install an antenna kit on the **T28**, follow the installation instructions of your corresponding kit:

- *Antenna Kit A - Parabolic 2.4 GHz*
- *Antenna Kit B - Yagi 900 MHz*
- *Antenna Kit C - Yagi 400 MHz*
- *Antenna Kit D - Wideband 2x Parabolic*
- *Antenna Kit F - DT 2.4 GHz Parabolic*

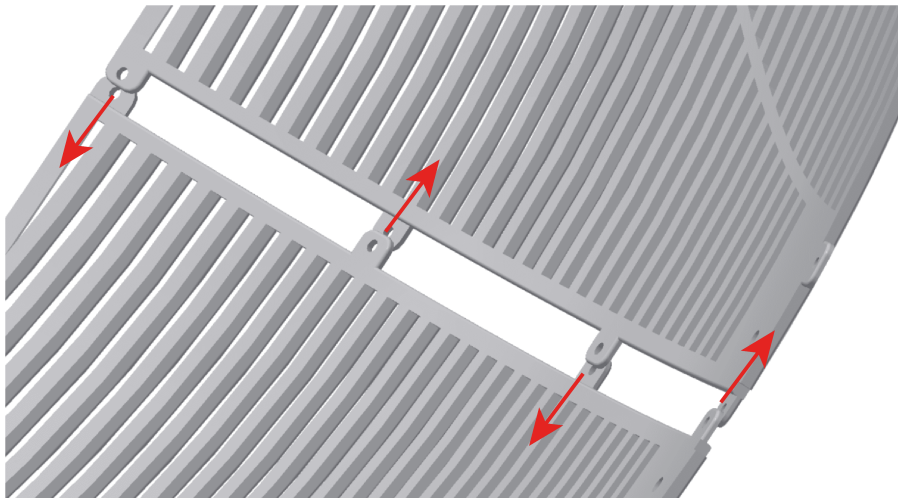
7.2.1 Antenna Kit A - Parabolic 2.4 GHz

1. Mount the omnidirectional antenna reading the *Omnidirectional Antenna* section.
2. Screw the splitter to the antenna mount with two screws M3 x 30 mm.

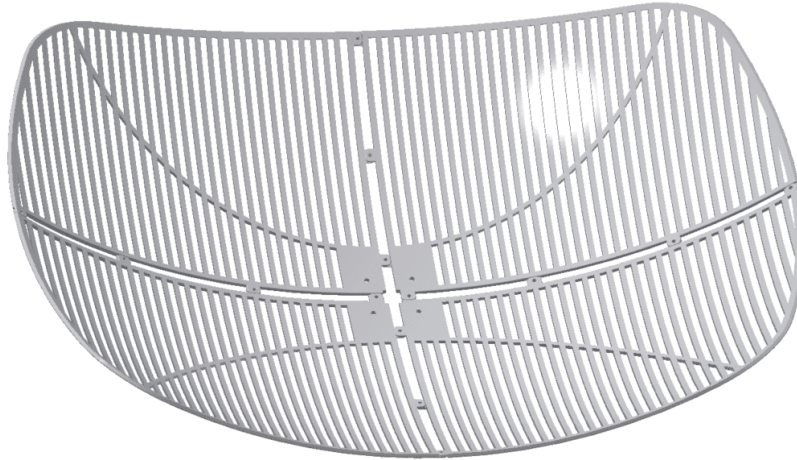


Note: The splitter receives an electrical signal and sends it to two different antennas.

3. Fit the 4 grids with the protrusions.



They must fit as next figure indicates:



4. Screw the 4 pieces with twelve screws M5x15 and their corresponding nuts.

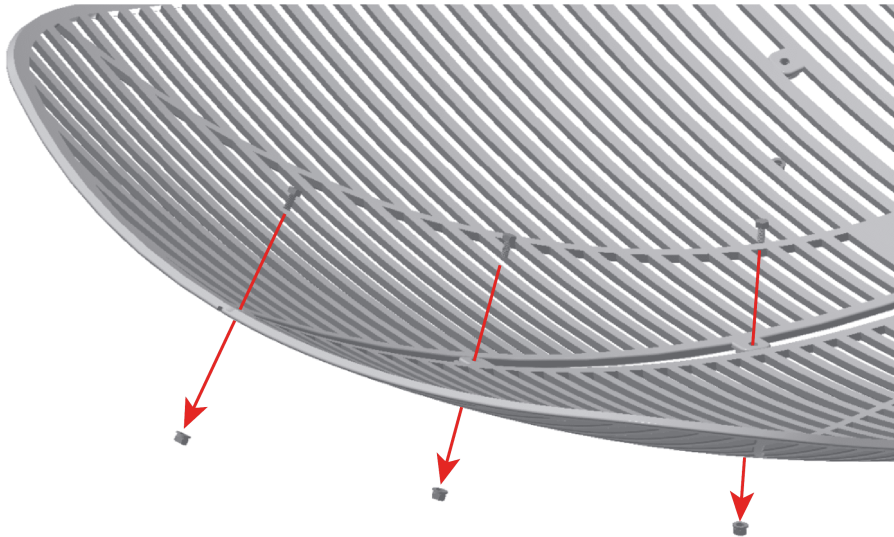
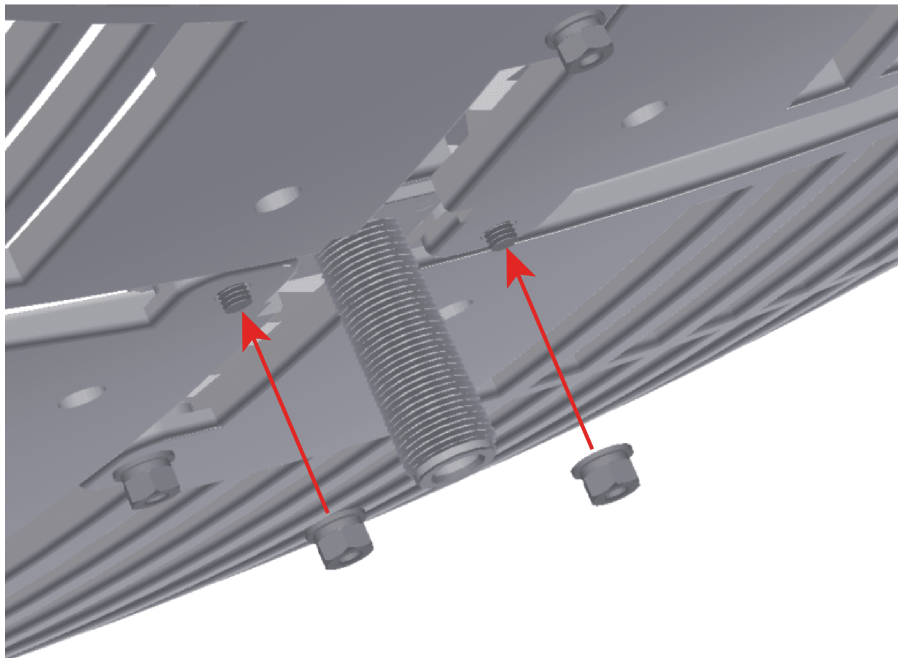
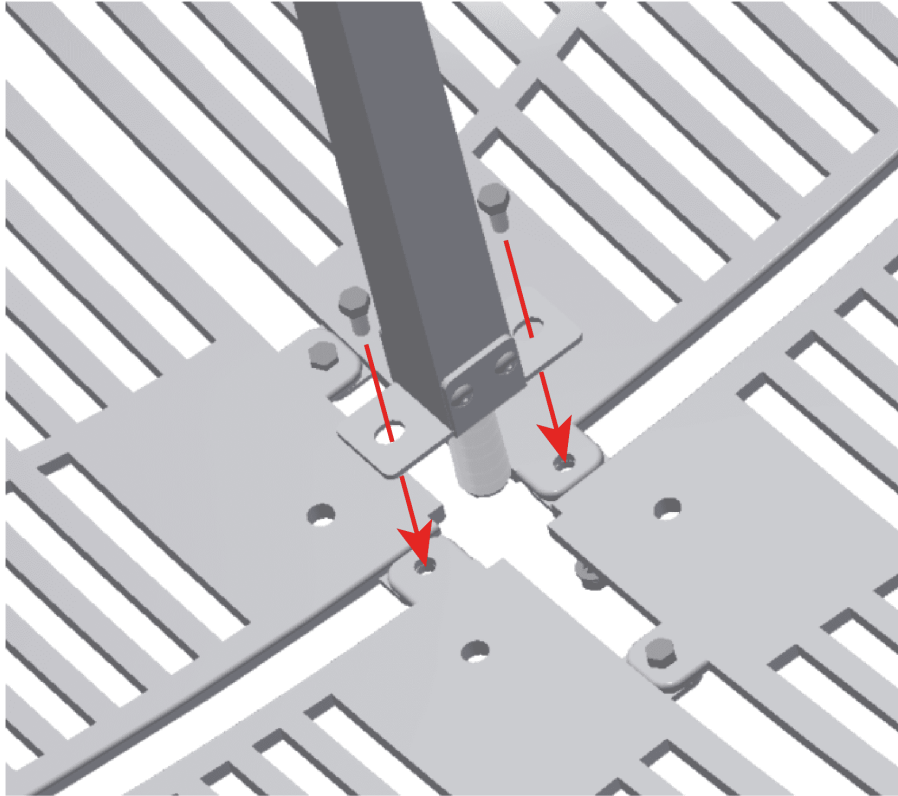


Fig. 1: Screwing one of four sides

5. Screw the horn to the grids with two screws M5x15 and their corresponding nuts.



6. Place the parabolic antenna on the **T28**, so the two upper screws on the **T28** are inserted into the antenna. It can

be placed with 90 degrees angle in case of desiring to change the polarity direction. This direction is indicated by an arrow on the antenna.

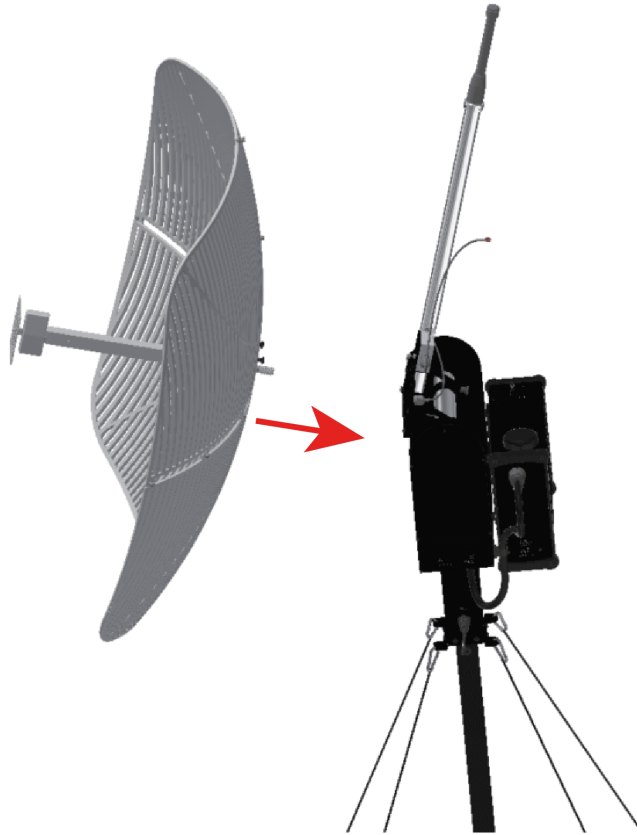


Fig. 2: Placing antenna

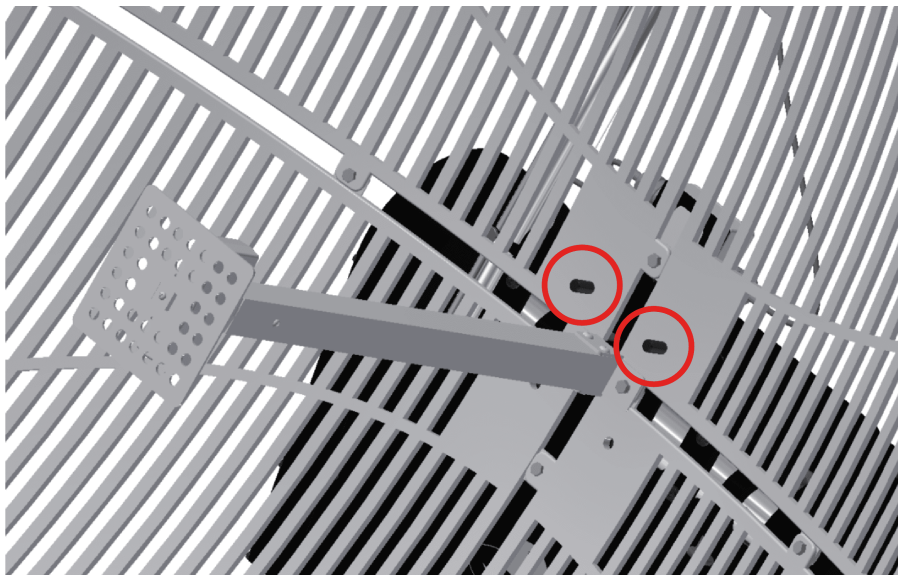
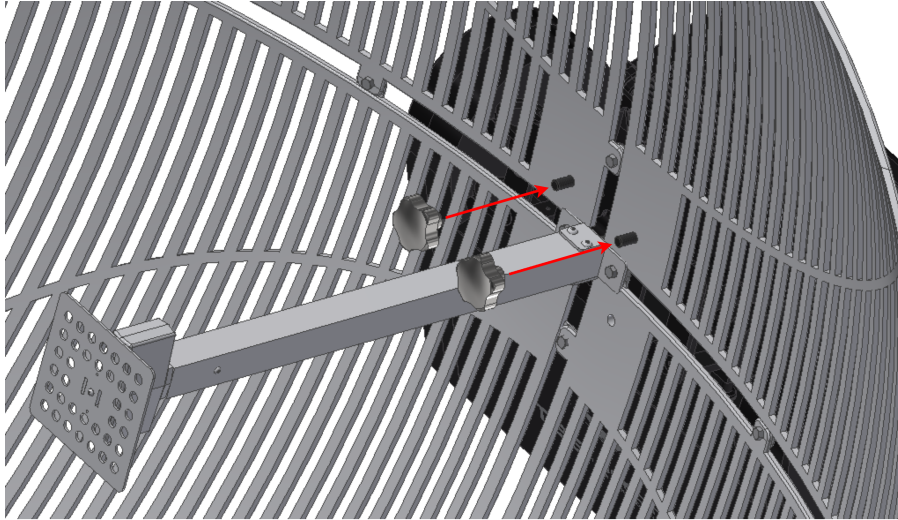


Fig. 3: Fitting antenna

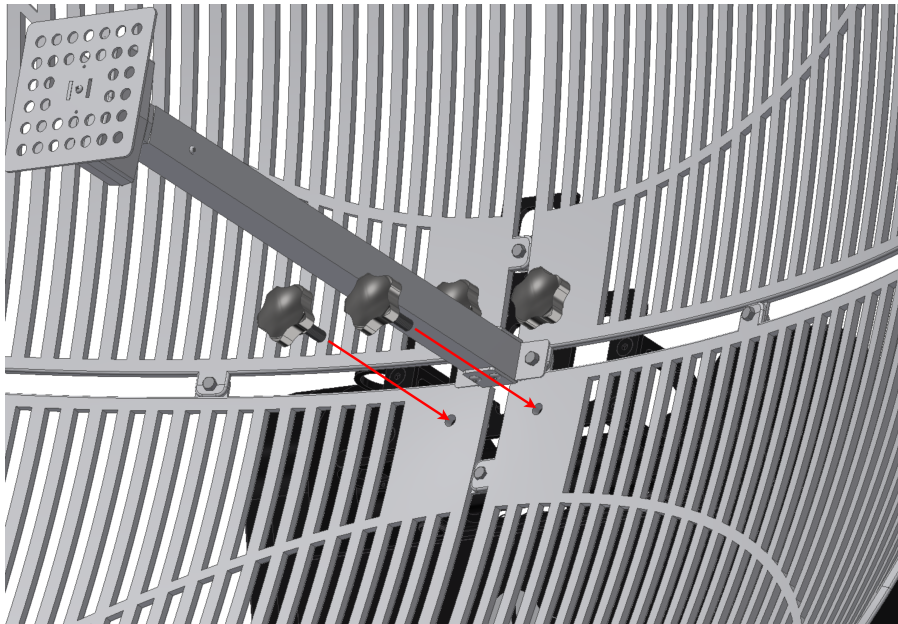


Fig. 4: Turned 90 degrees

7. Fix the Parabolic Grid Antenna with the two female knobs.

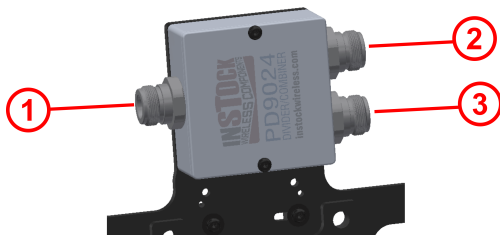


8. Screw two male knobs on the other two holes.





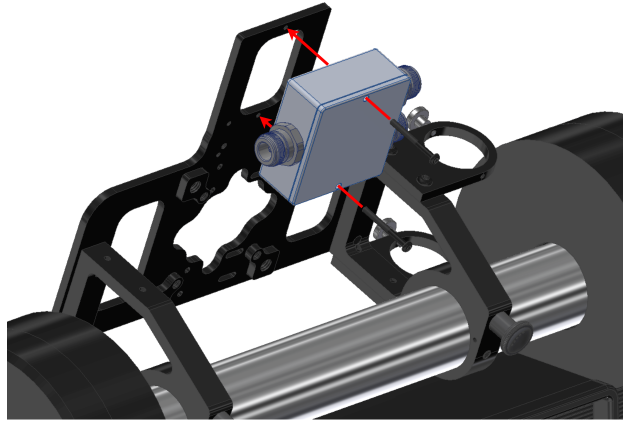
9. Connect each plug of the splitter.



1	Port RF2 of PCS
2	Omnidirectional antenna
3	Parabolic antenna

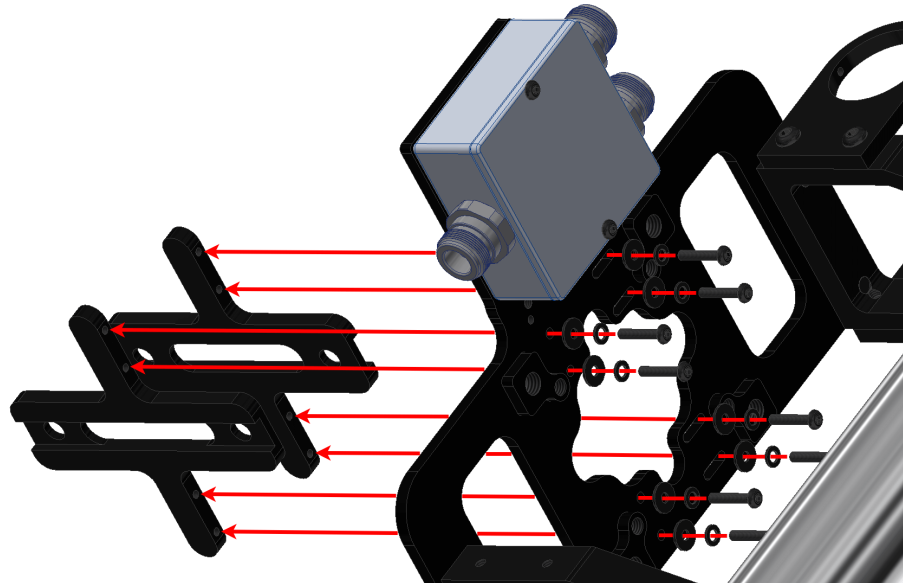
7.2.2 Antenna Kit B - Yagi 900 MHz

1. Mount the omnidirectional antenna reading the *Omnidirectional Antenna* section.
2. Screw the splitter to the antenna mount with two screws M3 x 30 mm.

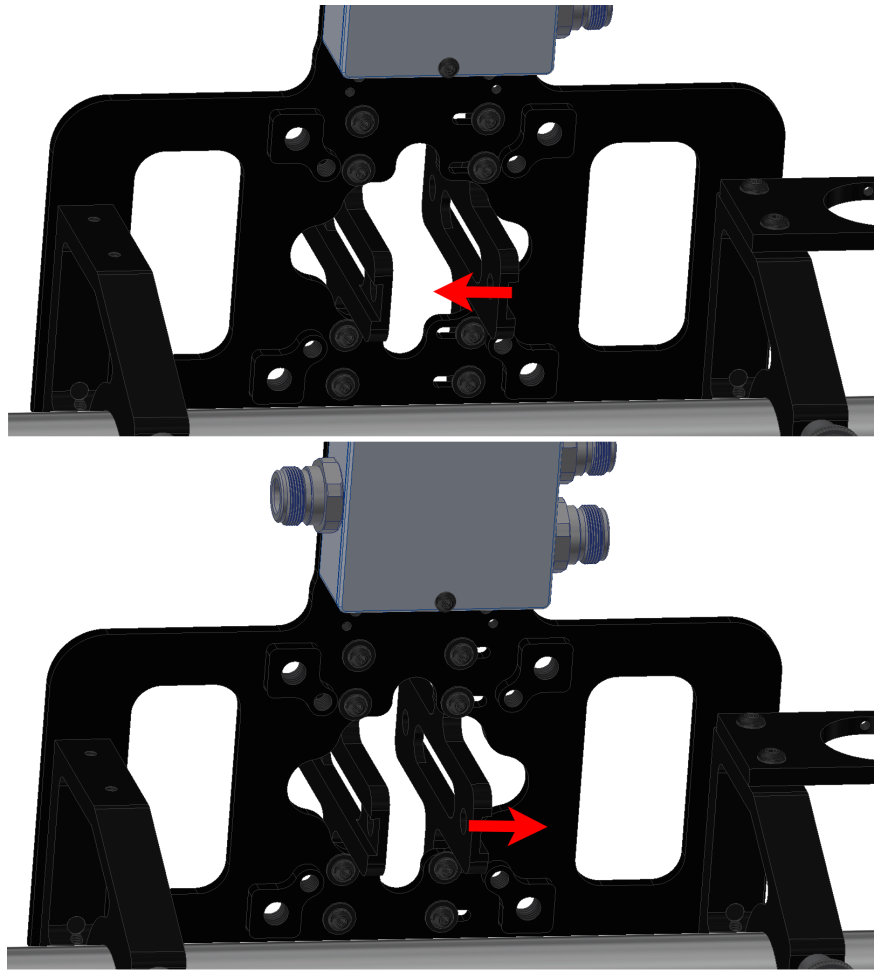


Note: The splitter receives an electrical signal and sends it to two different antennas.

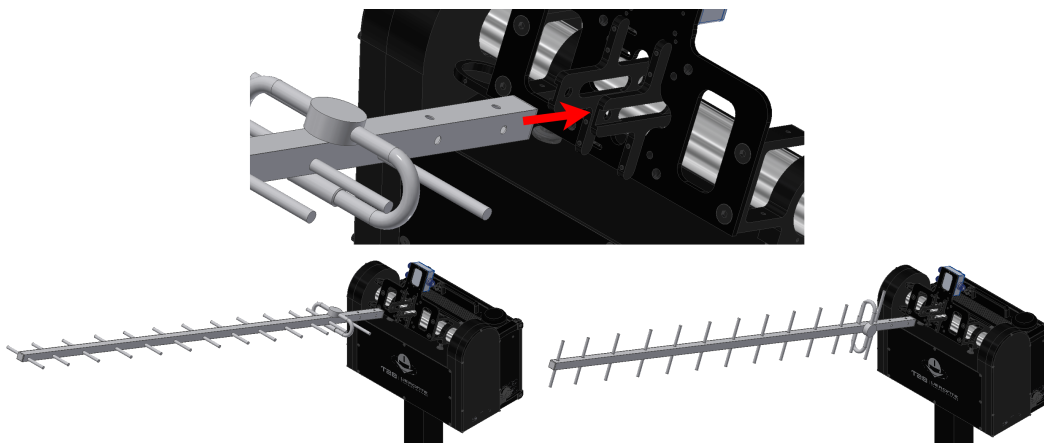
3. Attach both adapters for the Yagi antenna with eight screws M3 x 16 mm and their corresponding washers.



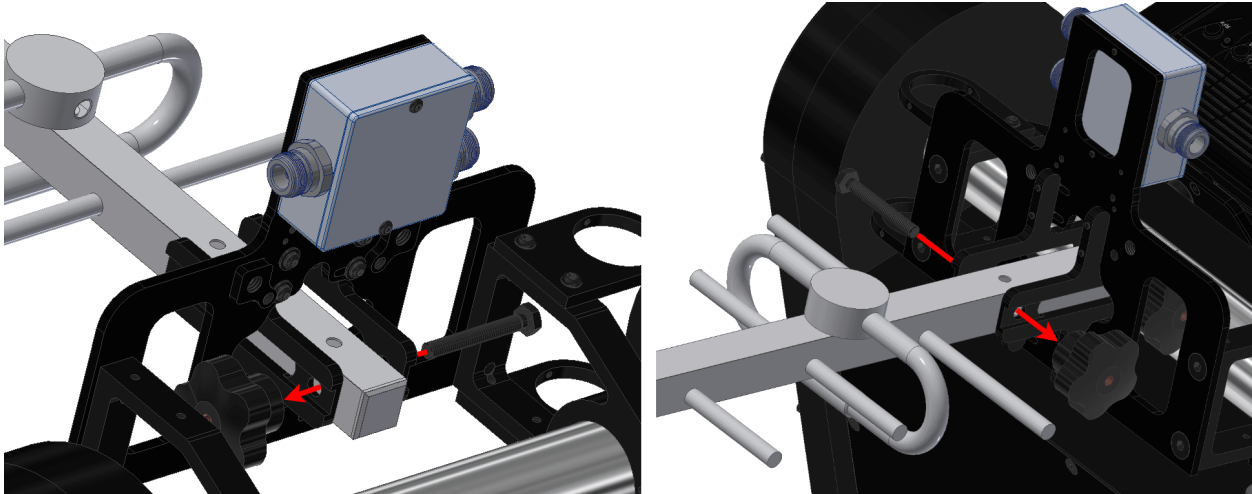
Note: The space between adapters can be adjusted according to the width of the antenna.



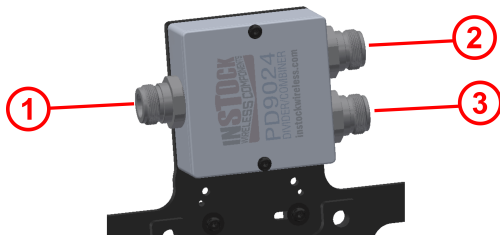
4. Insert the Yagi antenna into the adapter according to the polarity. The polarity direction is indicated by an arrow on the antenna.



5. Screw the Yagi antenna to the adapters with two screws M6 x 45 mm and their corresponding knobs.



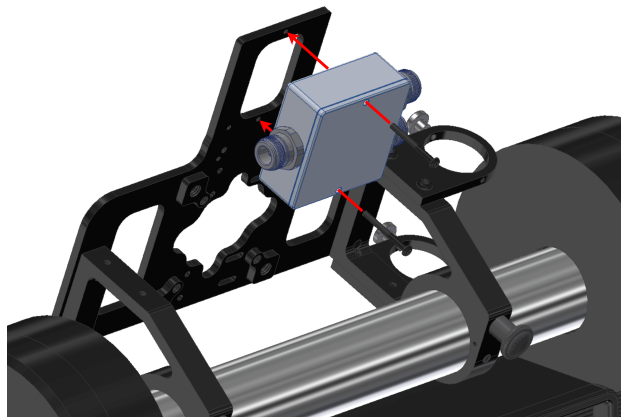
6. Connect each plug of the splitter.



1	Port RF2 of PCS
2	Omnidirectional antenna
3	Yagi antenna

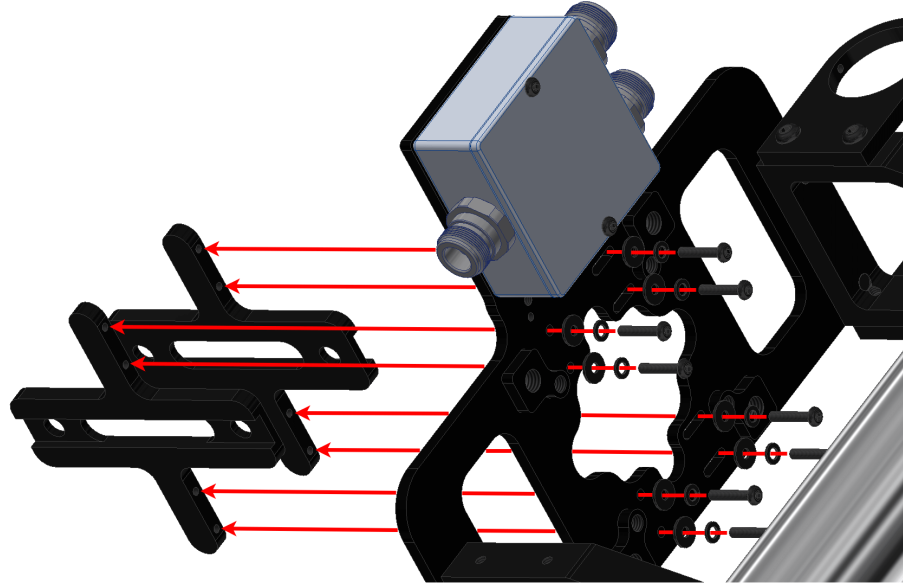
7.2.3 Antenna Kit C - Yagi 400 MHz

1. Mount the omnidirectional antenna reading the *Omnidirectional Antenna* section.
2. Screw the splitter to the antenna mount with two screws M3 x 30 mm.

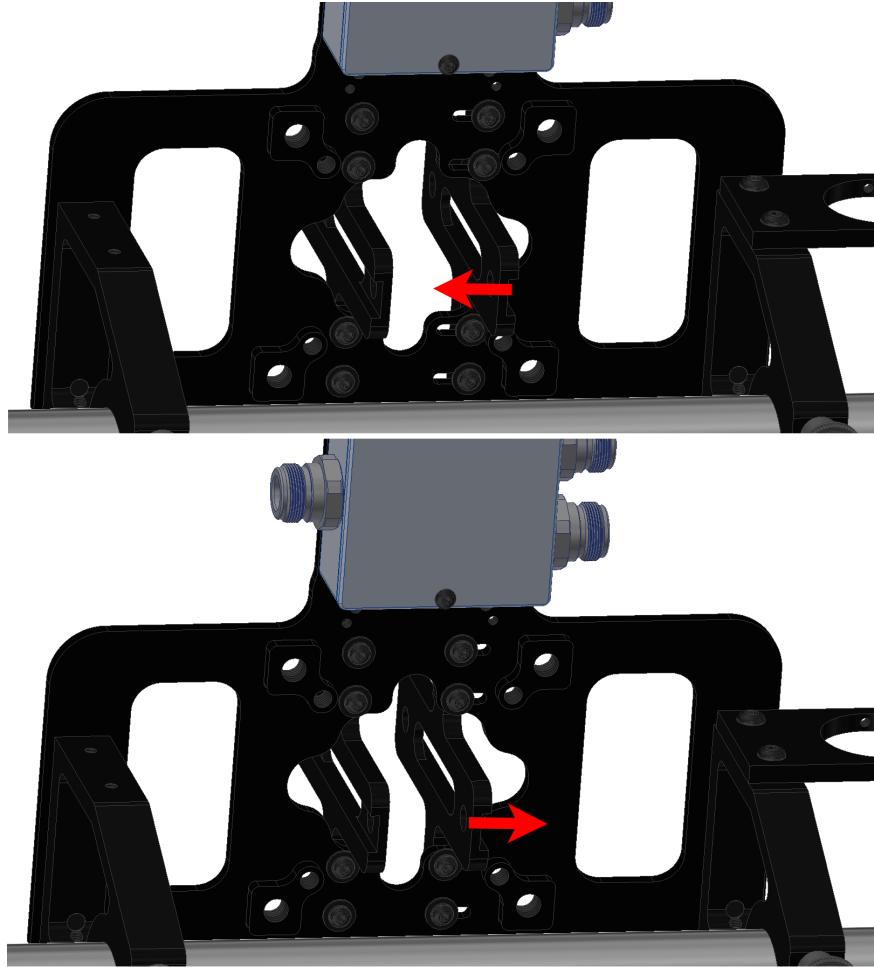


Note: The splitter receives an electrical signal and sends it to two different antennas.

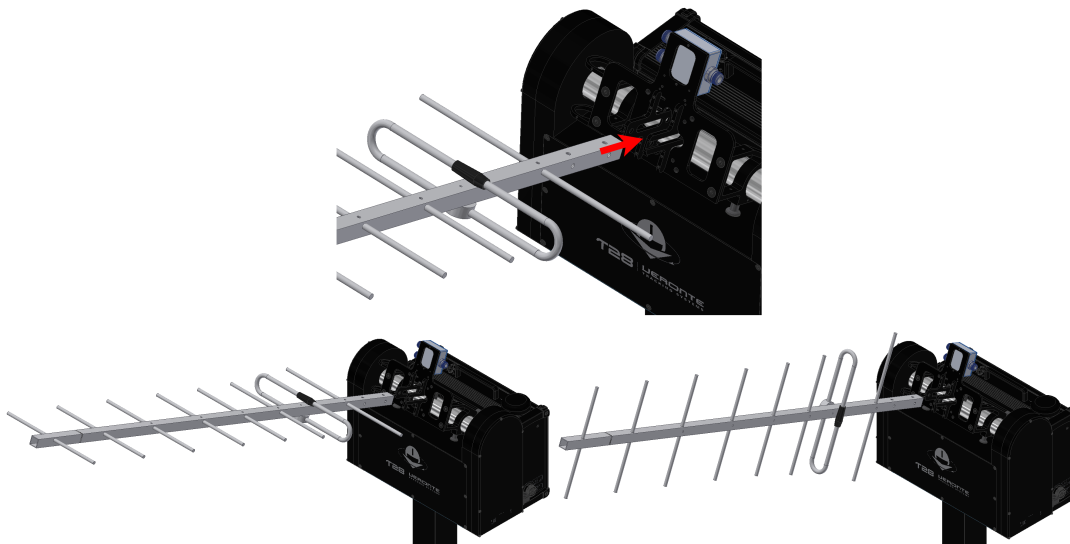
3. Attach both adapters for the Yagi antenna with eight screws M3 x 16 mm and their corresponding washers.



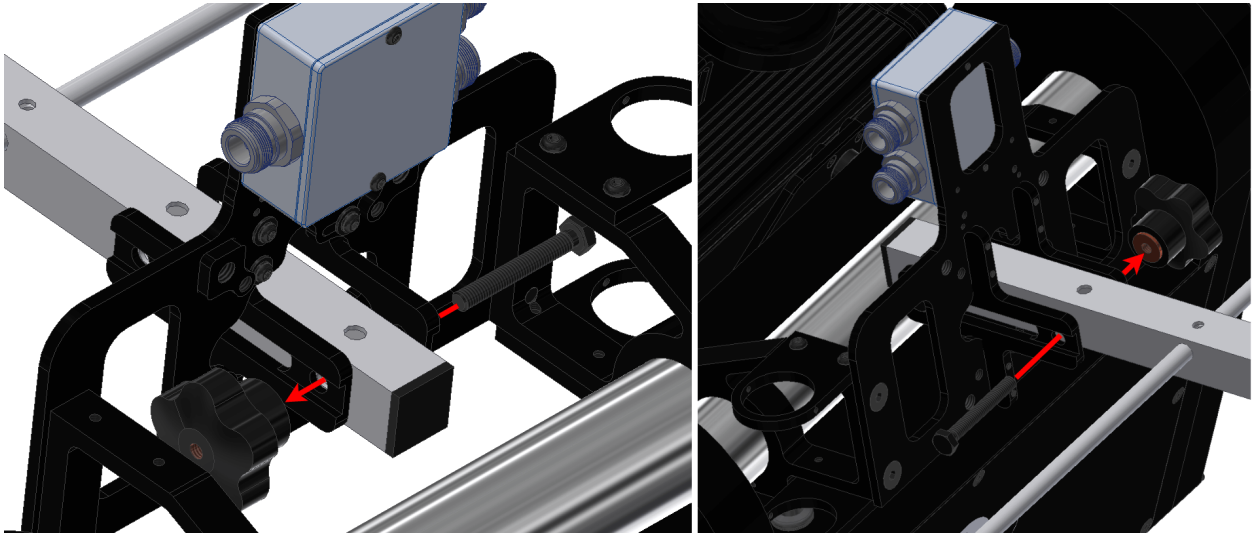
Note: The space between adapters can be adjusted according to the width of the antenna.



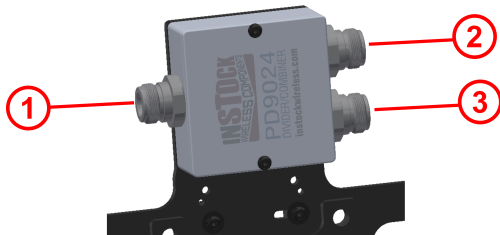
4. Insert the Yagi antenna into the adapter according to the polarity. The polarity direction is indicated by an arrow on the antenna.



5. Screw the Yagi antenna to the adapters with two screws M6 x 45 mm and their corresponding knobs.



6. Connect each plug of the splitter.

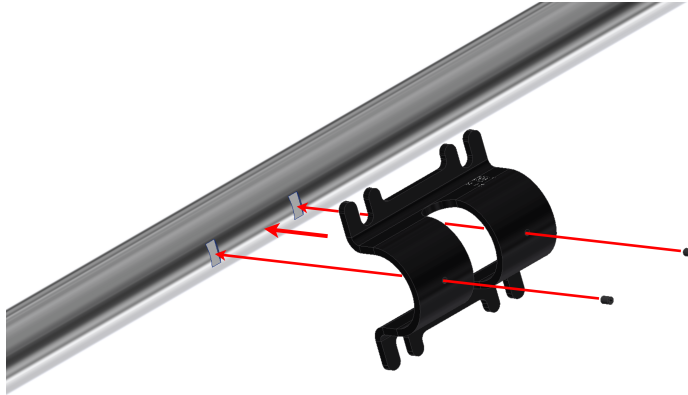


1	Port RF2 of PCS
2	Omnidirectional antenna
3	Yagi antenna

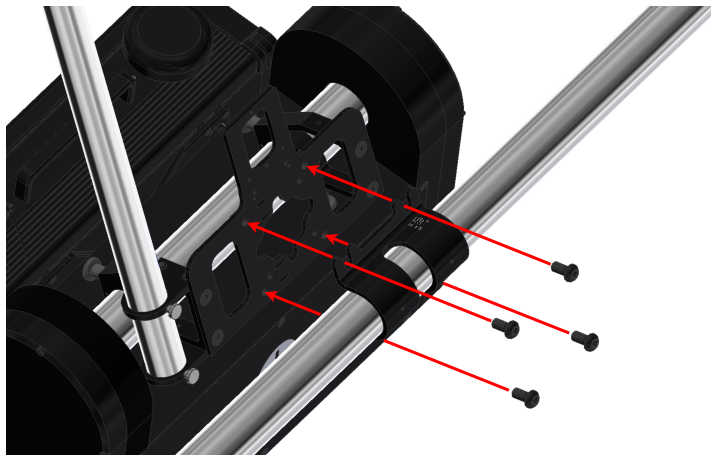
7.2.4 Antenna Kit D - Wideband 2x Parabolic

1. Mount the omnidirectional antenna reading the *Omnidirectional Antenna* section.
2. Assemble the support to the center of the horizontal tube. After that, screw two set screws M4 x 6 mm, so they stand on both grooves.

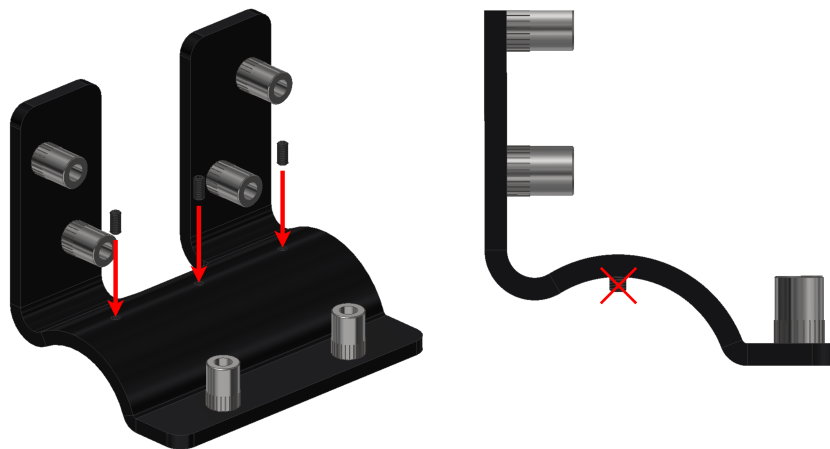
Note: The set screws on grooves prevent the tube from moving inside the support.



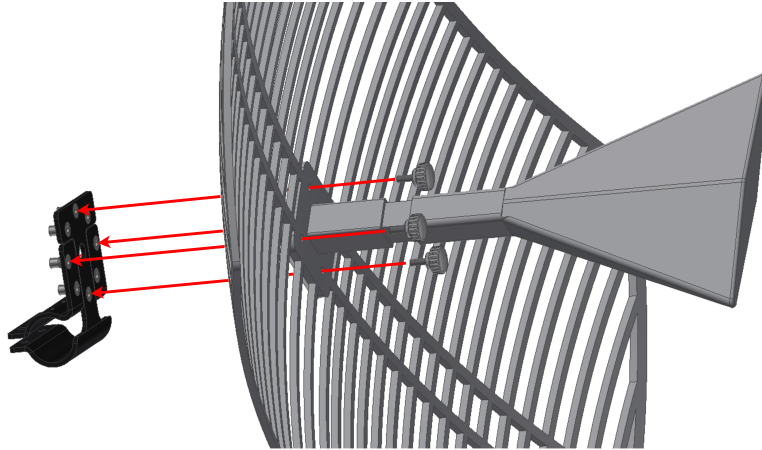
3. Screw the tube with its corresponding support and four screws M8 x 16 mm.



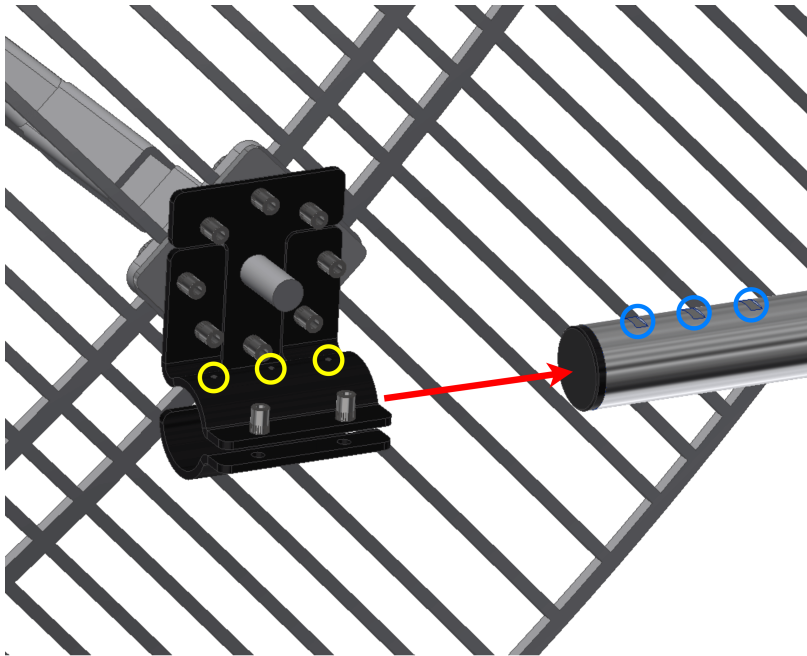
4. Screw slightly the three set screws M3 x 6 mm on the top mount of the antenna. They must not traverse the mount.



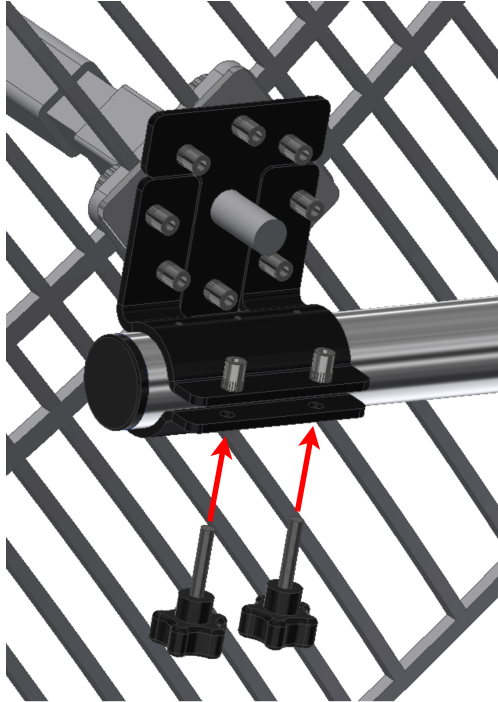
5. Attach the antenna to both mounts with knobs.



6. Slide the tube through the mounts until the three screws (marked with yellow) stand over the three grooves (marked with blue).

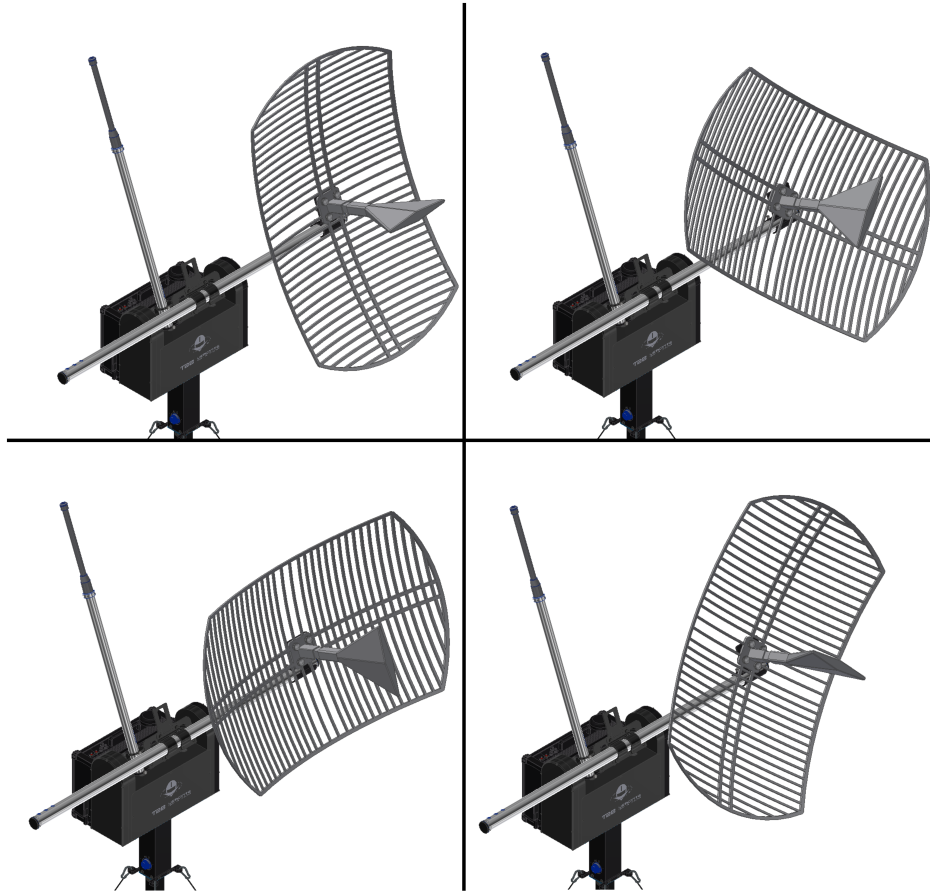


7. Screw both knobs into the mount parts.



Note: The set screws on grooves prevent the mount from moving around the tube.

Both antennas can be placed with different angles depending on the polarity direction. This direction is indicated by an arrow on the antenna.



8. Tighten the three set screws previously placed.
9. Repeat the mounting process with the other antenna on the opposite side of the tube.

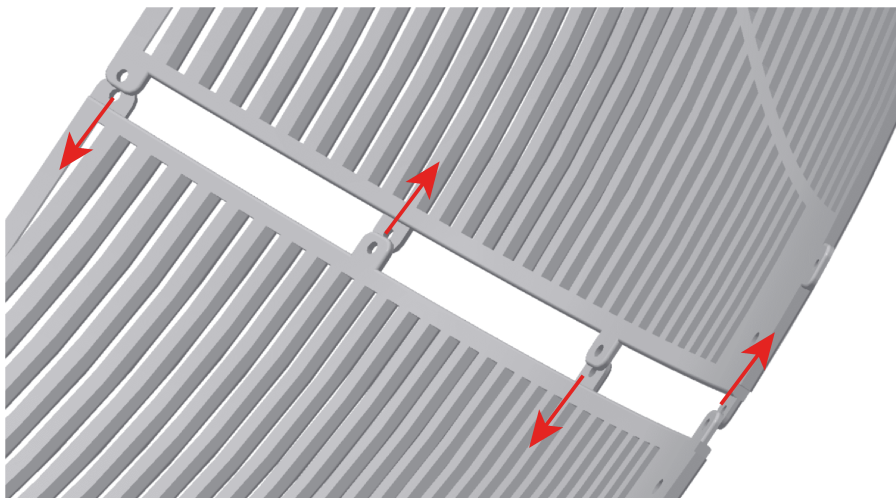


10. Connect the omnidirectional antenna to the SMA port RF4 and the parabolic antennas to RF2 and RF3.

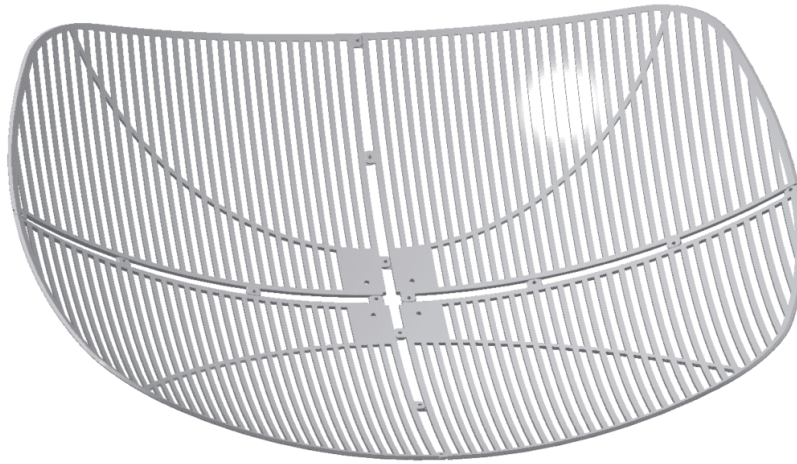


7.2.5 Antenna Kit F - DT 2.4 GHz Parabolic

1. Mount the omnidirectional antenna reading the *Omnidirectional Antenna* section.
2. Fit the 4 grids with the protrusions.



They must fit as next figure indicates:



3. Screw the 4 pieces with twelve screws M5x15 and their corresponding nuts.

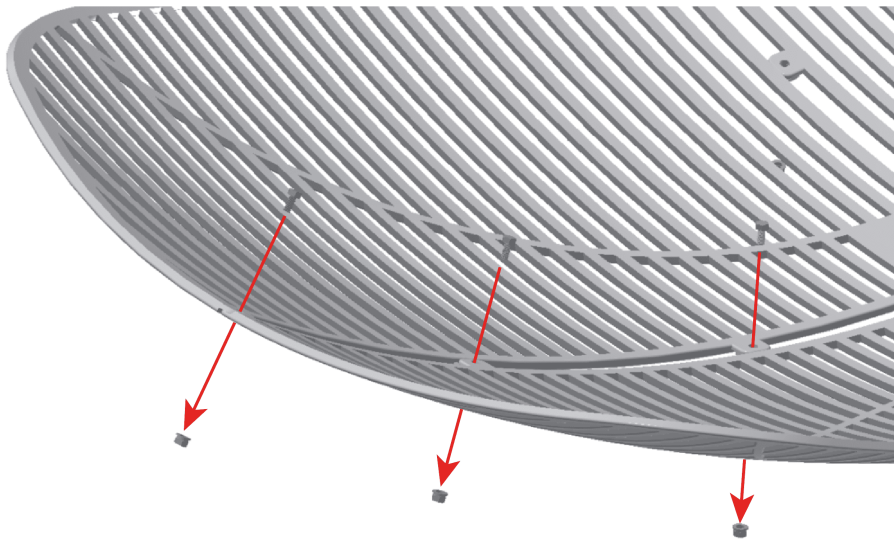
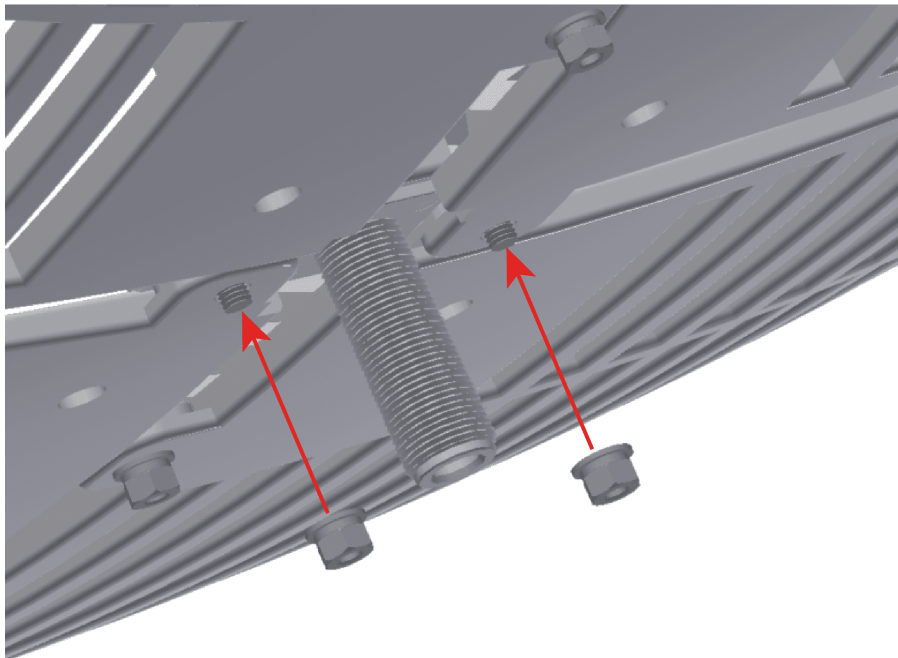
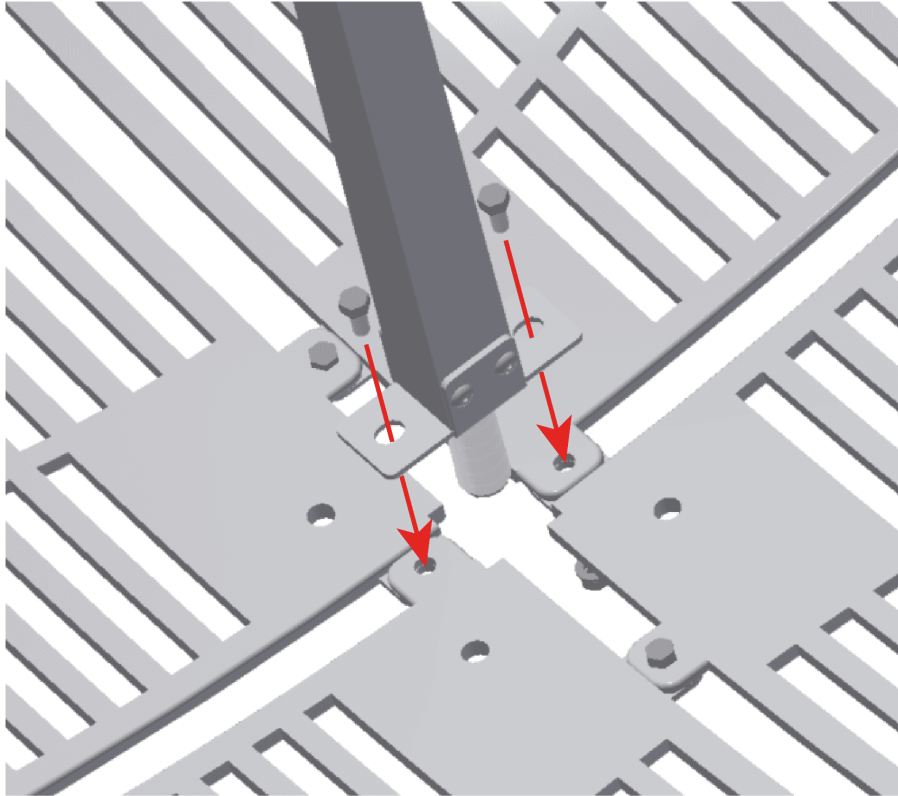


Fig. 5: Screwing one of four sides

4. Screw the horn to the grids with two screws M5x15 and their corresponding nuts.



5. Place the parabolic antenna on the **T28**, so the two upper screws on the **T28** are inserted into the antenna. It can

be placed with 90 degrees angle in case of desiring to change the polarity direction. This direction is indicated by an arrow on the antenna.

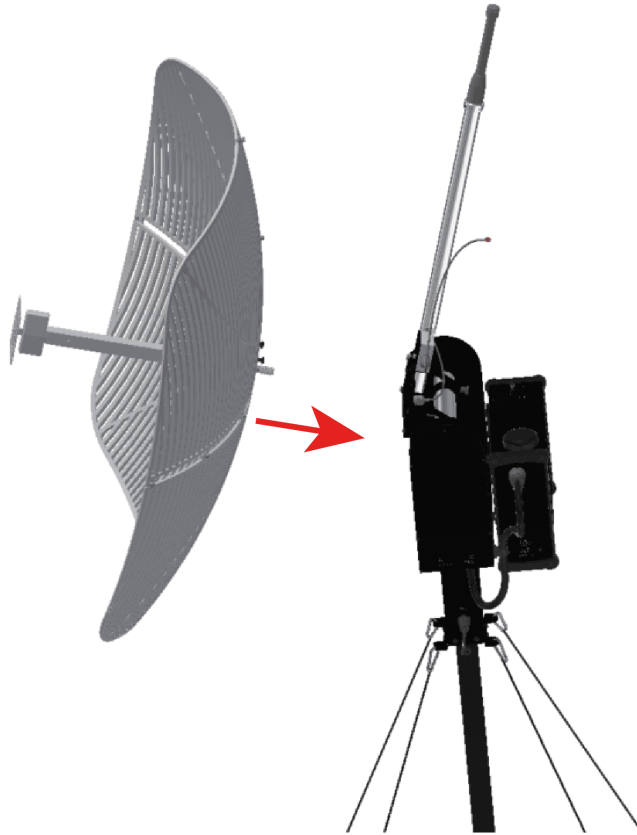


Fig. 6: Placing antenna

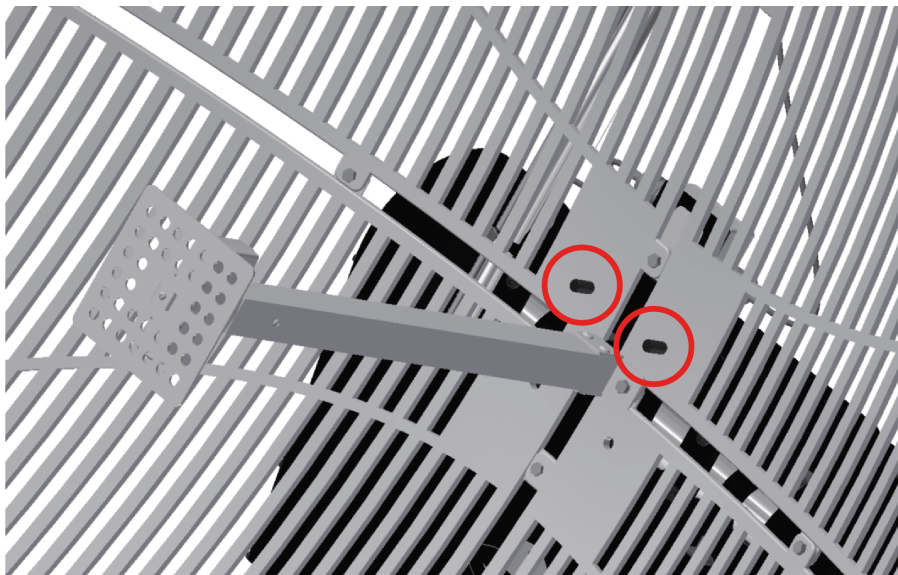
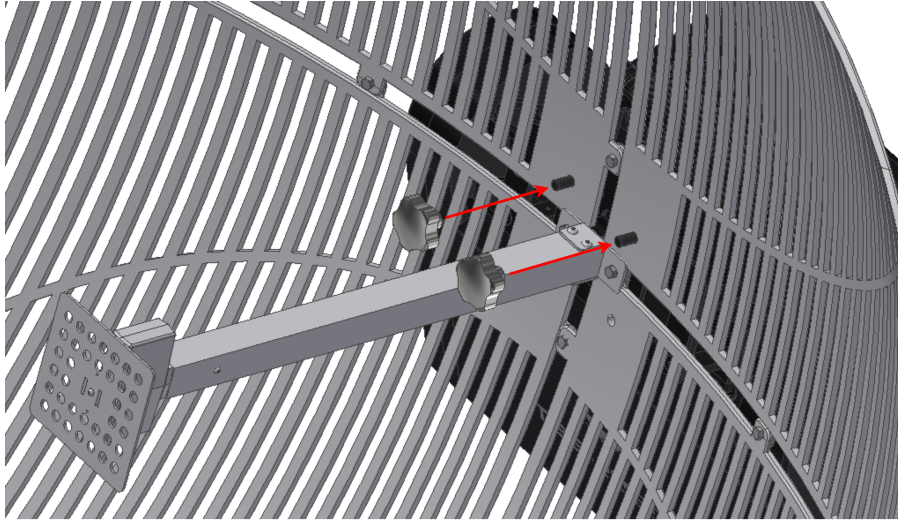


Fig. 7: Fitting antenna

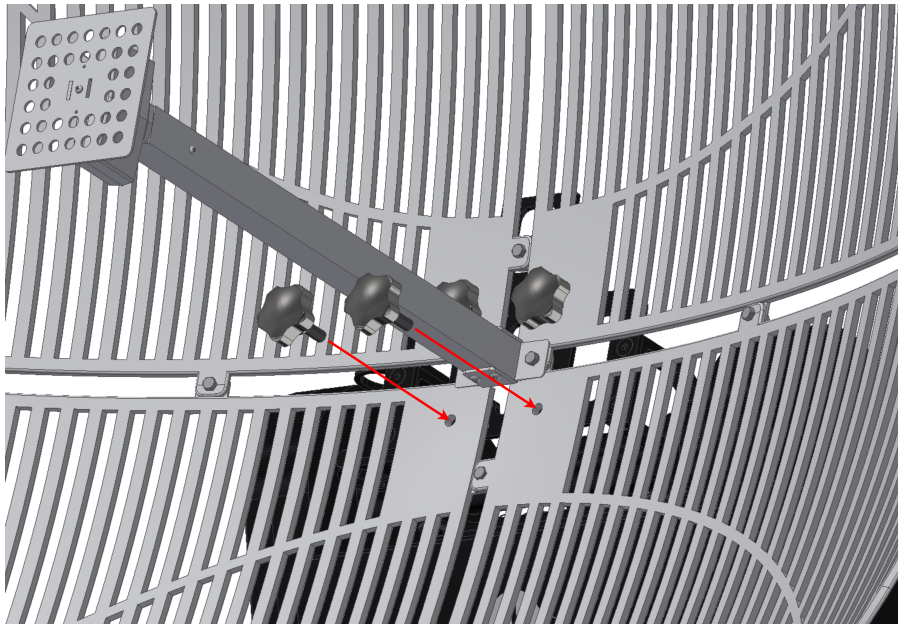


Fig. 8: Turned 90 degrees

6. Fix the Parabolic Grid Antenna with the two female knobs.



7. Screw two male knobs on the other two holes.





8. Connect the parabolic antenna to SMA port RF2 and the omnidirectional antenna to RF3.



ACRONYMS AND DEFINITIONS

ADC	Analog to Digital Converter
CAN	Controller Area Network
COM	COMmunications
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
GND	Electrical ground
I/O	Input/Output
LOS	Line Of Sight
PC	Personal Computer
PCS	Pole Control Station
PPM	Pulse Position Modulation
PWM	Pulse Width Modulated signal
R	Resistance
RF	Radio Frequency
RS-232	Recommended Standard 232
RS-485	Recommended Standard 485
TCP	Transmission Control Protocol
UAV	Unmanned Aerial Vehicle
UDP	User Datagram Protocol

CONTACT DATA

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