



PTP-SYNC

Installation Guide

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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.

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About this guide

This guide describes the installation of the Motorola PTP-SYNC. Users of this guide should have knowledge of the following areas:

- Outdoor radio equipment installation
- System installation, configuration, monitoring and fault finding

CAUTION

The PTP-SYNC unit should not be installed in a domestic (home) environment as it is a Class A product. In a domestic environment, it may cause radio frequency (RF) interference in other appliances.

NOTE

When this document refers to the *User Guide*, it means *User Guide: PTP 600 Series (phn-0896)*. This can be downloaded from <http://www.motorola.com/ptp/support>.

Version information

The following shows the issue status of this document since it was first released.

Document issue	Date of issue	Remarks
001v000	Feb 2010	Original issue
002v000	Feb 2010	First revision
003v000	Mar 2010	Second revision
004v000	Apr 2010	Third revision

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1. Inventory

Standard components

PTP-SYNC kit

Part number WB3665.

The PTP-SYNC kit (Figure 1) contains the following items:

- 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)

Figure 1 PTP-SYNC kit



Indoor cable

The cable used for indoor connections, for example from the PTP-SYNC to the PIDU Plus, can be any standard screened or unscreened CAT5e cable. This must be purchased separately, as it is not supplied in the PTP-SYNC kit.

Optional components for GPS

If the PTP-SYNC configuration requires GPS as the timing reference source, then the following additional components are required: GPS receiver, outdoor drop cable, connectors, glands, cable grounding kit and Lightning Protection Unit (LPU) end kit. These components must be purchased separately.

GPS receiver

The Trimble Acutime™ Gold GPS receiver is a suitable timing reference source for PTP-SYNC.

Part number STLN6594.

Outdoor drop cable

This is only required for GPS configurations.

Always use Cat5e cable that is gel-filled and shielded with copper-plated steel. This is the only type of outdoor drop cable supported in this application. A suitable make is Superior Essex, with part numbers as specified in [Table 1](#).

CAUTION

The drop cable must be Cat5e cable that is gel-filled and shielded with copper-plated steel. Alternative types of drop cable are not supported by Motorola.

Table 1 Superior Essex cable - available lengths and part numbers

Length (on plywood reel)	Part number
1000 ft	BBDGe 04-001-55
2500 ft	BBDGe 04-002-55
5000 ft	BBDGe 04-003-55
Cut to length	BBDGe 04-601-55

Outdoor connectors and glands

These are only required for GPS configurations.

The recommended connectors and glands to be used for connecting the supported drop cable to the LPU are specified in [Table 2](#).

Table 2 Recommended outdoor connectors for ODU and LPU

Item	Manufacturer	Part number
Connector	Tyco (AMP)	5-569278
Crimp tool	Tyco (AMP)	2-231652
Die set	Tyco (AMP)	1-8534400-0
Gland	Motorola	WB1811

NOTE

The connector, crimp toll and die set listed in [Table 2](#) are specific to Superior Essex cable. They may not work with other makes of cable.

The recommended connectors and glands to be used for connecting the supported drop cable to the Trimble GPS receiver are specified in [Table 3](#).

Table 3 Recommended outdoor connectors for Trimble GPS receiver

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		

Cable grounding kits for 1/4" and 3/8" cable

These are only required for GPS configurations.

Part number 01010419001.

The cable grounding kit ([Figure 2](#)) is for grounding the GPS receiver drop cable. One kit is required for each grounding point. The kit contains the following items:

- 1 x grounding cable with grounding 2 hole lug fitted (M10)
- 1 x self-amalgamating tape
- 1 x PVC tape
- 3 x tie wraps
- 2 x bolt, washer and nut

Figure 2 Cable grounding kit



Lightning Protection Unit (LPU) end kit

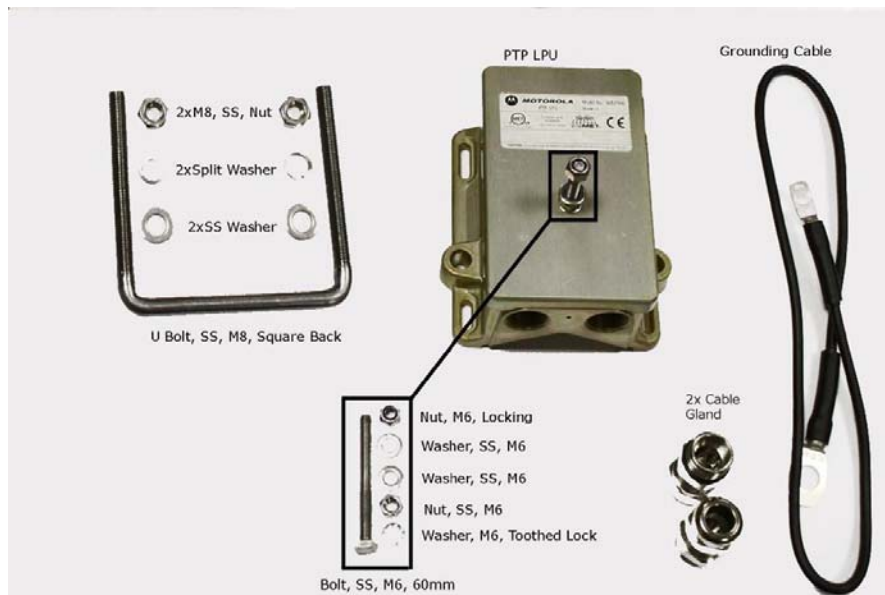
This is only required for GPS configurations. Part number 2900.

CAUTION

The LPU (part number 2900) contained in the WB2978 kit must only be used on the GPS receiver cable. It must not be used on the drop cable to the PTP 600 ODU. The ODU drop cable uses LPU part number 2900B.

The LPU End Kit ([Figure 3](#)) is for protecting the connection to the GPS receiver.

Figure 3 LPU end kit



Other optional components

Rack mount installation kit

Part number WB3486. The PTP800 CMU / PTP-SYNC 19" rack mount installation kit ([Figure 4](#)) is an optional item that must be purchased separately. This kit contains the following components:

- 1 x rack bracket
- 8 x M3 screws and washers
- 1 x rack mount blank plate
- 8 x M5 nuts and washers
- 2 x rack handles

Figure 4 PTP 800 CMU / PTP-SYNC 19" rack mount installation kit



2. Interface description

PTP-SYNC front panel

The PTP-SYNC front panel is illustrated in [Figure 5](#). The annotated interfaces are described in [Table 4](#).

Figure 5 PTP-SYNC front panel

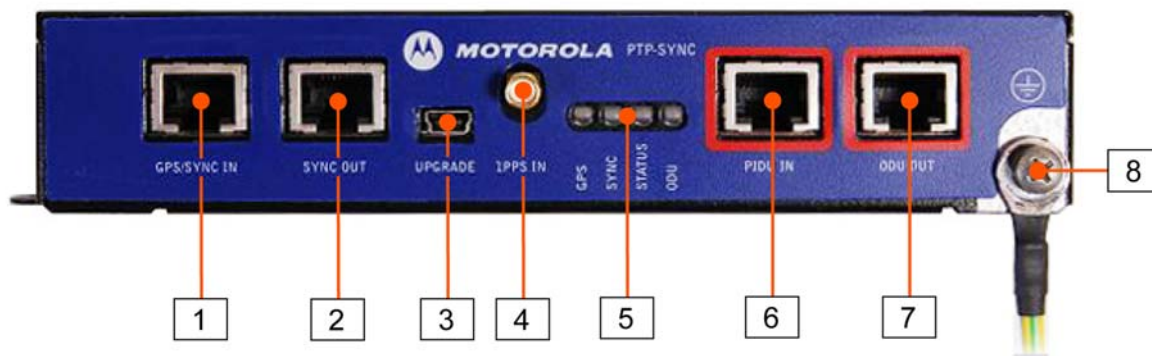


Table 4 PTP-SYNC front panel interfaces

Number	Description	Function
1	GPS/SYNC IN	Input from GPS receiver module.
2	SYNC OUT	Output to clustered GPS-SYNC units.
3	USB	Input for software upgrades. Contact Motorola for instructions.
4	1PPS IN	Coaxial alternative to GPS/SYNC IN. Peak input supply must not exceed 5V.
5	LED bank	LEDs and their functions are described in Table 5 .
6	PIDU IN	Input from PIDU Plus.
7	ODU OUT	Output to ODU.
8	Ground stud	For connecting to a ground point.

Table 5 PTP-SYNC indicator LEDs

Indicator	Function	Description
GPS	Off	No GPS satellite data being received at either the GPS/SYNC IN or 1PPS 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.
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.
ODU	Off	No signal being received from the ODU.
	On	Communication with the ODU is established.

GPS/SYNC IN Pinout Description

Table 6 describes the pinouts of the GPS/SYNC IN port of the PTP-SYNC unit. Pins 3 and 6 carry the 1Hz differential input to the GPS/SYNC IN port.

Table 6 GPS/SYNC IN port pinouts

Pin no.	Connector pinout 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).

Signal polarities

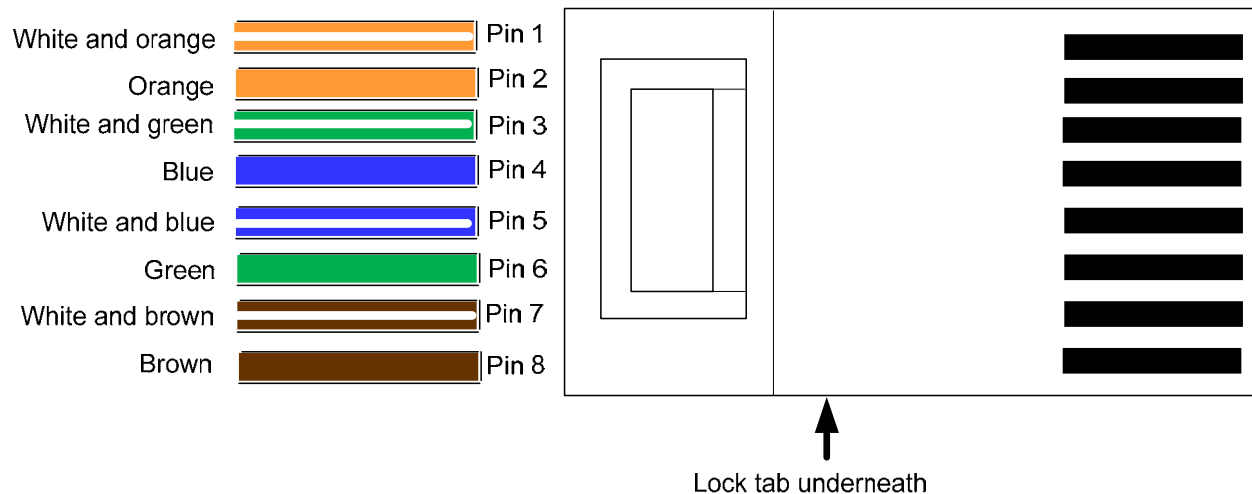
A 1 PPS timing datum is detected when GPS_1PPSA goes positive relative to GPS_1PPSB.

A serial data start bit is detected when GPS_RXDA (or GPS_TXDA) goes positive relative to GPS_RXDB (or GPS_TXDB).

RJ45 connector

Figure 6 shows how the pin numbers of the GPS/SYNC IN port correspond to the RJ45 connector color codes (with T568B color coding).

Figure 6 RJ45 pins 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 guide and in the user manual, when followed correctly, give the user the best protection from the harmful effects of EMD. However 100% protection is neither implied nor possible.

CAUTION

Ensure that the GPS receiver module is mounted in a position where all protection requirements can be met.

Electro-magnetic discharge (lightning)

Lightning protection zones

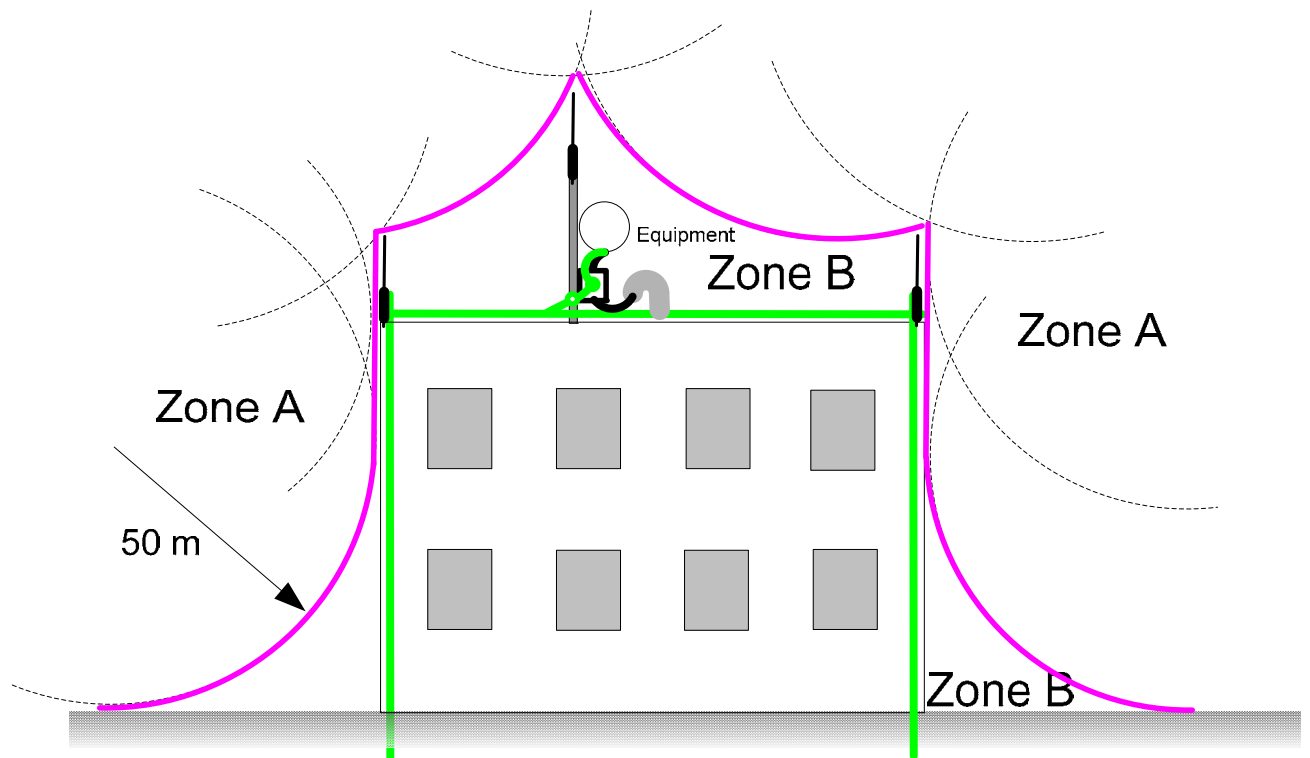
The 'rolling sphere method' is used to determine where it is safe to mount antennas or ODUs. An imaginary sphere, typically 50 meters in radius, is rolled over the structure (Figure 7). Where the sphere rests against the ground and a strike termination device (such as a finial or ground bar) all the 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 will put equipment, structures and life at risk.

Figure 7 Rolling sphere method to determine the lightning protection zones

General protection requirements

To adequately protect a GPS receiver installation, both ground bonding and transient voltage surge suppression are required.

NOTE

Where an installation already has, or requires the use of a Master Ground Bar then the requirements of *Motorola Specification R56: STANDARDS AND GUIDELINES FOR COMMUNICATION SITES (68P81089E50)* take precedence over those in this guide.

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 at the entry point to the building or equipment room. The use of the LPU provided in the lightning protection kit (WB2978) is strongly recommended.
- 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 damage to equipment.
- The drop cable must be grounded at the building entry point.
- The drop cable must not be laid alongside a lightning finial cable.
- All grounding cables must be minimum size 8 AWG, preferably 6 or 4 AWG.

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, 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 mounting options

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 have an un-interrupted view of the sky.
- It must receive an adequate signal from at least four GPS satellites.
- It must be possible to protect the installation as described in [General protection requirements](#) on page 11.

The GPS receiver should be mounted 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.

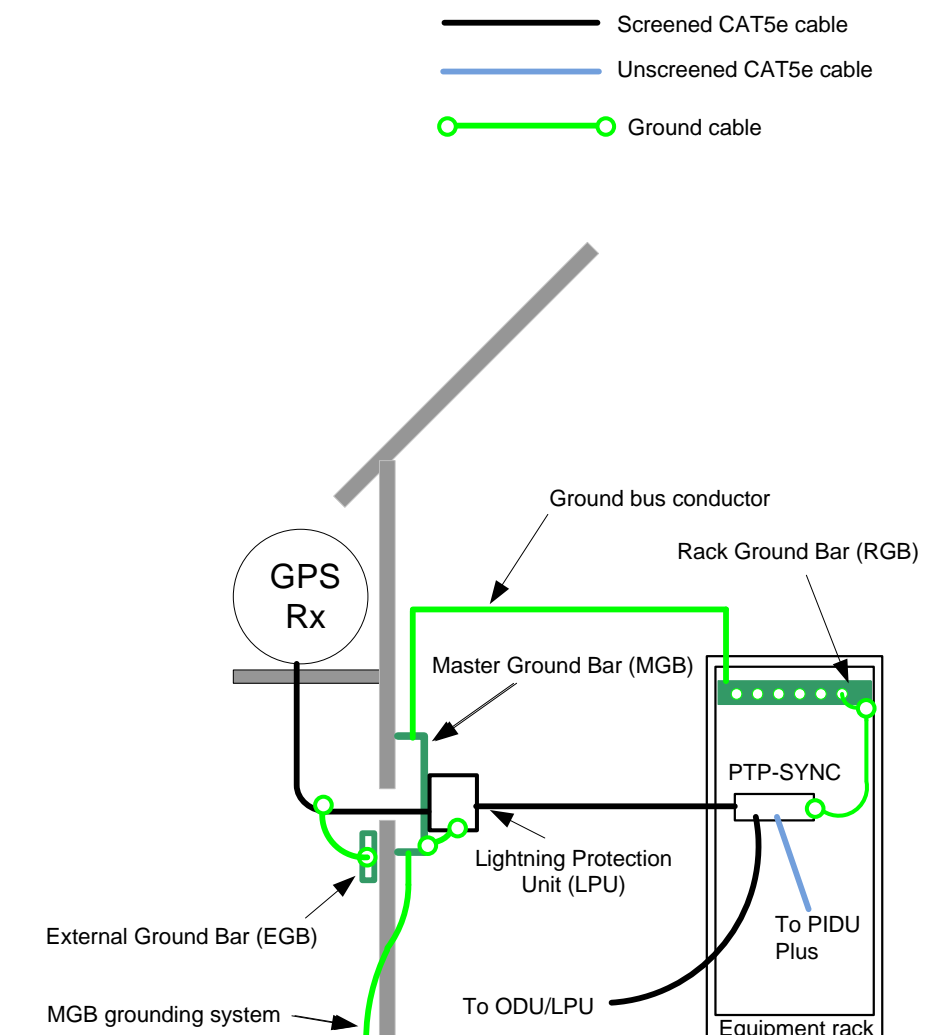
Mounting the GPS receiver module on the equipment building

If mounting the GPS receiver for PTP-SYNC on the equipment building (Figure 8), 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 terminals and finials.
- It must not project more than 600mm (24 inches) from the wall of the building.

If these requirements cannot all be met, then the module must be mounted on a metal tower or mast.

Figure 8 GPS receiver mounted on equipment building



Mounting the GPS receiver module on a metal tower or mast

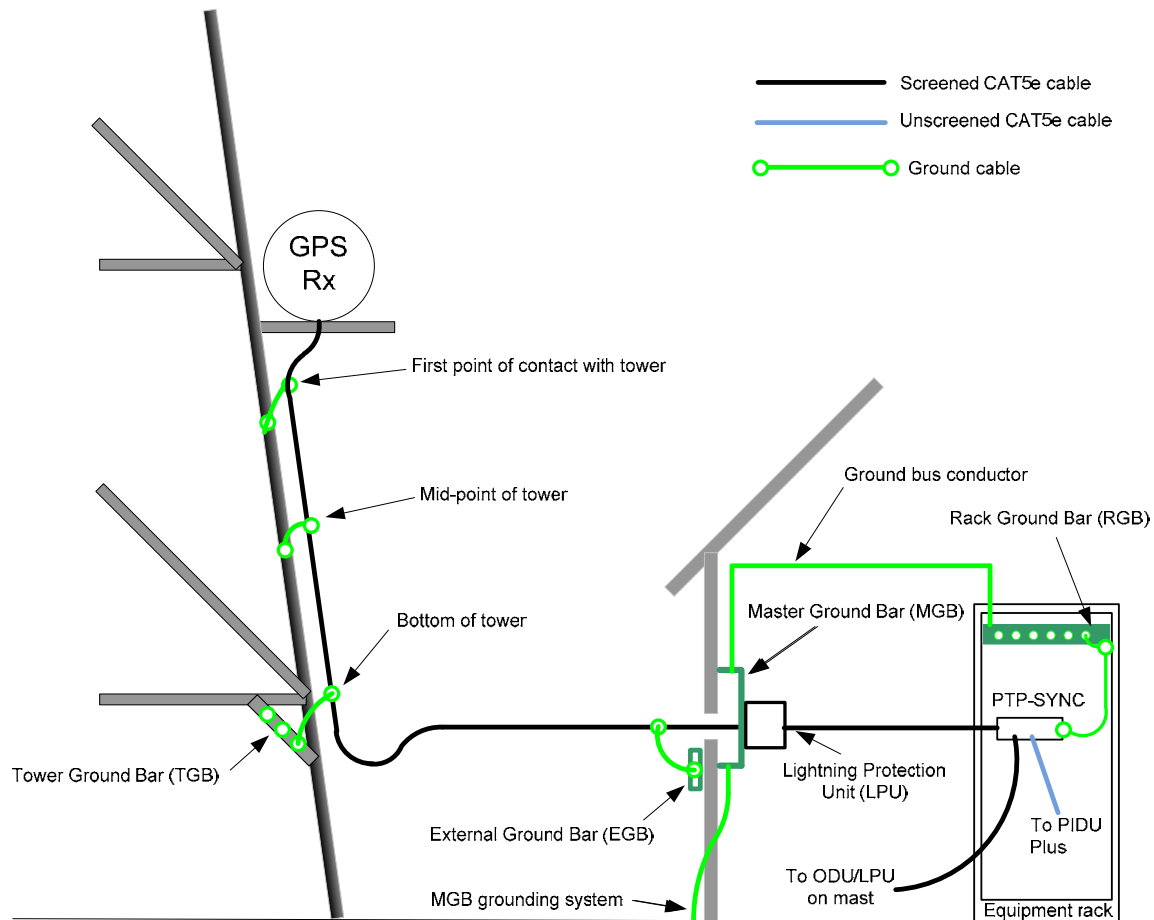
If mounting the GPS receiver module on a metal tower or mast (Figure 9), select a position that meets the following requirements:

- It must not be mounted any higher than is necessary to receive an adequate signal from four GPS satellites.
- It must be protected by a nearby lightning terminal or finial that projects further out from the tower than the GPS receiver module.
- It must meet all the protection requirements stated below.

Protection requirements for a mast or tower installation

If the PTP-SYNC is to be mounted on a metal tower or mast, then in addition to the general protection requirements (above), the following requirements must be observed:

- The equipment must be lower than the top of the tower or its lightning terminal and finial.
- 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. This grounding kit must be bonded to the tower or tower ground bus bar (TGB), if installed.
- If the tower is greater than 61 m (200 ft) in height, an additional grounding kit must be installed at the tower midpoint. Additional ground kits must be installed 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.).
- If a coaxial (or other) cable is already grounded to the mast or tower, the same grounding points on the mast or tower must be used for the CAT 5e cable.

Figure 9 GPS receiver mounted on tower or mast

Maximum cable lengths

The maximum permitted cable lengths for PTP-SYNC installations are:

- ODU to PTP-SYNC: 40 meters (130 ft).
- PTP-SYNC to PIDU Plus: 2 meters (6.5 ft).
- PIDU Plus to network equipment: 20 meters (65 ft).

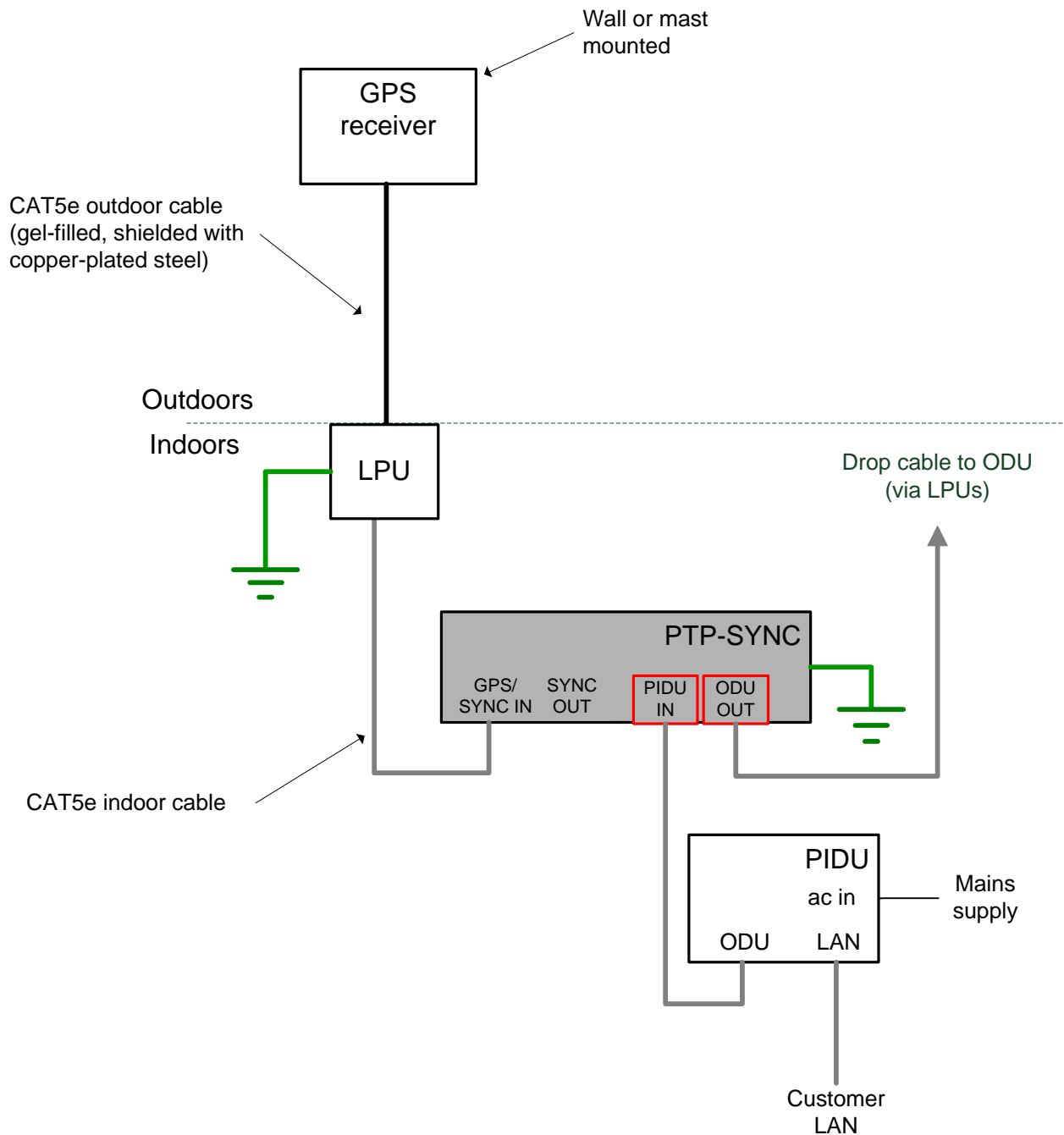
4. Configuration options

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

Single link configuration

The single link configuration (Figure 10) consists of a single PTP-SYNC with a single timing reference source (1PPS), which is normally a GPS receiver.

Figure 10 Single link configuration

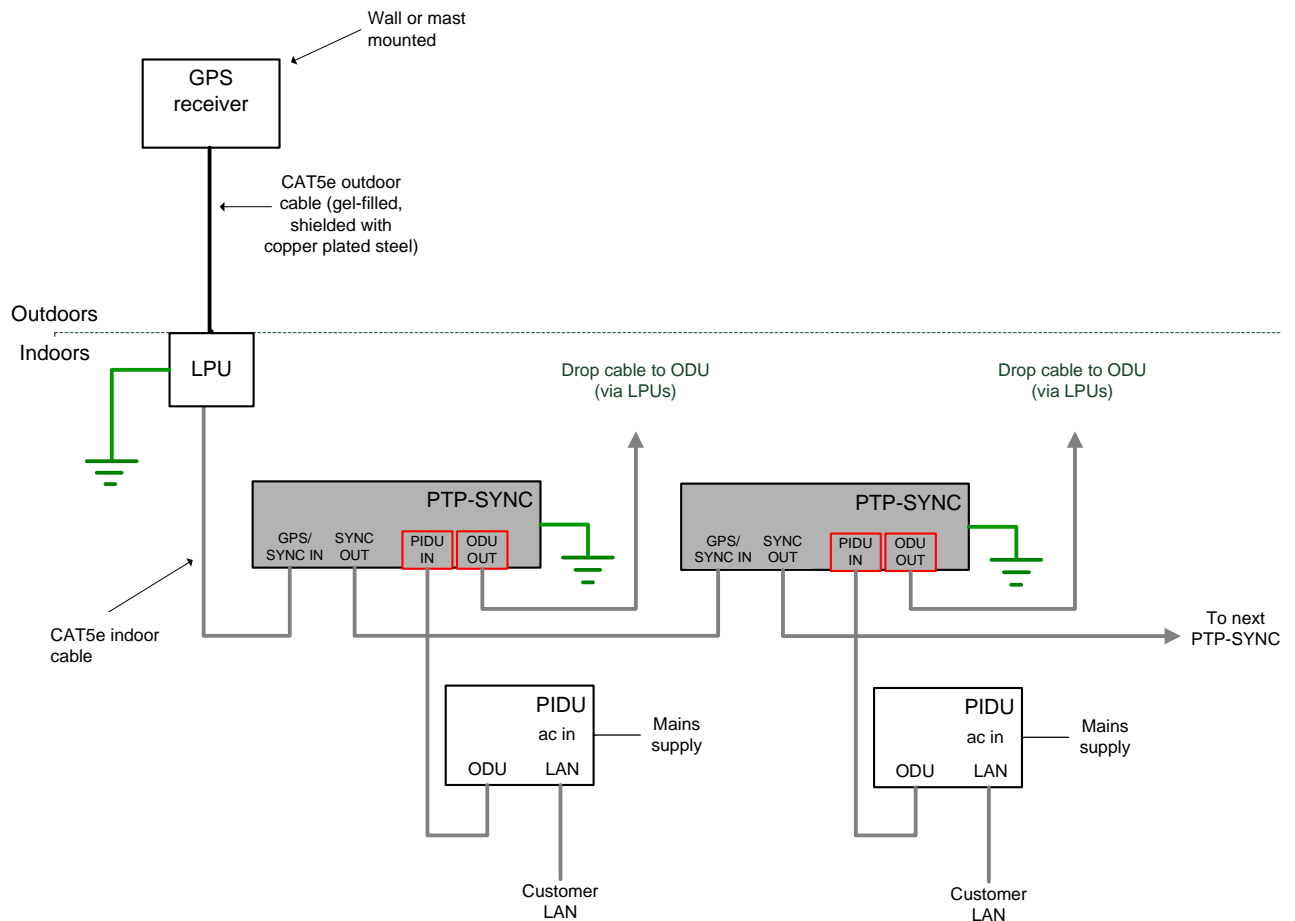


Cluster configurations

The cluster configurations consist of multiple PTP-SYNC units connected in a chain. These configurations support multiple ODUs at one site. Between two and ten PTP-SYNCS may be chained in this way.

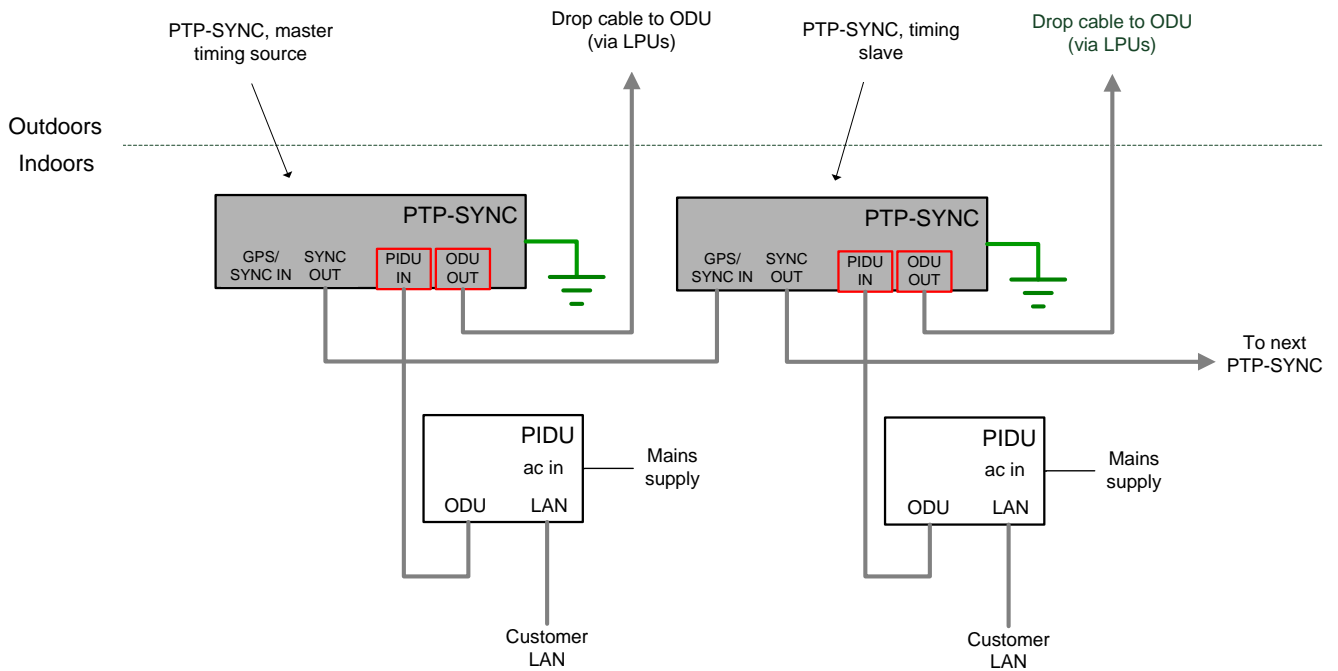
The cluster configuration with GPS (Figure 11) consists of multiple PTP-SYNC units with a single timing reference source (1PPS), which is normally a GPS receiver.

Figure 11 Cluster configuration with GPS



The cluster configuration without GPS (Figure 12) consists of multiple PTP-SYNC units with no GPS timing reference source. One ODU is designated as a cluster timing master.

Figure 12 Cluster configuration without GPS



5. Installing PTP-SYNC

Installing the GPS receiver and drop cable

If a GPS receiver is the selected timing reference source, then ensure that the GPS receiver, drop cable, connectors, glands, grounding kits and LPU are of the approved types, as specified in [Optional components for GPS](#) on page 3. Install the GPS receiver, drop cable, ground cables and LPU as described in the *User Guide*. Check that the installation is protected as described in [Grounding and lightning protection](#) on page 10.

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 ([Figure 13](#)).

Figure 13 Rack mount securing screws for PTP-SYNC



Wall mounting







If the PTP-SYNC is to be on a wall, mount it vertically with interfaces and cabling facing downwards ([Figure 14](#)).

Figure 14 PTP-SYNC mounted on wall



Connecting up PTP-SYNC


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

<p>1 Disconnect the power supply from the PIDU Plus.</p> 	<p>2 Use a short unshielded CAT5e Ethernet cable (this must be less than 2 meters long) to connect the ODU port of the PIDU Plus to the PIDU IN port of the PTP-SYNC.</p> 
<p>3 If using a GPS timing reference, connect the GPS drop cable from the LPU at building entry to the GPS/SYNC IN port of the PTP-SYNC. This must be an outdoor drop cable of the approved type.</p> 	<p>4 Connect the ODU drop cable from the LPU at building entry to the ODU OUT port of the PTP-SYNC. This must be an outdoor drop cable of the approved type.</p> 
<p>5 To link clustered PTP-SYNC units, use an un-screened CAT5e Ethernet cable to 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.</p> 	<p>6 Use a grounding cable to connect the ground stud of the PTP-SYNC to the master ground bar of the building.</p> 

6. Powering up and testing the installation

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.	2	Connect the power supply to the PIDU Plus.
	 CAUTION Failure to do so may result in damage to the equipment.		
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 [Table 5](#) for descriptions of the PTP-SYNC LEDs.

LEDs do not illuminate

Ensure that there is a cable connection between the PIDU Plus 'ODU' interface and the 'PIDU Plus 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.

Table 7 describes the action to be taken depending upon the behavior of the 'GPS' LEDs at the master and slave(s).

Table 7 Clustered PTP-SYNC units - 'GPS' LEDs Fault-finding

Cluster timing source	'GPS' LED at master	'GPS' LED at slave(s)	Corrective action
GPS receiver providing NMEA data	On steady or blink	On steady or blink	None - behaving as expected.
	Off	On steady or blink	Investigate a possible fault in the GPS receiver.
	On steady or blink	Off	Investigate a possible fault in the CAT5e cable from the master to the first slave.
	Off	Off	Investigate a possible fault in the CAT5e cable from the GPS receiver to the master.
Alternative 1PPS source, no NMEA data	Off	Off	None - behaving as expected.
No external source, one ODU is cluster timing master	Off	Off	None - behaving as expected.