



PTP-SYNC

Installation Guide



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About this guide

This guide describes the installation of the Motorola PTP-SYNC for PTP 500 and PTP 600.

The minimum System Releases for compatibility with PTP-SYNC are 600-08-04 (PTP 600) and 500-04-00 (PTP 500). TDD synchronization (and thus PTP-SYNC) is not supported with PTP 300.

CAUTION

Do not install the PTP-SYNC unit in a domestic (home) environment as it is a Class 'A' product. In a domestic (home) environment, it may cause radio frequency (RF) interference in other appliances.

Related documents

PTP 300 and PTP 500 Series User Guide or *PTP 600 Series User Guide* – download from <http://www.motorola.com/ptp/support>.

PTP 300 and PTP 500 Series Installation Guide or *PTP 600 Series Installation Guide* – in box with the ODU and PIDU.

Version information

The following shows the issue status of this document.

Document issue	Date of issue	Remarks
007v000	Jan 2011	Sixth revision
008v000	Jun 2011	Seventh revision

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Important safety information

WARNING

To prevent loss of life or physical injury, observe the safety guidelines in this section.

Power lines

Exercise extreme care when installing antennas near power lines.

Working at heights

Exercise extreme care when working at heights.

Grounding PTP-SYNC

In order to meet the safety requirements for deployment in Australia and New Zealand (AS/NZS 60950-1), the PTP-SYNC unit, if deployed, must be grounded to a Protective Ground in accordance with Local Electrical Regulations.

Powering down before servicing

Always power down and unplug the equipment before servicing.

Primary disconnect device

The main power supply is the primary disconnect device.

External cables

Safety may be compromised if outdoor rated cables are not used for connections that will be exposed to the weather.

1. Inventory

PTP-SYNC components

PTP-SYNC installations require the following components:

PTP-SYNC

Motorola part number WB3665.



The kit contains: 1 x PTP-SYNC unit; 1 x M4 pan screw; 2 x M4 washers; 2 x M3 (6mm) torx drive screws; 1 x lug for unit ground (cable not supplied); 1 x Cat5e cable (length 1 meter).

PTP800 CMU/PTP-SYNC 19inch Rack Mount Installation Kit

Motorola part number WB3486.

This is only required when the PTP-SYNC unit is mounted in a rack.



The kit contains: 1 x rack bracket; 8 x M3 washers; 8 x M3 screws; 1 x blank plate; 8 x M5 nuts; 8 x M5 washers; 2 x rack handles.

Cat5e cable

This is only required if the 1 meter Cat5e cable supplied with the PTP-SYNC kit is not long enough. It may be up to 2 meters long.

GPS components

PTP-SYNC installations with GPS require the following additional components:

Item	Motorola description	Motorola part number
GPS receiver	Trimble Acutime™ Gold GPS receiver	WB3903
GPS adapter cable kit (optional)	PTP-SYNC <-> Trimble Adapter Cable	WB3961
Outdoor drop cable	1000 ft Reel Outdoor Cooper Clad CAT5E	WB3175
	328 ft (100 m) Reel Outdoor Cooper Clad CAT5E	WB3176
RJ45 connectors	Tyco/AMP, Mod Plug RJ45 Unscreened, 25 pk	WB3177
RJ45 crimp tool	Tyco/AMP Crimp Tool	WB3211
RJ45 crimp tool dies	Tyco/AMP Die Set (available from Tyco, part number 1-853400-0)	n/a
Cable grounding kit	Cable Grounding Kits For 1/4" And 3/8" Cable	01010419001
Lightning Protection Unit (LPU) kit	LPU End Kit PTP 250/300/500	WB2978D

CAUTION

Always use Cat5e cable that is gel-filled and shielded with copper-plated steel. Alternative types of drop cable are not supported by Motorola. Superior Essex BBDGe can be bought from Motorola with part numbers listed above.

NOTE

The connector, crimp tool and die set listed above are specific to Superior Essex BBDGe cable. They may not work with other types of cable.

Direct GPS connection

As an alternative to the GPS adapter cable, the drop cable can be connected directly to the GPS unit via a 12 way circular connector, using the components and tools listed in the following table:

Item	Manufacturer	Part number
12 way circular connector	Deutsch	IMC26-2212X
Size 22 crimp socket	Deutsch	6862-201-22278
Crimp tool	Daniels Manufacturing Corp	MH860
Positioner	Daniels Manufacturing Corp	86-5
Insertion / extraction tool	Deutsch	6757-201-2201
Adaptor	Deutsch	IMC2AD
Self amalgamating tape		

2. PTP-SYNC interface description

Model number

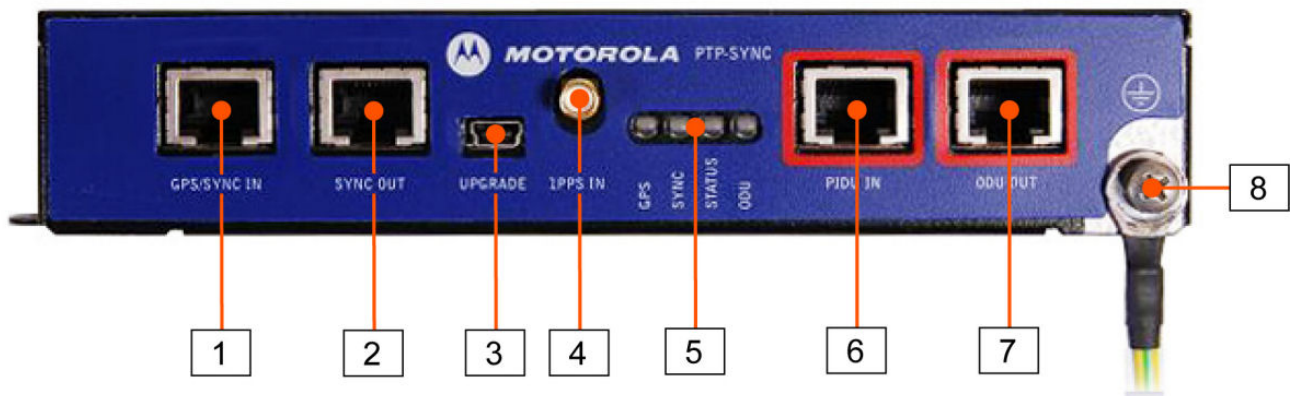
The PTP-SYNC model number (for example WB3665BB or WB3665AA) is located underneath the unit, on the bar code label.

NOTE

Legacy installations may incorporate PTP-SYNC model number WB3665AA. This model does not provide all of the LED states that are available in later models (see [LEDs](#) on page 9). Installations with this model are subject to shorter maximum cable lengths (see [Maximum cable lengths](#) on page 16).

Front panel

The PTP-SYNC front panel has the following interfaces:



Number	Description	Function
1	GPS/SYNC IN	Input from GPS receiver or from the daisy-chained SYNC OUT signal of another PTP-SYNC.
2	SYNC OUT	Output to daisy-chained PTP-SYNC units.
3	USB	Input for software upgrades. Contact Motorola for instructions.
4	1PPS IN	Coaxial alternative to GPS/SYNC IN. Peak input voltage must not exceed 5V.
5	LED bank	Indicator LEDs to show signal and power status.
6	PIDU IN	Input from PIDU.
7	ODU OUT	Output to ODU.
8	Ground stud	For connecting to a ground point.

LEDs

The PTP-SYNC indicator LEDs have the following functions:

Indicator	State	Description
GPS	Off	No GPS satellite data being received at the GPS/SYNC IN port.
	On steady or blink	GPS satellite data being received.
SYNC	Off	No data being received at the SYNC OUT port.
	On steady or blink	Data being received at the SYNC OUT port. The SYNC LED does not normally illuminate, even in cluster configurations.
STATUS	Off	No power.
	On steady	Power but no satellite lock.
	Blink	Power and satellite lock at either the GPS/SYNC IN or 1PPS IN port.
	Double blink (*)	Possible fault in GPS/SYNC IN or 1PPS IN cables.
ODU	Off	No signal being received from the ODU.
	On steady green	Communication with the ODU is established.
	Blink red (*)	Error in communication with ODU. Possible causes are: fault in the ODU or PIDU cable, or maximum recommended cable lengths exceeded.

(*) These states are not available in PTP-SYNC model number WB3665AA. The model number is located underneath the unit, on the bar code label.

Pinouts

The pinouts of the GPS/SYNC IN port of the PTP-SYNC unit are as follows:

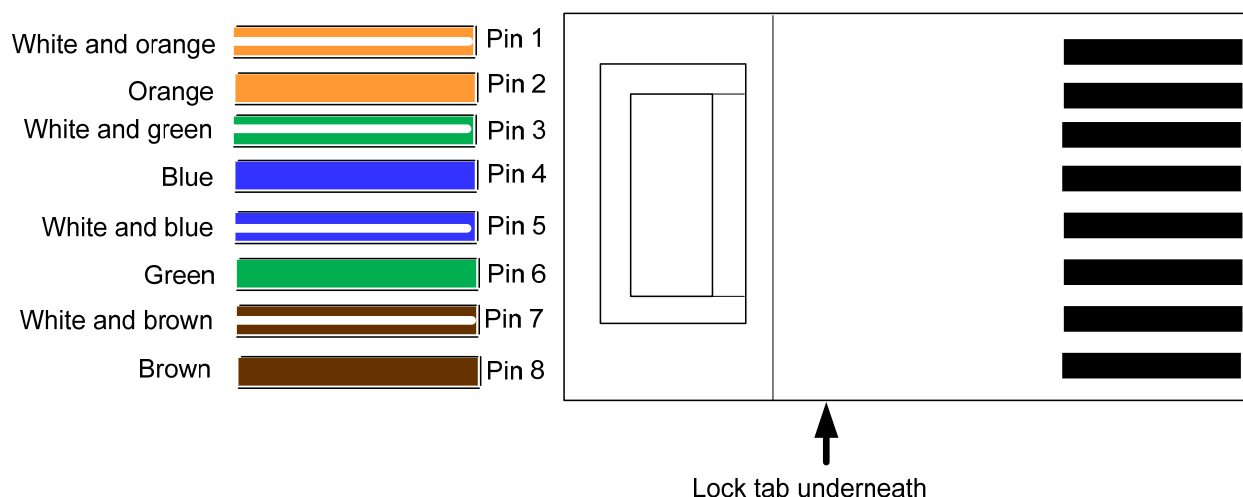
Pin no.	Signal name	Signal description
Pin 1	12VGPS	12 V output to GPS receiver module, 250 mA max
Pin 2	GND	Ground
Pin 3	GPS_1PPSA	1 Hz pulse input
Pin 4	GPS_RXDA	GPS receive data
Pin 5	GPS_RXDB	GPS receive data
Pin 6	GPS_1PPSB	1 Hz pulse input
Pin 7	GPS_TXDA	GPS transmit data
Pin 8	GPS_TXDB	GPS transmit data

NOTE

The GPS_1PPS, GPS_RXD and GPS_TXD signals conform to International Telecommunication Union (ITU) recommendation V.11 (RS422).

RJ45 connector

This diagram shows how the pin numbers of the GPS/SYNC IN port correspond to the RJ45 connector color codes (with T568B color coding):



3. Grounding and lightning protection

If a GPS receiver is the selected timing reference source, then the installation must be protected as described in this section.

WARNING

Electro-magnetic discharge (lightning) damage is not covered under warranty. The recommendations in this document, when followed correctly, give the user the best protection from the harmful effects of EMD. However 100% protection is neither implied nor possible.

Lightning protection zones

The 'rolling sphere method' is used to determine where it is safe to mount equipment. An imaginary sphere, typically 50 meters in radius, is rolled over the structure. Where the sphere rests against the ground and a strike termination device (such as a finial or ground bar), all the space under the sphere is considered to be in the zone of protection (Zone B). Similarly, where the sphere rests on two finials, the space under the sphere is considered to be in the zone of protection.

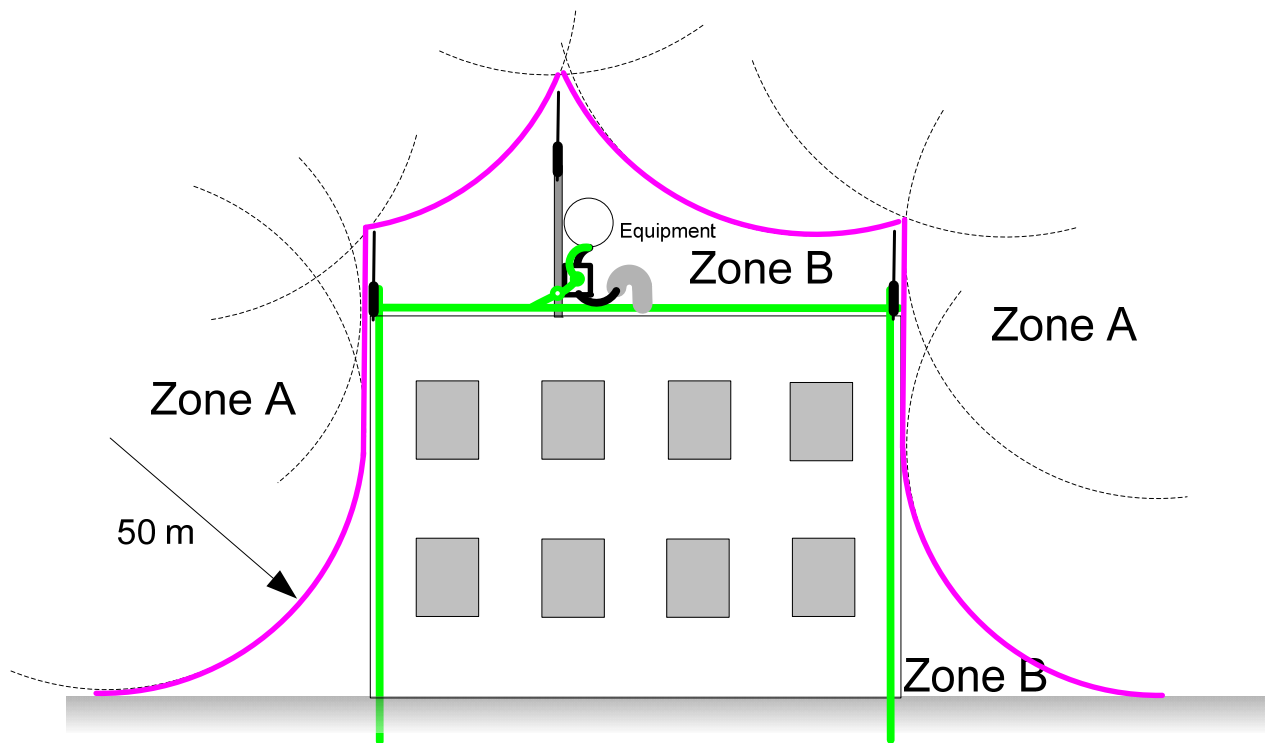
Assess locations on masts, towers and buildings to determine if the location is in Zone A or Zone B:

- Zone A: In this zone a direct lightning strike is possible. Do not mount equipment in this zone.
- Zone B: In this zone, direct EMD (lightning) effects are still possible, but mounting in this zone significantly reduces the possibility of a direct strike. Mount equipment in this zone.

WARNING

Never mount equipment in Zone A. Mounting in Zone A may put equipment, structures and life at risk.

Rolling sphere method to determine the lightning protection zones:



General protection requirements

Apply the practices and procedures detailed in manual *R56: Standards And Guidelines For Communication Sites (68P81089E50)* to all new site build activities.

The following requirements are described in greater detail in the *User Guide* (PTP 500 or PTP 600, as appropriate):

Basic requirements

The following basic protection requirements must be implemented:

- The equipment (GPS receiver for PTP-SYNC) must be in 'Zone B'.
- A lightning protection unit (LPU) must be installed within 600 mm (24 in) of the point at which the drop cable enters the building or equipment room.
- The drop cable must be bonded to the supporting structure in order to prevent lightning creating a potential between the structure and cable, which could cause arcing, resulting in fire risk and damage to equipment.
- The drop cable must be grounded at the building entry point.
- The drop cable must not be laid alongside a lightning air terminal.
- All grounding cables must be minimum size of 10 mm² csa (8AWG), preferably 16 mm² csa (6AWG) or 25 mm² csa (4AWG).

Grounding cable requirements

When routing, fastening and connecting grounding cables, the following requirements must be implemented:

- Grounding conductors must be run as short, straight, and smoothly as possible, with the fewest possible number of bends and curves.
- Grounding cables must not be installed with drip loops.
- All bends must have a minimum radius of 203 mm (8 in) and a minimum angle of 90°. A diagonal run is preferable to a bend, even though it does not follow the contour or run parallel to the supporting structure.
- All bends, curves and connections must be routed towards the grounding electrode system, ground rod, or ground bar.
- Grounding conductors must be securely fastened.
- Braided grounding conductors must not be used.
- Approved bonding techniques must be used for the connection of dissimilar metals.

GPS receiver location requirements

The GPS receiver for PTP-SYNC must be mounted at a location that meets both the general protection requirements and the following requirements:

- It must be possible to protect the installation as described in [General protection requirements](#) on page 12.
- It must have an un-interrupted view of the sky.
- It must receive an adequate signal from at least four GPS satellites.
- It must be mounted at least 1 m (3 ft), preferably 2 m (6 ft), away from other GPS receiving equipment.
- It must not be sited in the field of radiation of co-located radio communications equipment and should be positioned at a distance of at least 3 m (10 ft) away.

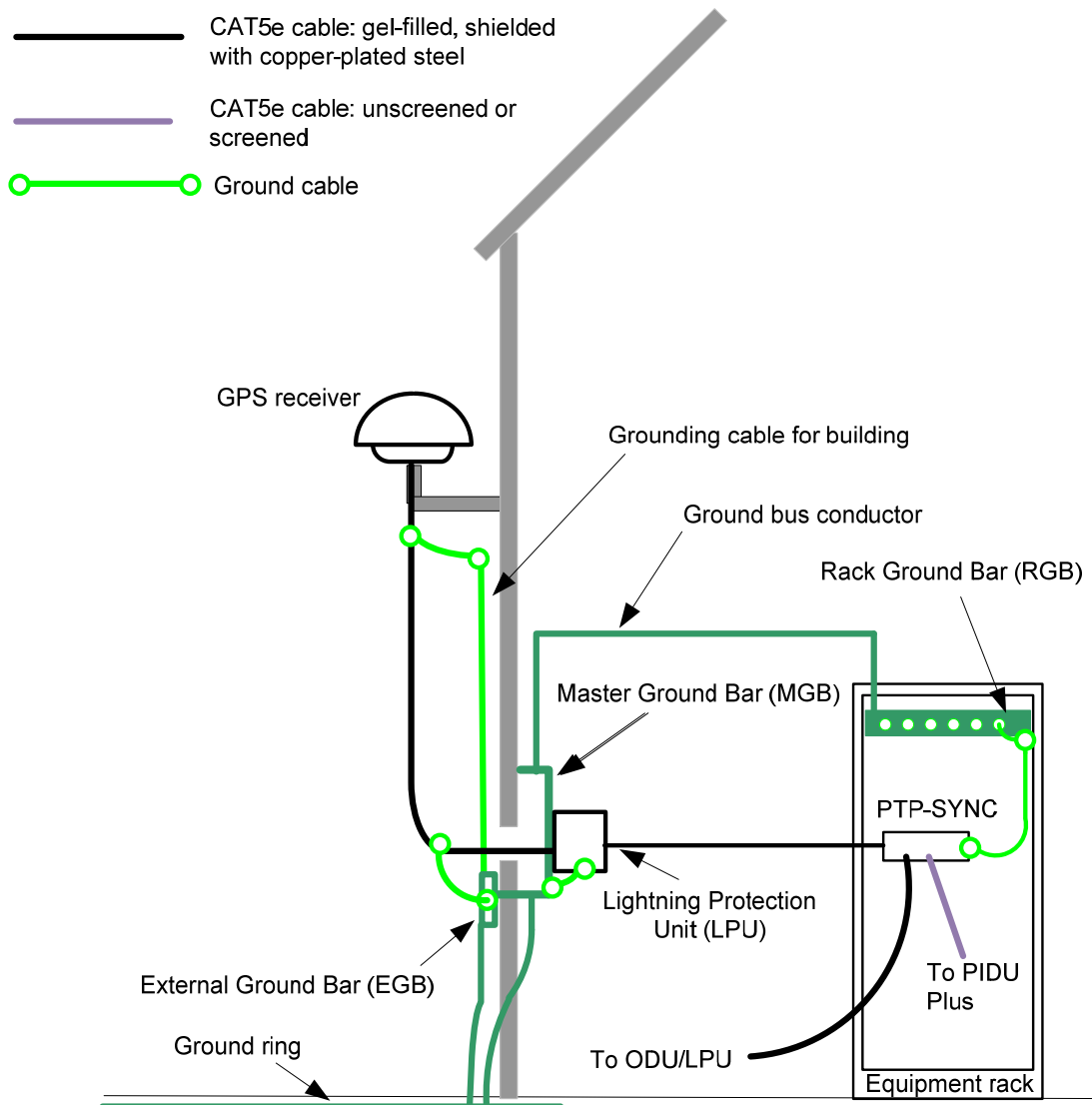
Mount the GPS receiver on the wall of the equipment building, if there is a suitable location on the wall that can meet these requirements. Failing that, mount it on a metal tower or mast.

Mounting the GPS receiver on the equipment building

If mounting the GPS receiver for PTP-SYNC on the equipment building, select a position on the wall that meets the following requirements:

- It must be below the roof height of the equipment building or below the height of any roof-mounted equipment (such as air conditioning plant).
- It must be below the lightning air terminals.
- It must not project more than 600mm (24 inches) from the wall of the building.

A schematic example of a building installation is as follows:

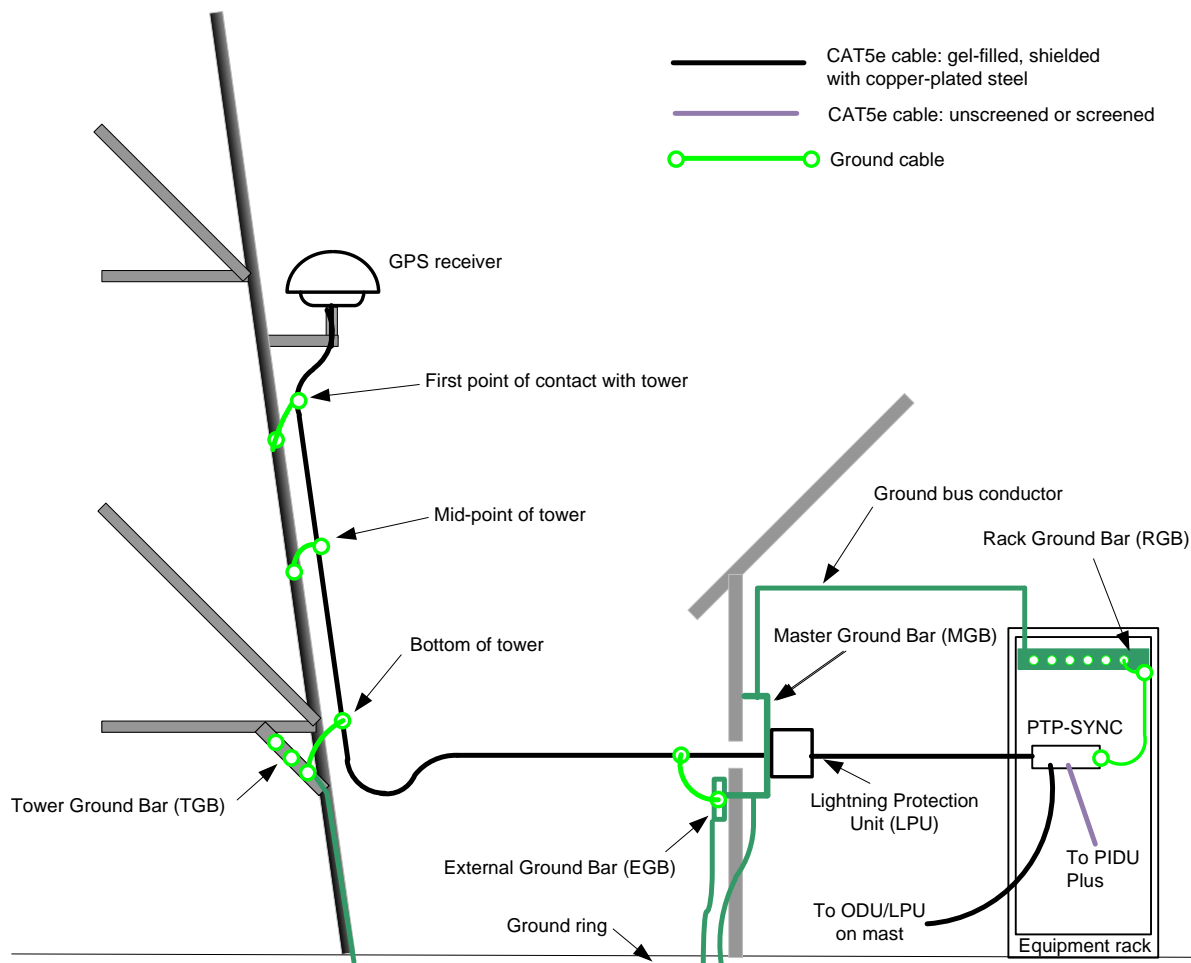


Mounting the GPS receiver on a metal tower or mast

For mast or tower installations, the following additional requirements must be met:

- The equipment must not be mounted any higher than is necessary to receive an adequate signal from four GPS satellites.
- The equipment must be protected by a nearby lightning air terminal that projects further out from the tower than the GPS receiver module.
- The equipment must be lower than the top of the tower or its lightning air terminal.
- The metal tower or mast must be correctly grounded.
- A grounding kit must be installed at the first point of contact between the drop cable and the tower, near the top.
- A grounding kit must be installed at the bottom of the tower, near the vertical to horizontal transition point, bonded to the tower or its ground bar (TGB).
- If the tower is greater than 61 m (200 ft) in height, an additional grounding kit must be installed at the tower midpoint, with additional kits as necessary to reduce the distance between ground kits to 61 m (200 ft) or less.
- In high lightning prone geographical areas, additional ground kits should be installed at spacing between 15 to 22 m (50 to 75 ft). This is especially important on towers taller than 45 m (150 ft.).

A schematic example of a mast or tower installation is as follows:



Maximum cable lengths

The maximum permitted length of the GPS drop cable (GPS receiver to PTP-SYNC) is 100 m (330 ft).

The maximum permitted lengths of the main ODU to network drop cable are:

Standard cable length restrictions

The following cable length restrictions apply to all PTP 500 installations, and to all PTP 600 installations that are not covered by [PTP 600 special cable length restrictions](#).

Interface type	Interface	Max length
Ethernet power and data	ODU to network terminating equipment	100 m (330 ft)
Ethernet power and data	PTP-SYNC to PIDU	2 m (6.6 ft)
Ethernet power only	ODU to PIDU 'power only' CAT5e cable when fiber Ethernet is installed	100 m (330 ft)
Ethernet power only	PTP-SYNC to PIDU CAT5e cable when fiber Ethernet is installed	2 m (6.6 ft)

PTP 600 special cable length restrictions

The following cable length restrictions apply to all PTP 600 installations where:

- Either, the PTP-SYNC model number is WB3665AA (the model number is located underneath the unit, on the bar code label);
- Or, the LPU model number is one of: WB2900A, WB2900B or WB2900C.

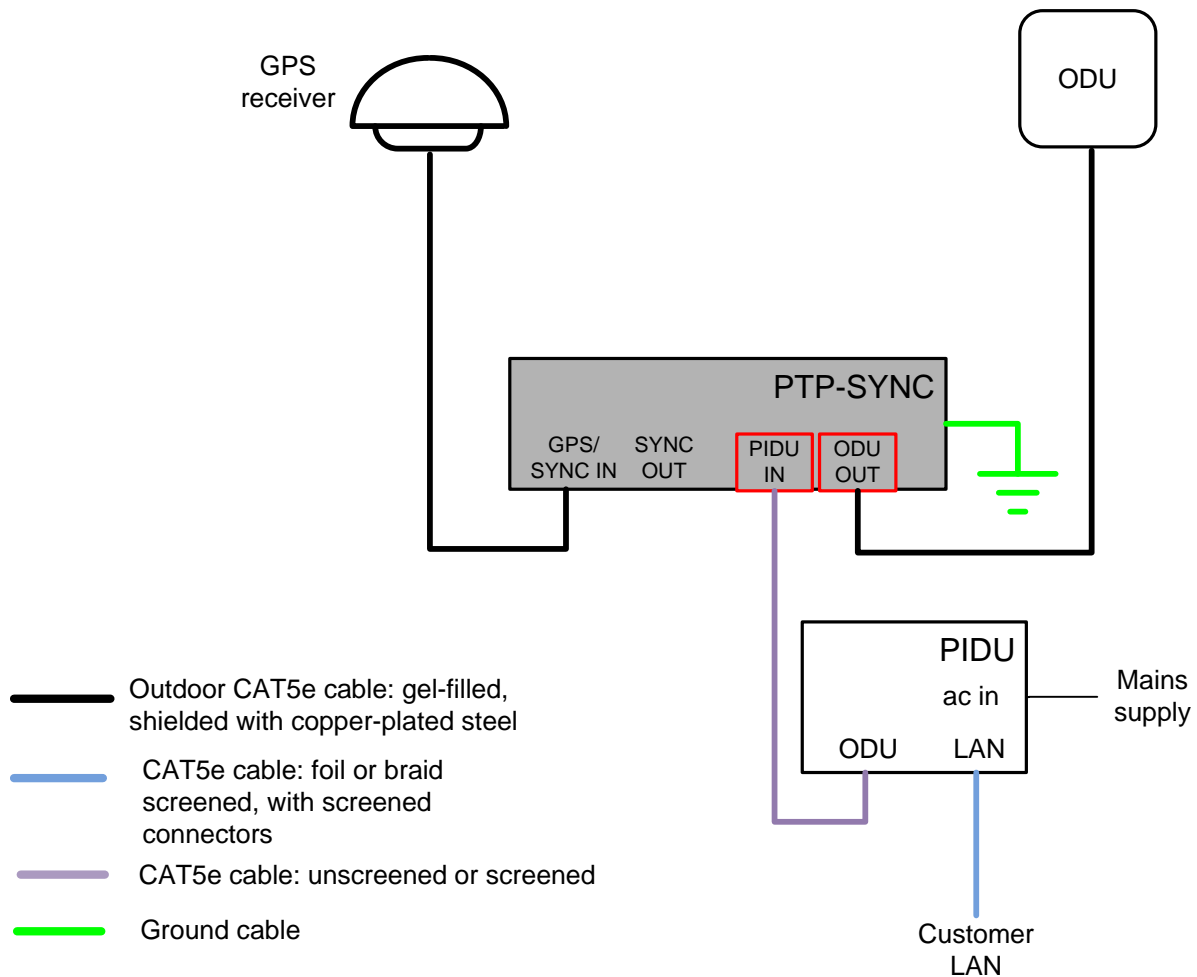
Interface type	Interface	Max length
Ethernet power and data	ODU to network terminating equipment	60 m (197 ft)
Ethernet power and data	ODU to PIDU	40 m (131 ft)
Ethernet power and data	PTP-SYNC to PIDU	2 m (6.6 ft)
Ethernet power only	ODU to PIDU 'power only' CAT5e cable when fiber Ethernet is installed	40 m (131 ft)
Ethernet power only	PTP-SYNC to PIDU CAT5e cable when fiber Ethernet is installed	2 m (6.6 ft)

4. Configuration options

This section describes three different ways in which PTP-SYNC and its timing reference source may be configured.

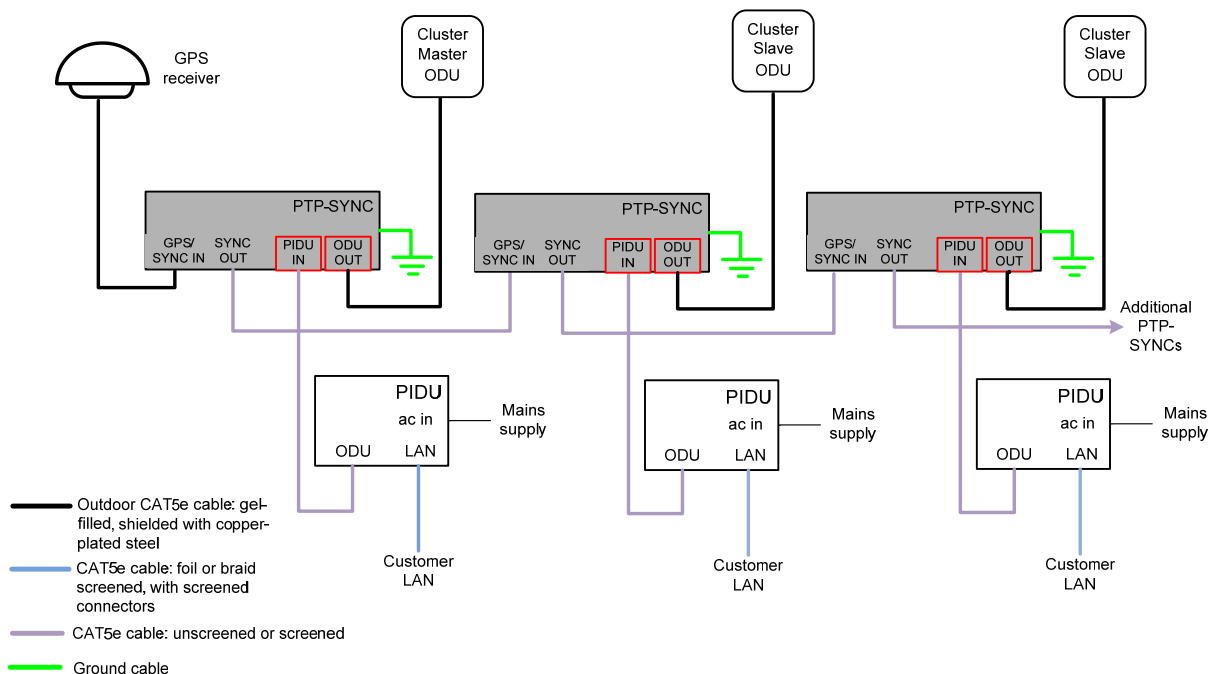
Single link configuration

Use the single link configuration where a site contains only one TDD master ODU. Each link requires one PTP-SYNC unit connected to the master ODU and one compatible GPS receiver. The GPS receiver and LPU can be replaced by an alternative compatible 1 Hz timing reference.



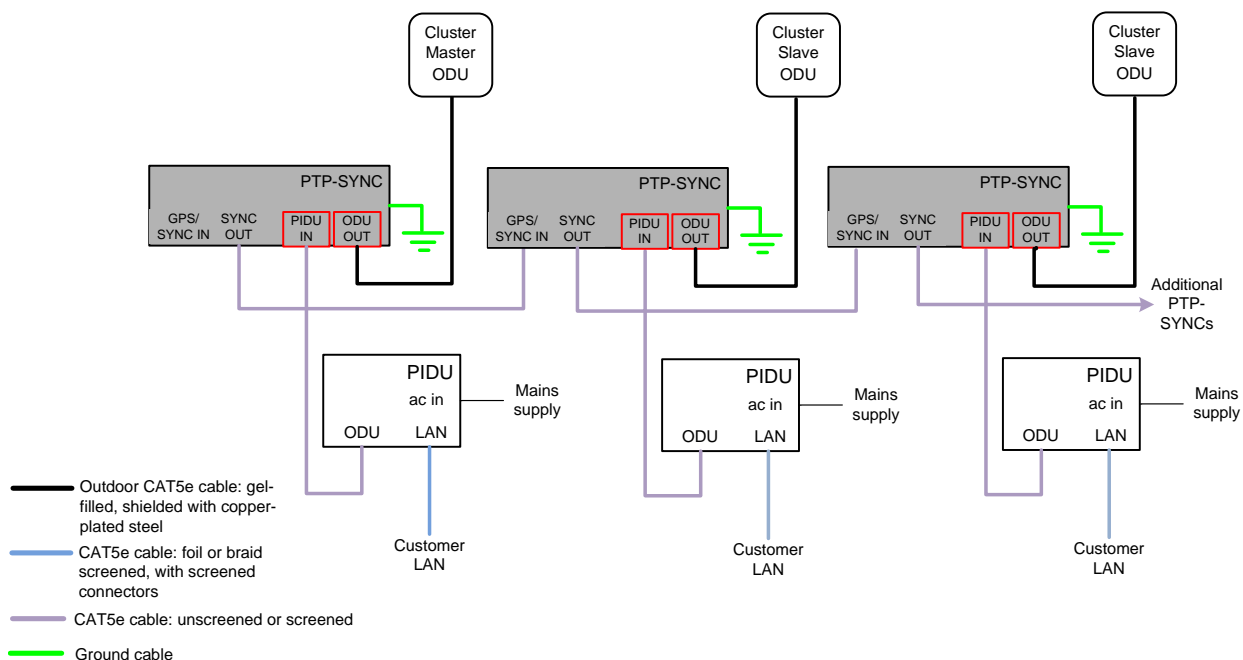
Cluster configuration with GPS receiver

Use this configuration where a site contains collocated TDD master ODUs in an extended network and where multiple sites have TDD master ODUs. Each link requires one PTP-SYNC unit. Each site requires one compatible GPS receiver. Collocated PTP-SYNC units are connected together in a daisy-chain. Between two and ten PTP-SYNCS may be chained in this way.



Cluster configuration without GPS receiver

Use this configuration where all master ODUs are collocated at a single site. Each link requires one PTP-SYNC unit. PTP-SYNC units are connected together in a daisy-chain. Between two and ten PTP-SYNCS may be chained in this way. One ODU is designated as a cluster timing master. As this configuration does not require a GPS receiver, it provides additional flexibility, particularly in applications requiring rapid deployment.



5. Installing PTP-SYNC

⚠ CAUTION

Do not install the PTP-SYNC unit in a domestic (home) environment as it is a Class 'A' product that may cause radio frequency (RF) interference in other appliances.

The PTP-SYNC unit must be installed indoors in a non-condensing environment, otherwise it will be prone to water damage.

To protect the PTP-SYNC unit from damage, disconnect the power supply from the PIDU before connecting up the PTP-SYNC.

Installing the GPS receiver and drop cable

If a GPS receiver is the timing reference source, then ensure that all components are of the approved types, as specified in [GPS components](#) on page 6. Install the GPS receiver, drop cable, ground cables and LPU as described in the relevant user guide (*PTP 300 and PTP 500 Series User Guide* or *PTP 600 Series User Guide*). Check that the installation is protected as described in [Grounding and lightning protection](#) on page 11.

Lay the drop cable from the GPS receiver into the building up to the PTP-SYNC mounting point.

Mounting PTP-SYNC

Install the PTP-SYNC unit in the equipment building, either in a rack or on a wall:

- **Rack mounting:** If the PTP-SYNC is to be in a rack, fix it to the rack mount using the M3 screws from the rack mount installation kit :









- **Wall mounting:** If the PTP-SYNC is to be on a wall, mount it vertically with interfaces and cabling facing downwards:



Connecting up PTP-SYNC

To connect the PTP-SYNC to the PIDU, ODU, GPS receiver (if fitted), and LPU (if fitted), proceed as follows:

1	Disconnect the power supply from the PIDU.	
2	If using GPS, connect the cable from the GPS unit to the GPS/SYNC IN port.	
3	To link clustered PTP-SYNC units, connect the SYNC OUT port of the first PTP-SYNC to the GPS/SYNC IN port of the second PTP-SYNC in the chain. Repeat for subsequent PTP-SYNC units in the chain.	
4	Connect the cable from the PIDU to the PIDU IN port. A suitable 1 meter cable is included in the PTP-SYNC kit.	
5	Connect the cable from the ODU to the ODU OUT port.	
6	Use a grounding cable to connect the ground stud of the PTP-SYNC to the master ground bar of the building, or to the rack ground bar.	


6. Powering up and testing the installation

NOTE

The minimum System Releases for compatibility with PTP-SYNC are 600-08-04 (PTP 600) and 500-04-00 (PTP 500). Upgrade the software as necessary.

Powering up

To power up the installation, proceed as follows:

- | | |
|----------|---|
| 1 | Ensure that all cables are connected to the correct interfaces of the PTP-SYNC unit and the GPS receiver (if used). Ensure that the installation is correctly grounded. |
| | <div style="background-color: #ffff00; padding: 2px; display: inline-block;"> CAUTION</div> <p style="margin-left: 40px;">Failure to do so may result in damage to the equipment.</p> |
| 2 | Connect the power supply to the PIDU. |
| 3 | Within 90 seconds, the PTP-SYNC 'STATUS' LED should blink once every second to show that satellite lock has been achieved. |
| 4 | If the system does not operate correctly, refer to the fault finding guide below. |

Fault finding guide

Refer to [2 PTP-SYNC interface description](#) for descriptions of the PTP-SYNC LEDs.

LEDs do not illuminate

Ensure that there is a cable connection between the PIDU 'ODU' interface and the 'PIDU IN' interface of the PTP-SYNC unit.

The 'STATUS' LED does not blink

This probably indicates that a 1PPS synchronization pulse is not detected by the PTP-SYNC unit (no satellite lock).

Depending on system configuration, take one of the following actions:

- System using a GPS receiver module - Ensure that there is a cable connection between the PTP-SYNC 'GPS/SYNC IN' interface and the LPU, also that there is a cable connection between the LPU and the GPS receiver module. Check that the GPS receiver module has an uninterrupted view of the sky.
- System using an alternative 1PPS timing source - Ensure that there is a cable connection between the PTP-SYNC 'GPS/SYNC IN' or '1PPS IN' interface and the 1PPS timing source.
- On cluster slave units – Ensure that there is a cable connection between the slave GPS/SYNC IN interface and the SYNC OUT interface of the preceding unit in the chain.

The 'ODU' LED does not illuminate within 90 seconds of power-up

This probably indicates that there is no communication between PTP-SYNC and ODU.

Ensure that the PTP-SYNC 'ODU OUT' interface is connected to the ODU (and LPUs if installed) via the drop cable.

The 'GPS' LED does not illuminate or blink on clustered PTP-SYNC units

This indicates a fault only when the timing source is a GPS receiver.

The following table describes the action to be taken depending upon the behavior of the 'GPS' LEDs at the master and slave(s):

Cluster timing source	'GPS' LED on master	'GPS' LED on slave(s)	Diagnosis
	Blink	Blink	OK
GPS receiver providing NMEA data	Off	Any	Fault in GPS unit or GPS cable
	Blink	Off	Fault in daisy chain cable
Alternative 1PPS source, no NMEA data	Off	Off	OK
	Off	On	Fault in alternative 1PPS source
One ODU is cluster timing master	Off	Off	OK