



MBS USER AND INSTALLATION MANUAL

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1. INTRODUCTION

The MBS Units are the outdoor modules that make up a Mast Mounted Base Station (MBS). They are independent units that can be interconnected with each other to increase the base station capacity. A MBS consists of a maximum of two MBS Units.

This manual is common to all the equipment models, including all their options and accessories.

The proper operation of any electronic device depends on its correct use. Therefore, it is recommended to follow the instructions showed in this manual.

2. UNPACKING AND CHECKING

The equipment is supplied with all the necessary materials for the installation, either on a mast/pole or on a wall:

- MBS Unit includes the followings items
 - One power connector.
 - One Ethernet connector
 - RF super-flexible wire N-Male – N-Male.
- Brackets for the installation.


Besides, in some types of installation, as detailed below, it is necessary an additional material that is NOT supplied with the equipment.

IMPORTANT: If any of the necessary elements to carry out the installation process described in this guide is missing or damaged, please contact your supplier.

3. PREVIOUS CONSIDERATIONS

This manual contains information about instructions for installation, maintenance and use. Read the following pages before using this equipment.

It is not advisable to switch on the equipment without having previously connected the antenna otherwise irreparable damage could be. It is important to use an antenna adjusted to the work frequency.

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4. LABELLING AND INFORMATION ON SAFETY AND ELECTROMAGNETIC COMPATIBILITY

The equipment is supplied with an identification label where the model, the IC Certificate number and the FCC ID are displayed depending on the frequency work band.



The equipment has been designed to fulfil the applicable compliance regulations.

The equipment complies with the applicable Parts of the FCC Title 47 of the Code of Federal Regulations and Industry Canada (IC) RSS-119 Standard.

This device complies with part 15 of the FCC Rules and Industry Canada ICES-003. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

FCC RF Exposure Requirements:

CAUTION:

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Antennas used for this transmitter must not exceed an antenna gain of 20 dBi and be located at least 400 cm, away from any person(s) in order to comply with the FCC RF exposure requirements.

Failure to observe these restrictions will result in exceeding the FCC RF exposure limits.



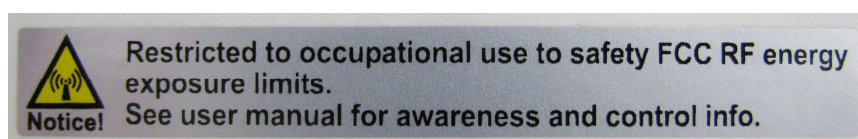
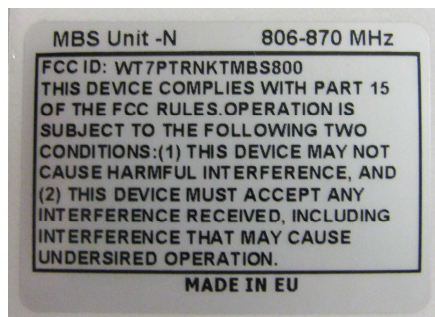
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The following labels will be placed in conspicuous view on the MBS Unit:



- Most electronic equipment is susceptible to electromagnetic interference if it is not duly protected. If the MBS Unit is placed near unprotected electronic devices, they may malfunction.
- The MBS Unit must not transmit without its antenna connected.
- When installing the antenna, follow the guidelines for exposure of the human body to high and low frequency electromagnetic fields. Follow the supplier's / manufacturer's instructions.
- Burns may be suffered if the antenna connector output is touched by bare skin when the MBS Unit is transmitting with the antenna disconnected.
- Take care when handling the MBS Unit. It has edges, which may cut if handled incorrectly.
- Maintenance and repair of these repeaters must be carried out by qualified personnel only.



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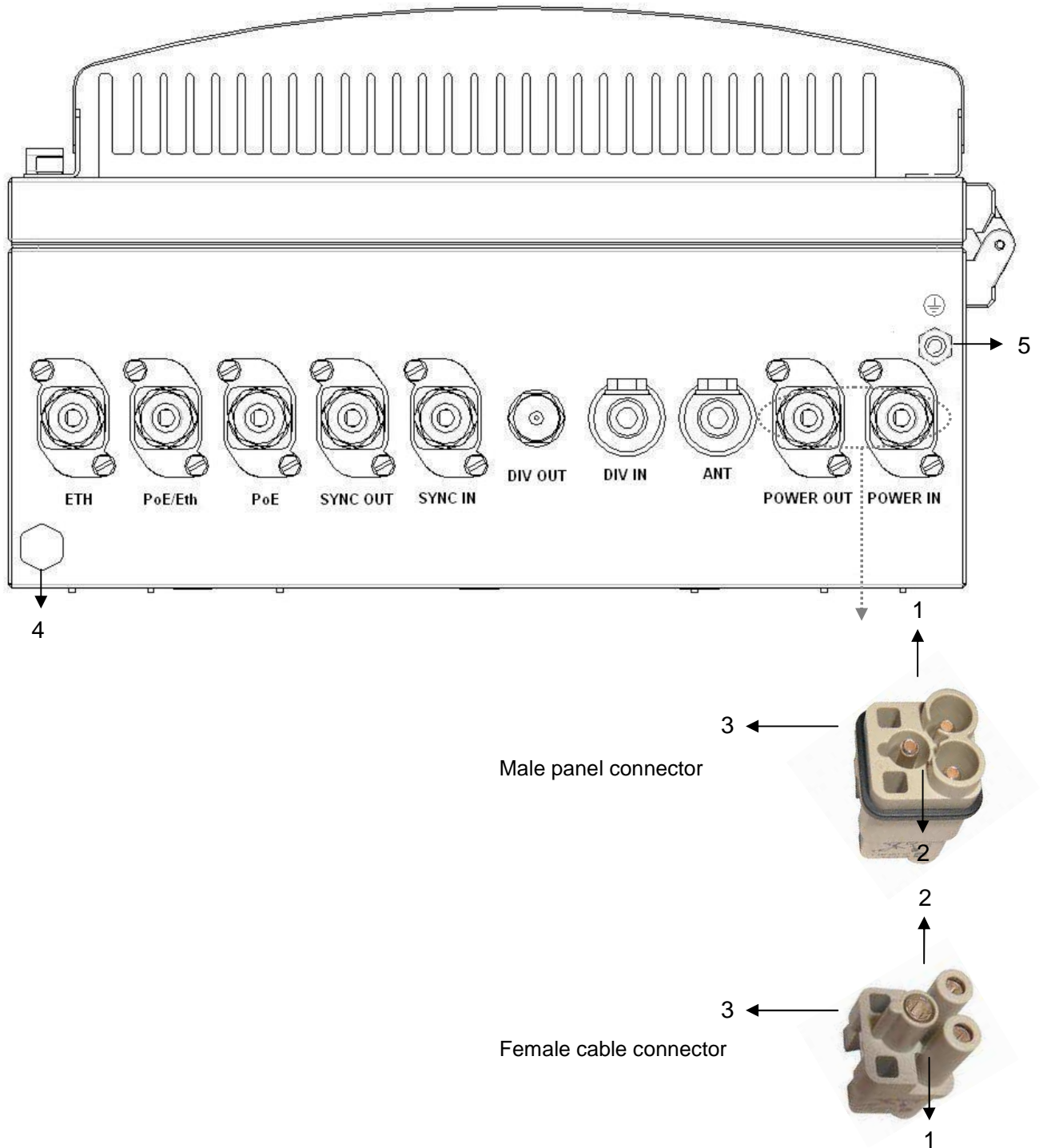
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5. EQUIPMENT DESCRIPTION

5.1. VIEW





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5.2. CONNECTORS

- 1.- Terminal with the following meaning depending on the MBS Unit Power option:
 - AC MBS Units: Neutral contact (N).
 - DC MBS Units: Negative contact (-).
- 2.- Terminal with the following meaning depending on the MBS Unit Power option:
 - AC MBS Units: Line contact (L).
 - DC MBS Units: Positive contact (+).
- 3.- Power supply Earth contact.
- 4.- Pressure equalizer.
- 5.- Chassis Earth contact.
- **ETH:** Connector that allows Ethernet connection between MBS Units. It also can be used as Maintenance Ethernet connector.
- **PoE/ETH:** Power Over Ethernet (IEEE 802.3at) connector. It provides power supply (48 VDC) and Ethernet connection to a PoE radio link. It can be used as Maintenance Ethernet connector if there is not radio link (Poe) connected.
- **PoE:** Power Over Ethernet (IEEE 802.3at) connector. It provides power supply (48 VDC) and Ethernet connection to a PoE radio link.
- **SYNC OUT:** Synchronism output connector. It provides synchronism to a second MBS Unit through its SYNC_IN connector.
- **SYNC IN:** Synchronism input connector.
- **DIV OUT:** Output reception connector. It provides the receiver chain 2 to the next MBS Unit through its DIV IN connector.
- **DIV IN:** Reception antenna connector (receiver chain 2). It is connected to an antenna or to a MBS Unit DIV OUT connector (diversity 2).
- **ANT:** Transmission/reception antenna power connector (receiver chain 1).
- **POWER OUT:** Output power supply connector. It provides power supply to another MBS Unit with the same Power Supply option.
- **POWER IN:** Input power supply connector (VAC or VDC).



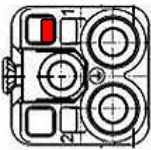
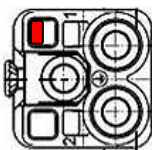
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Note: **POWER_IN** and **POWER_OUT** connectors have a coding key to avoid wrong connections; on the following table is showed the location of this coding key depending on the MBS Unit power supply option.

External view of power supply panel connector	
AC Power Supply	DC Power Supply
	

Note: The amount of power delivered by both PoE and PoE/ETH connectors to the radio links can not exceed 35 W in total.



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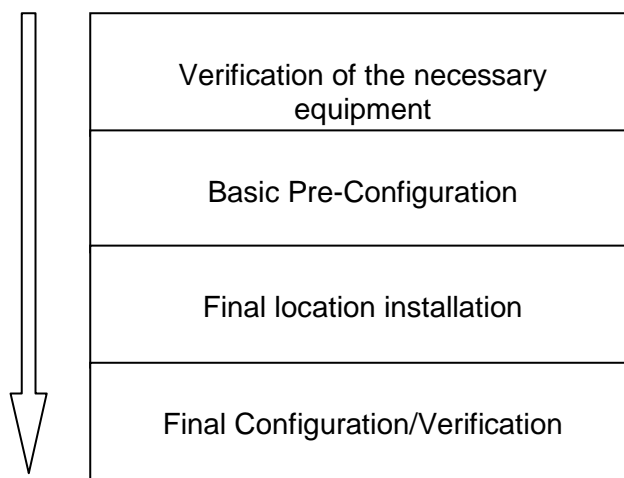
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6. INSTALLATION GUIDE

The following recommendations must be followed before powering on the MBS Unit module.

Next diagram shows the steps to be followed to carry out the installation:





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6.1. NECESSARY EQUIPMENT



Make sure you have the necessary equipment depending on the configuration to install. If any of the elements necessary to carry out the installation process described in this manual, were lost or damaged, contact your supplier and / or installer.

Necessary equipment		
Element	Code	Comments
MBS Unit	D148x01	"x" varies depending on band. Each MBS Unit includes: <ul style="list-style-type: none">- MBS Unit equipment- Power supply cable connector- Ethernet cable connector- RF superflexible wire N-Male ↔ N-Male- Brackets for installation
Anti-vandal kit	D014000	It is only necessary if anti-vandal protection is required
Ethernet cable connector	225120	Every MBS Unit includes one connector of this type; if a MBS Unit must be connected to two radio links, it is necessary to have a second unit.
RF superflexible wire N-Male ↔ N-Male	208931	Each MBS Unit includes one cable of this type; if a MBS Unit requires diversity 2 on reception it is necessary to have a second unit.
Additional carrier interconnection kit	D014001	It is mandatory in case of connecting a second MBS Unit to the first MBS Unit.



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Additional equipment to be considered for installation

Element	Comments
Cable to power the MBS Unit.	See features in external power connection section. One power supply cable connector is supplied with the MBS Unit.
Ethernet cable to connect PoE radio links	See features in Ethernet connection section. One Ethernet cable connector is supplied with the MBS Unit.
Antenna coaxial cable and antenna.	See features in Antenna connection section.

Tools

Element	Comments
Toolbox	In addition to the usual material used for installations (wrenches, screwdrivers ...) it is necessary to use: <ul style="list-style-type: none">- Torque wrench for 17 mm hexagonal nut capable of delivering 15 Nm.- Vulcanizable tape.
Ethernet Cable	Cable to make specific maintenance tasks in the field



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6.2. BASIC PRE-CONFIGURATION

Before connecting the MBS Unit to the infrastructure it should have the IP address correctly configured in order to have remote access once it is connected (to set the IP address, see the configuration chapter (F067220) in technical manual).

Steps:

- Apply power supply to the MBS through its **POWER_IN** connector.
- Wait 3 minutes until the MBS Unit initializes.
- Connect the PC, to set the IP address, to the **ETH** connector.
- Change the IP address according to the network IP addressing.
- Check that IP address was successfully changed through a “ping” from the PC to the new IP address of the MBS Unit.



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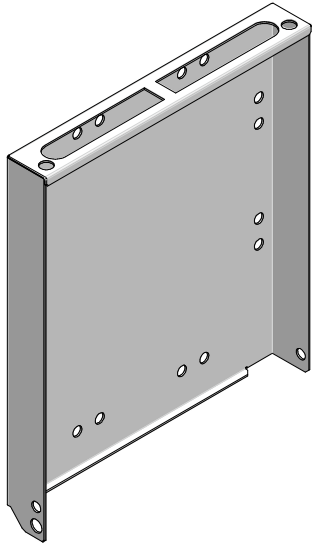
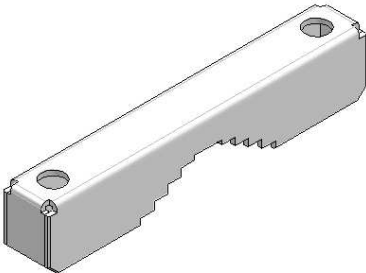
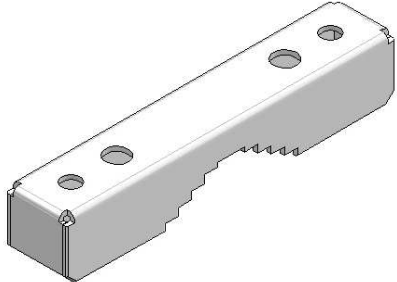
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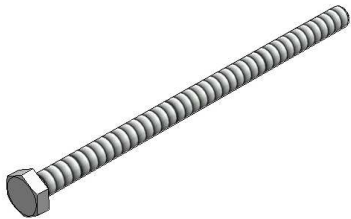
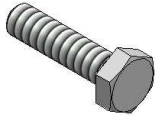
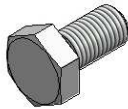
6.3. INSTALLATION

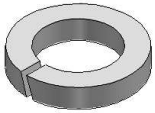
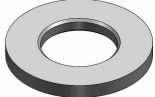
The MBS has been designed to be mounted on both mast/pole and wall. This chapter provides the necessary steps to be followed for a right MBS Unit installation.

At least two people are required to carry out the installation of a MBS Unit on a mast/pole.

Bracket system:

1 x Bracket	2 x clamp (2 holes)	2 x clamp (4 holes)
		

4 x Bolt M10x180 (Clamp attachment)	6 x Bolt M10x40 (lateral attachment MBS- Bracket & Clamp-Bracket)	2 x Bolt M10x20 (Top attachment MBS- Bracket)
		

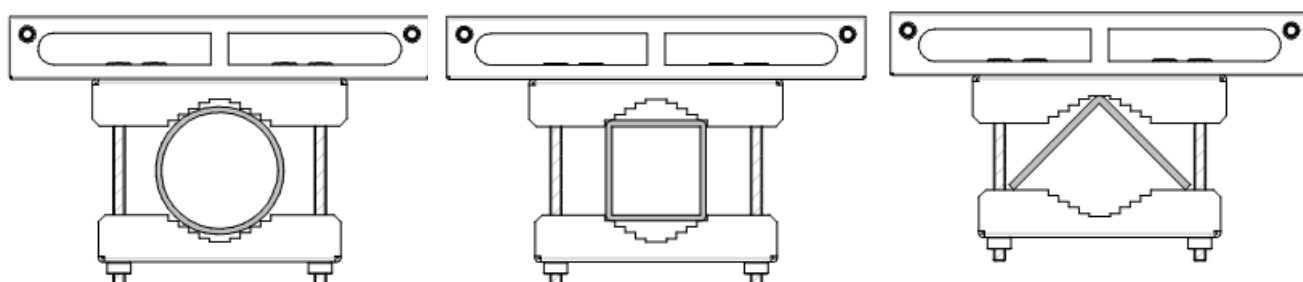
12 x Grower washer DIN 127 Ø10	12 Plain washer DIN125 x Ø10	
		---



6.3.1. MAST/POLE INSTALLATION

The different section types of mast/pole where the MBS Unit can be mounted are the following ones:

- ❑ Circular section: Diameter from 30 mm to 130 mm.
- ❑ Square section: From 30 mm x30 mm to 85 mm x85 mm.
- ❑ L section: From 30 mm x30 mm to 110 mm x110 mm.



In the choice of the mast/pole where the MBS Unit is being installed the following recommendations must be followed:

- ❑ The mast/pole has to support the loads due to the installation of some elements on them.
- ❑ The mast/pole has to support the loads due to the action of the wind, snow as well as its own weight, because these are going to induce its flexion.
- ❑ The mast/pole must have the enough inertia both lateral and frontal in order that the action of different loads does not induce permanent deformations on it.
- ❑ The manufacturer of the mast/pole must evaluate the structural factor of the mast/pole correctly depending on its type.
- ❑ It is necessary to take into account both the height where the MBS Unit is installed and its weight/dimensions (See section "MBS Unit" in chapter (F067326) "SBS Technical Description" in the Technical Manual).



It is recommended to choose a lattice mast/pole in case of this one has a high height and it is going to be submitted to important flexion efforts. In any case, it is responsibility of the manufacturer of the mast/pole to determine if the resistant section of mast/pole is suitable.



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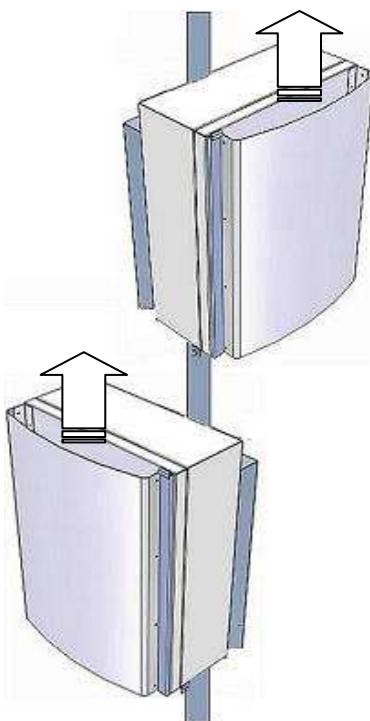
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The brackets should be installed tight enough to support the MBS Unit without causing deformation of the mast/pole or areas of corrosion.

Once mounted in its definitive location, if the vandal resistant kit is available, it will prevent the access / disassembly not authorized.

In case of installing more than one MBS Unit on the same mast/pole, it is recommended not to mount one above the other one to avoid the heat transfer from the MBS Unit low to the MBS Unit high. If the MBS Units have to be installed in the same vertical axis these must be oriented in different directions to increase the separation of them as far as possible, depending on the length of wiring between both equipments (1.5 m approximately).





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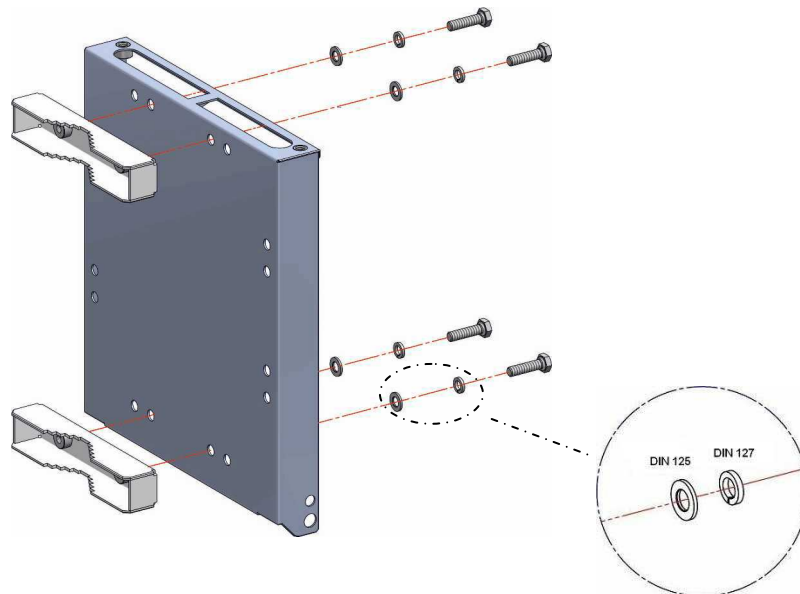
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Steps to install a MBS on a mast/pole:

- 1) Place the MBS Unit bracket on the mast/pole as follows.

Note: Handle the MBS Unit bracket with care if it rests on the floor. Place some protection underneath to prevent scratches on the surface.

- a) Secure 4 holes clamps on the bracket by tightening the bolts with a 15 Nm torque, using a 17 mm torque wrench, do not forget to place the washers



- b) Install the bracket to the desired final location on the mast/pole. Embrace the 2 holes clamps and screw these to the bracket with a 17 mm wrench and 15 Nm torque. Due to the length of the bolts it is advisable to screw them slowly.

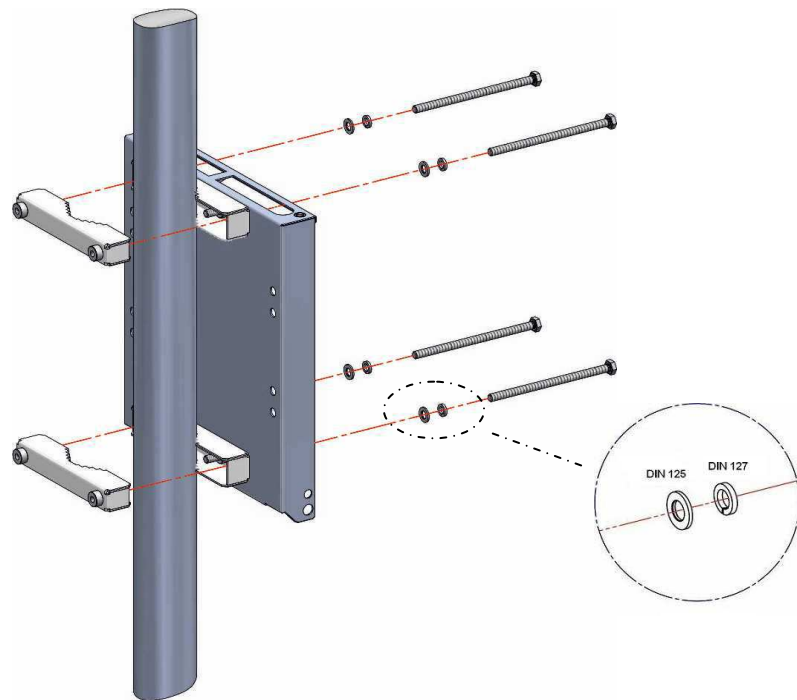


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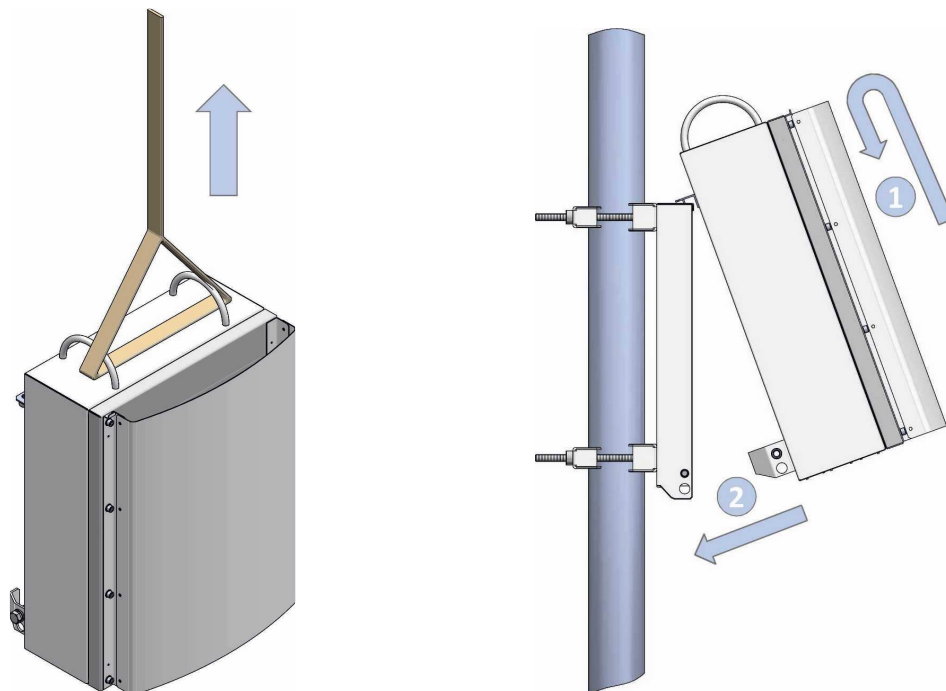
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2) Place MBS Unit on the bracket as follows.

- a) Raise the MBS Unit to the position where the bracket is placed on the mast/pole and hang it on the bracket, tilting slightly to match the bracket guides as indicated in the following figure:





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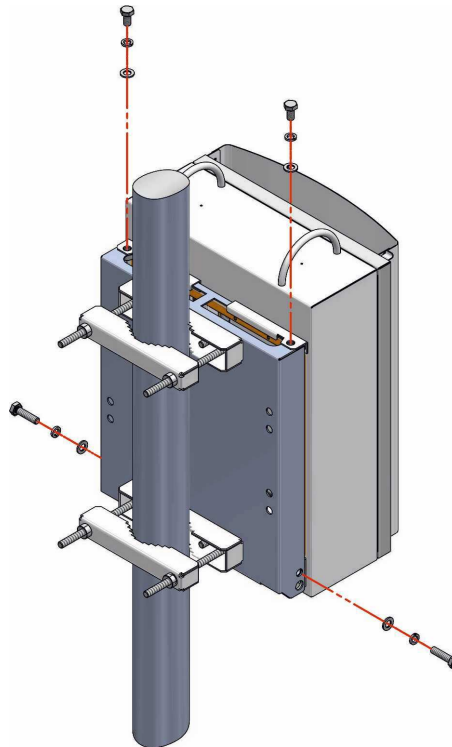
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- b) Put the bolts of the MBS Unit and washers to the bracket with a 17 mm wrench and 15 Nm torque.

Note: If anti-vandal kit is available (D014000), lateral bolts should be placed after mounting the anti-vandal kit.



- 3) Make the necessary cable connections as described in the connections section in this guide.



6.3.2. WALL INSTALLATION

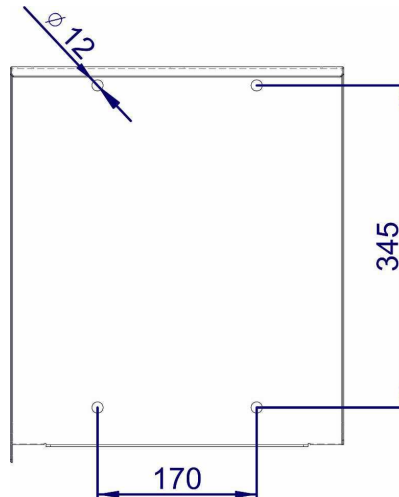
To install the MBS Unit on a wall, make the following steps:

- 1) Mark the position of the holes using the bracket as a template itself with the help of a level.

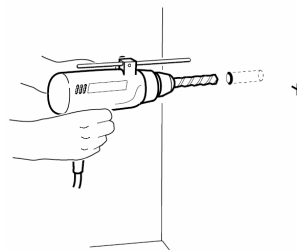
Note: To ensure proper ventilation there must be at least 700 mm clearance above and below each MBS Unit. There must also be a minimum distance of 300 mm free on both sides of the MBS Unit.

Note: The screws, expansion bolts and washers needed to secure the brackets to wall are not supplied with the unit.

The distance between the holes are shown in the following figure.



- 2) Drill holes on the wall and insert a rawlplug in each hole.





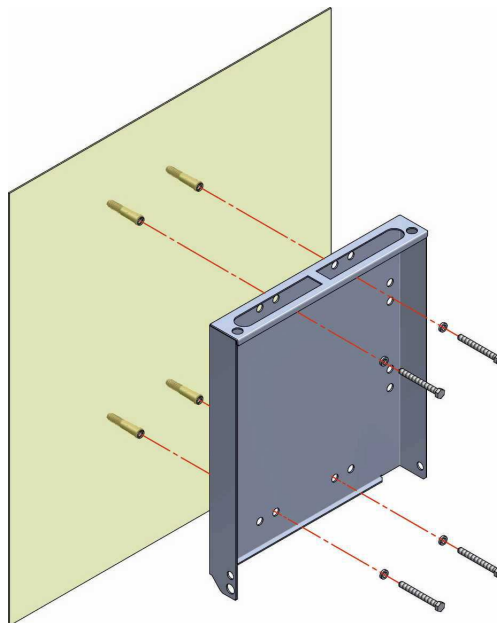
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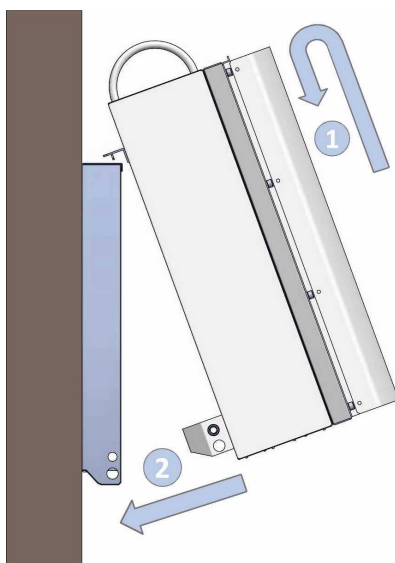
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- 3) Place the bracket over the rawplug and insert the bolts and washers. Finally screw them with a 17 mm wrench and 15 Nm torque.



- 4) Place the MBS Unit on the bracket as follows.
 - a) Raise the MBS Unit to the position where the bracket is placed and hang it on the bracket, tilting slightly to match the anchor guides as indicated in the following figure:





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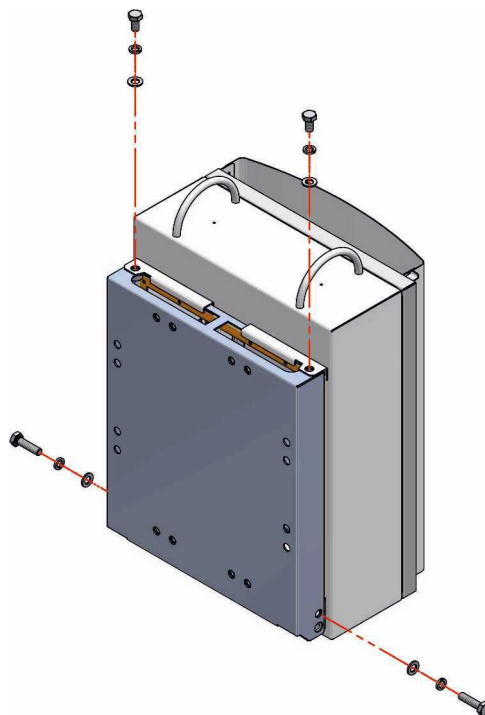
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- b) Put the bolts of the MBS Unit and washers to the bracket with a 17 mm wrench and 15 Nm torque. The order is bolt + grower washer + plain washer.

Note: If anti-vandal kit is available (D014000), lateral bolts should be placed after mounting the anti-vandal kit.



- 5) Make the necessary cable connections as described in the connections section in this guide.



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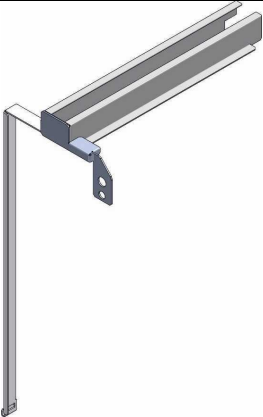



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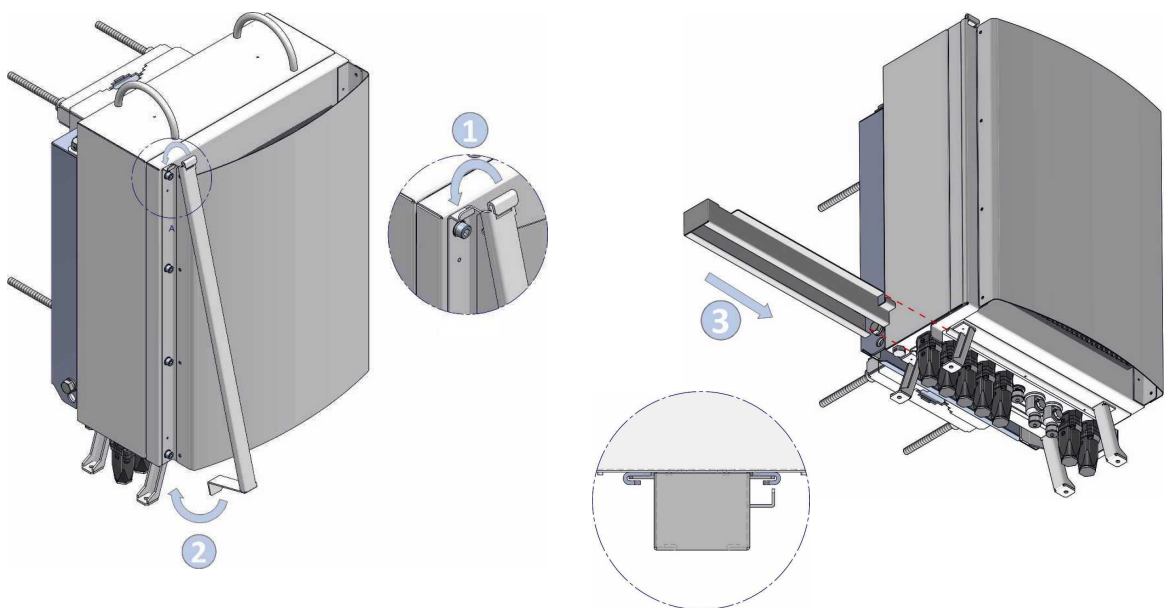
6.3.3. ANTI-VANDAL KIT INSTALLATION

The anti-vandal kit for MBS Unit is an optional accessory (D014000). Either the MBS Unit is mounted on a mast/pole or on a wall, the anti-vandal kit, is performed as follows. Take into account that the installation of the anti-vandal kit should be done once you have completed the wiring connections of the MBS Unit.

Anti-vandal Kit:

Anti-Vandal Kit	6 x Torx screw M3X4	6 x Grower washer	1 x padlock
			

- Place the anti-vandal kit and slide the kit guides as shown on the following figure:





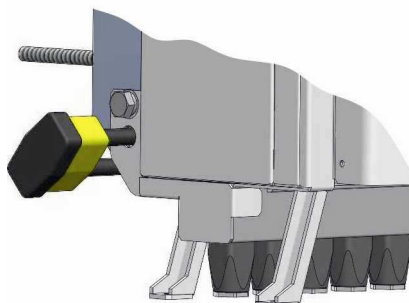
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- Place the padlock and screw the attachment bolt to the bracket with a 17 mm wrench and 15 Nm torque.





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6.3.4. CONNECTIONS

This section shows the connections to be made and the characteristics of the material to be used. The MBS Unit is a weather-protected device once the equipment has been installed in its final location; make sure that there is no MBS Unit connector without plug or cable connected. Besides, the external wiring connections of the MBS Unit must be protected from weather, (vulcanizable tape can be used if it is necessary).



6.3.4.1. SUPPORTED CONFIGURATIONS

a) **ONE MBS UNIT WITHOUT DIVERSITY IN RECEPTION**

The connections are the following ones:

- ❑ Power supply 220/110 VAC or 24 VDC.
- ❑ From ANT connector to the antenna.
- ❑ Connection with radio link through PoE connector.
- ❑ Maintenance through PoE/ETH N or ETH connector.





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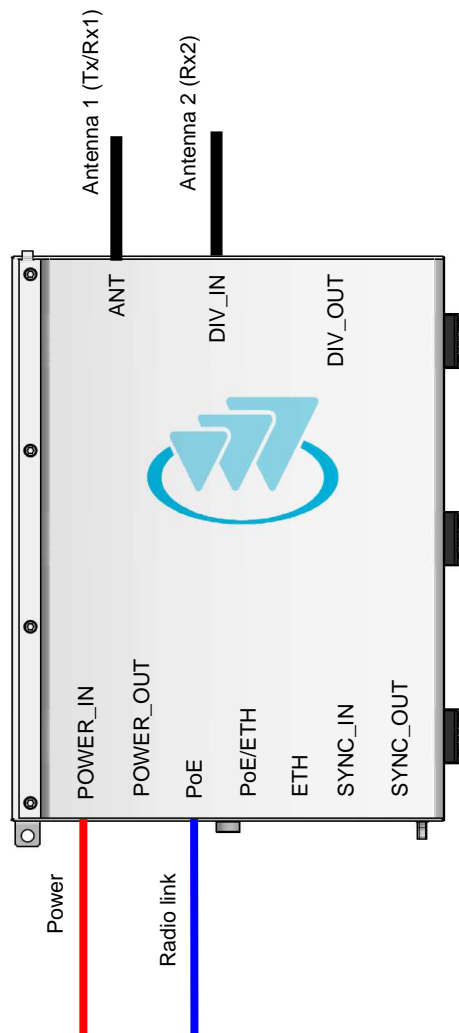
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b) ONE MBS UNIT WITH DIVERSITY 2 IN RECEPTION

The connections are the following ones:

- ❑ Power supply: 220/110 VAC ó 24 VDC.
- ❑ From ANT connector to the first antenna.
- ❑ From DIV IN connector to the second antenna.
- ❑ Connection with the radio link through PoE connector.
- ❑ Maintenance through PoE/ETH or ETH connector.





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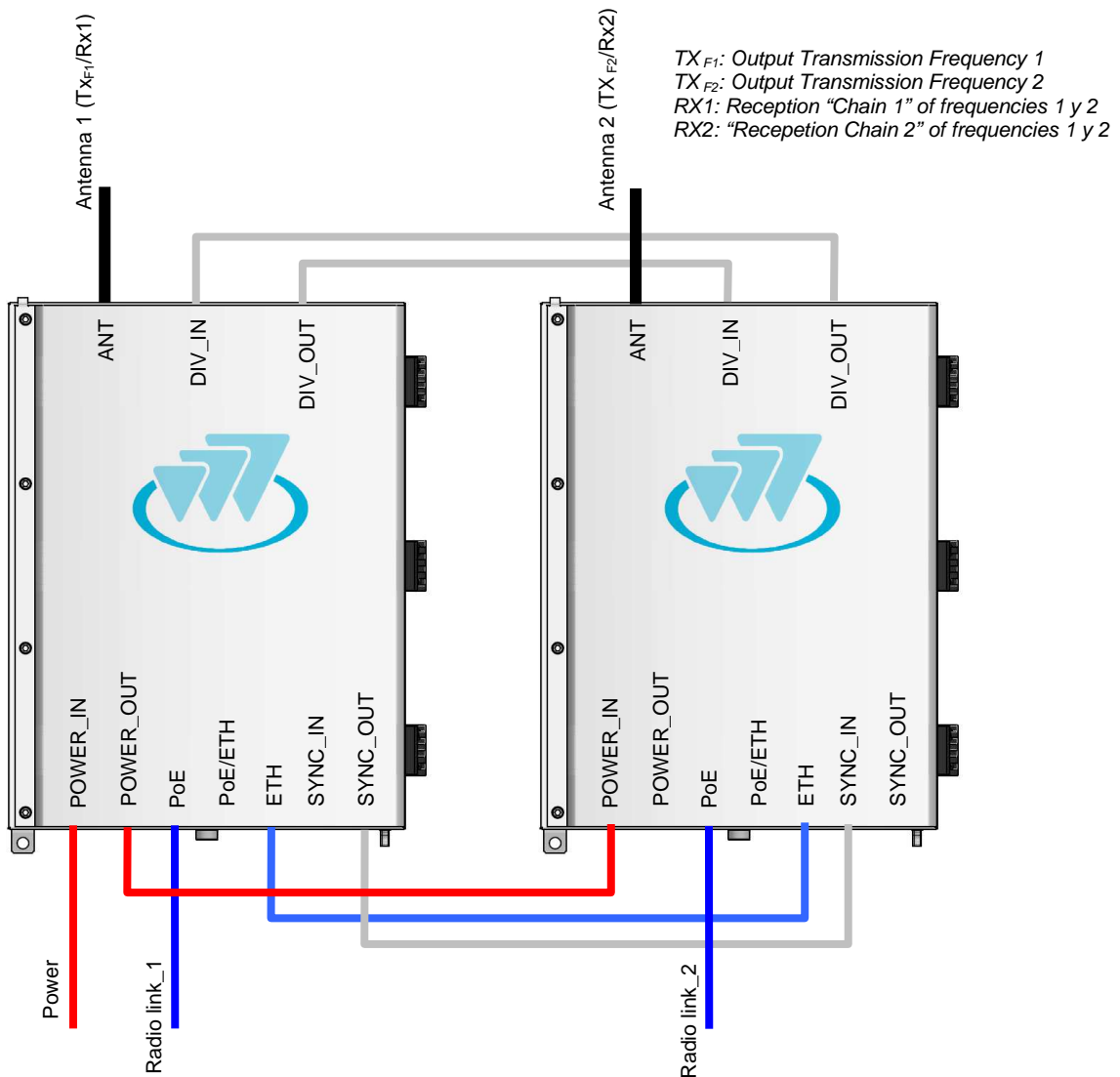
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c) TWO MBS UNIT WITH DIVERSITY 2 IN RECEPTION

The connections are the following ones:

- ❑ Power supply for the MBS Unit 1: 220/110 VAC or 24 VDC.
- ❑ From ANT connector of the MBS Unit 1 to the first antenna.
- ❑ From ANT connector of the MBS Unit 2 to the second antenna.
- ❑ Connection with the radio links through PoE connector of both MBS Units.
- ❑ Maintenance through PoE/ETH connector of both MBS Units





6.3.4.2. CONNECTION OF THE EXTERNAL POWER SUPPLY



Check that the power supply source and/or the battery to be used are adapted to the type of MBS Unit (AC/DC) and meets the voltage and current requirements necessary to supply the equipment.

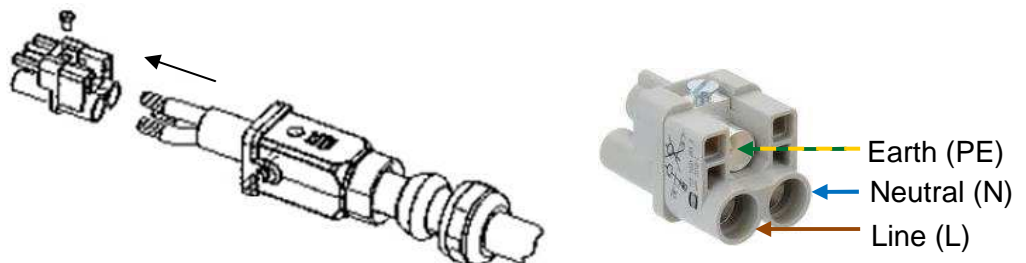
a) MBS Unit with AC power supply source:

- Nominal voltage: 110/220 VAC (Range: from 94 to 264 VAC).
- Use the power cable connector provided with the MBS Unit to connect the MBS Unit to the power supply source. Use a cable of 3 wires; with weather protection; with the following features:
 - Cable diameter: 6 mm - 12 mm.
 - Cable section: 4 mm² (0.6/1KV) or AWG-11.
- Ensure that the connection is made in the correct way (Line, Neutral and Earth) following the next steps:
 - Strip cable and wires (stripping length 8 mm -9 mm).



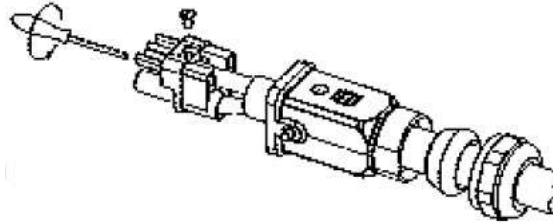
NOTE: The earth cable must be 2 mm longer.

- Push the cable through the cable gland and the hood/housing and insert the wires into the insert respecting the correct polarity.

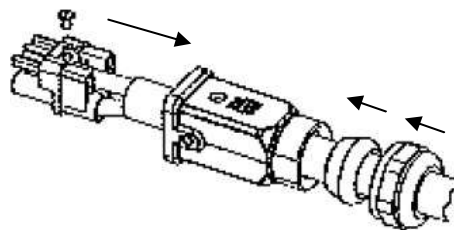




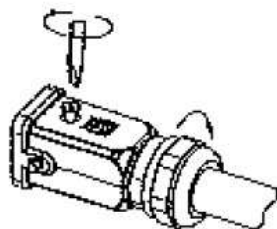
- Fix each wire tightening each pin from the front side with a hexagonal screwdriver (Allen number 2).



- Push the insert back into the hood/housing.



- Fix the assembly tightening the top locking screw and tightening the cable gland nut on the back of the hood/housing.



b) MBS Unit with DC power supply source:

- Nominal voltage: 24 VDC (Range: from 21.6 to 31.2 VDC).
- Use the power cable connector provided with the MBS Unit to connect the MBS Unit to the power supply source. Use a cable of 3 wires with weather protection and the following features:
 - Cable diameter: 10 mm - 14 mm.
 - Cable section: 6 mm² (0.6/1KV) or AWG-10.
 - Maximum cable length¹:
 - One MBS Unit: 85 m.
 - Two MBS Units: 42 m.

¹ The greater the cable length, the greater the voltage drop in it. The specified length has been calculated to ensure minimum operating voltage of the MBS Unit, assuming a minimum voltage of 24V at the output of the power system and a typical resistivity of copper wire $\Omega \leq 0.0172 \text{ mm}^2/\text{m}$.



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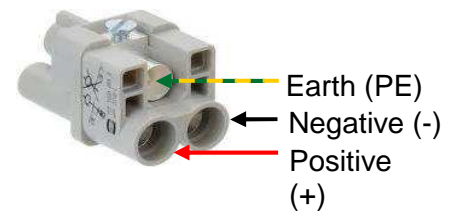
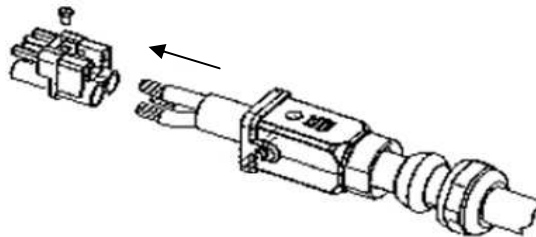
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- Ensure that the connection is made in the correct way (Positive, Negative and Earth) following the next steps:
 - Strip cable and wires (stripping length 8 mm - 9 mm).

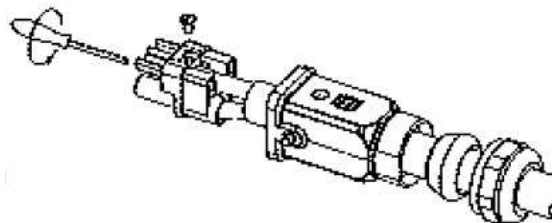


NOTE: The Earth cable must be 2 mm longer.

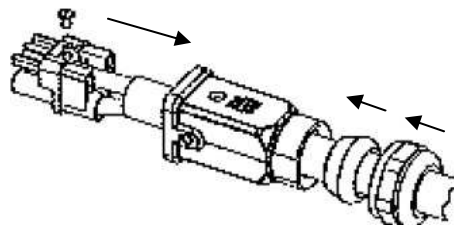
- Push the cable through the cable gland and the hood/housing and insert the wires into the insert respecting the correct polarity.



- Fix each wire tightening each pin from the front side with a hexagonal screwdriver (Allen number 2).



- Push the insert back into the hood/housing.





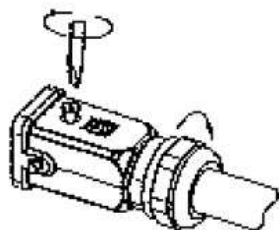
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- Fix the assembly tightening the top locking screw and tightening the cable gland nut on the back of the hood/housing.



c) In both cases:

- ❑ The power supply cable to the MBS Unit must be provided by the installer with the proper power supply connector adapted for the connection to the electrical network or to a 24 VDC source
- ❑ Ensure that the earth connection is made. The MBS Unit has an earth connector; this connector will connect to the earth protection of the installation, which is different to the earth protection of the lightning rod.

Make this connection with a cable of, at least, 25 mm² section (or AWG-3).

NEVER use a gas or electricity conduit as an earth.

6.3.4.3. ANTENNA CONNECTION

- ❑ With every MBS Unit, a RF super-flexible wire, N-Male – N-Male, is supplied to connect the ANT connector of the MBS Unit with the RF wire of the antenna.

Note: In case of installation a MBS Unit with diversity 2, it is recommended to contact your supplier and/or installer who will provide the additional RF super-flexible wire (Cod. 208931).

- ❑ The RF assembly depends on the cable type used in the installation up to the antenna.
- ❑ The RF cable must have a protection against water entry (vulcanizable tape).
- ❑ Choose the most adaptable antenna for the installation. The antenna must have an impedance of 50 ohms to the equipment transmission frequency. Install the antenna in accordance with the manufacturer's instructions.
- ❑ Use a coaxial cable, avoiding as much as possible large cable lengths. Cable impedance is 50 ohms.



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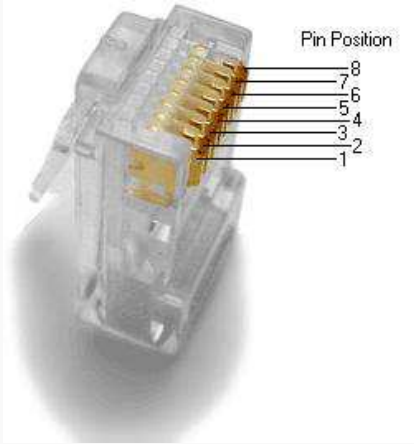




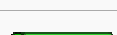
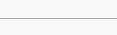
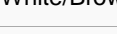
- ❑ In installations with diversity, the greatest gain is achieved by placing the antennas on the same horizontal plane with a minimum distance of 5.5 m between them.
- ❑ Measure the ROE of the installation. Never accept a ROE greater than 2.

6.3.4.4. EXTERNAL ETHERNET CONNECTION

- ❑ The Ethernet cable connector, to connect the MBS Unit with the radio link (PoE), is supplied with every MBS Unit.

Note: In the case of connection to two radio links, it is recommended to contact your supplier and/or installer who will provide the additional Ethernet cable connector.

- ❑ The Ethernet wire for the radio link connections is supplied by the installer, and must have the following characteristics:
 - Cable with 8 wires, FTP cat5E with outdoor protection.
 - Diameter: 6.5 mm to 9.5 mm.
 - Maximum length: 100 m
 - Mount the wire on the connector according to the TIA / EIA 568B standard (The assembly requires no tools, is done manually).

Pin	Color T568B	Pins on plug face (socket is reversed)
1	 White/Orange	
2	 Orange	
3	 White/Green	
4	 Blue	
5	 White/Blue	
6	 Green	
7	 White/Brown)	
8	 Brown	



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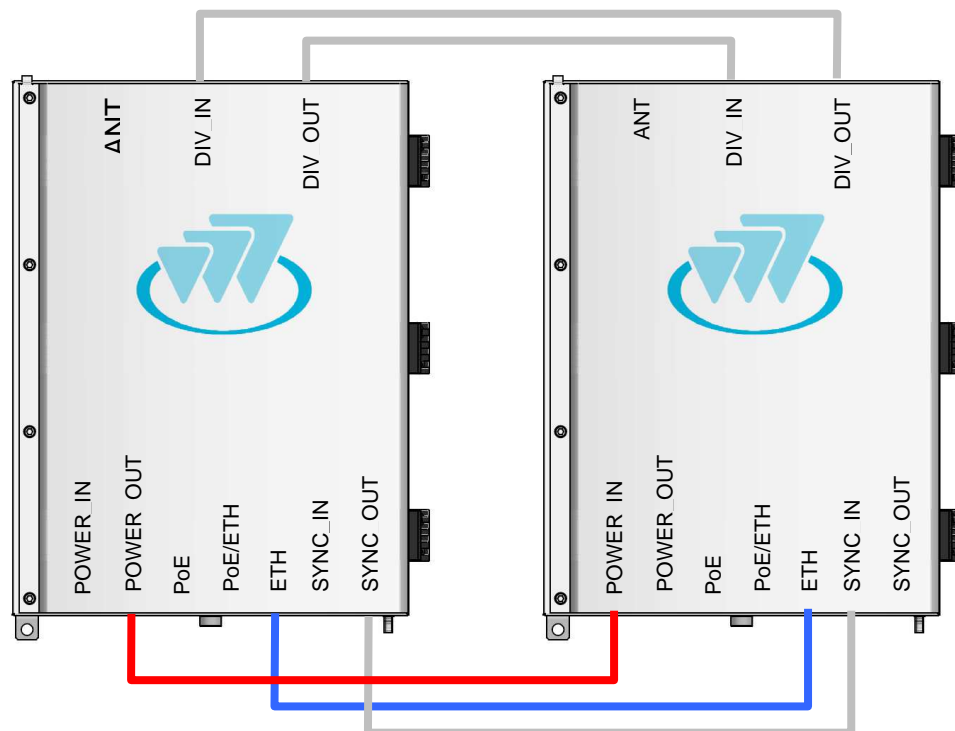
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6.3.4.5. CONNECTION BETWEEN TWO MBS UNITS

To connect two MBS Units you must have the interconnection kit for additional carrier (Cod. D014001). This is obtained as an independent accessory.

Apart from the power wiring, antennas and radio links to connect as indicated in the section of supported configurations, it should be considered the use of interconnection kit between the two Units MBS, as indicated bellow.

Connections	MBS_1 connector	MBS_2 connector
Power Supply	Power_OUT	Power_IN
Ethernet	ETH	ETH
Synchronism	SYNC_OUT	SYNC_IN
Diversity in reception	DIV_OUT	DIV_IN
	DIV_IN	DIV_OUT





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7. START UP/CONFIGURATION/VERIFICATION



IMPORTANT: Ensure that the power supply of the MBS Unit is the proper one before switch it on; an erroneous power supply can cause damages in the equipment.

Every MBS Unit has in its labelling the diverse options that it offers. If the MBS Unit includes the option **O148017**, this it will have to be powered with AC (220/110 VAC), however, if the MBS Unit includes the option **O148018** it will have to be powered with +24 VDC nominal voltage.

Preliminary considerations for carrying out the MBS Unit start up:

- To start up the equipment, this must have the final IP correctly configured (see chapter of infrastructure configuration (F067220) in the Technical Manual).
- Refer to the radio link used to configure this device. Make sure this element is properly connected to ground.

The steps to perform the final settings are:

1.	Before connecting power supply to the MBS Unit, make sure the right voltage level reaches the power supply cable connector.
2.	Provide power to the MBS Units through the POWER_IN connector.
3.	Wait for the MBS Unit initialization (about 3 minutes).
4.	Verify that you have access to the MBS (by performing a "ping"). Make partial checks in case of no response from the MBS, perform pings to intermediate elements: SNI → Node radio link → remote site radio link → MBS.
5.	From NMS, register the MBS Unit(s), completing the necessary settings (see chapter of infrastructure configuration, F067220, and the client's user manual NMS, F067201).
6.	Verify the absence of alarms in monitoring module and check with a radio terminal that it is registered and you can make and receive calls. In case of interference or coverage fault alarms see chapter of the infrastructure adjustment (F067218).



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8. INCIDENTS



The MBS Unit must be repaired by authorized technical personnel only. There will not be performed any repair of the MBS Unit and it will have to be sent to factory except for the change of the pressure equalizer or the overvoltage protections.

8.1. INTERFERENCE AT MBS UNIT

This alarm is monitored in the NEBULA (NMS) management and configuration module. See the infrastructure event list (F067516) in NEBULA Technical Manual.

Any interference in the MBS Unit is activated when there are a large number of consecutive invalid events in the MBS Unit. A reception fault is considered when a level higher than the threshold for reception of the carrier, but is not recognized as a valid signal. Depending on the signal level, interference is considered low or high. So, if the level of signal is above the threshold for reception and below the threshold set to high interference and is not recognized as a valid sign, it will be a low interference alarm. If the signal level is above the threshold set to high interference and is not recognized as a valid signal, the low level alarm would disappear (if it happened) and high interference would produce.

These alarms are turned off with any valid signal reception for low interference case, and with more than one consecutive right reception for high-level interference.

8.2. OVER VOLTAGE PROTECTION

The MBS Unit has several protections against lightning and surges, in any case the action of these protections generate an alarm in the NMS client which disappear when the protective element is replaced by authorized technical staff.

a) **Protection against lightning and power surges**

This protection is located within the MBS Unit. It should be changed every time it breaks even if the MBS Unit continues functioning properly. An alarm in the NMS Client is reported showing that the replacement of this type of protection is needed.

b) **Protection against lightning and surges in the RF connections**

This protection is located inside the connectors themselves (ANT and DIV_IN). These connectors have a gas discharger that when it is broken, it ceases to receive/transmit signal through the connector. The NMS Client provides a reflected alarm when the ANT discharger fails and diversity alarm when the DIV_IN discharger fails.