Memorylink UltraSync™ GPS-100M Synchronization Guide

for PTP 600 Series Wireless Ethernet Bridges

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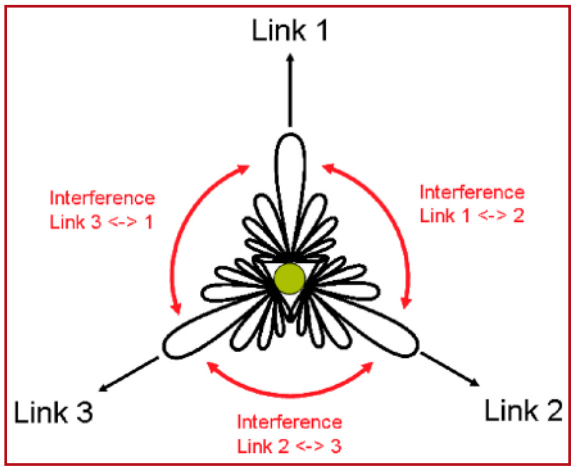
Introduction

The Motorola wi4 Fixed Point-To-Point (PTP) 600 Series Wireless Ethernet Link, which consists of a pair of radios deployed one at each end of the link, operates on a single frequency channel in each direction using Time Division Duplex (TDD) synchronization.

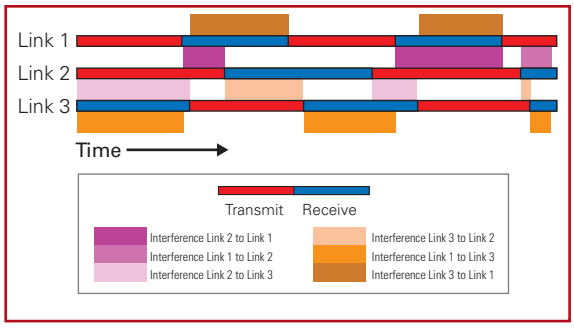
In situations where a number of radios are installed on the same mast or where a large number of links are installed in a sizeable, dense network, it is possible that the performance or throughput of some of the links can be reduced. In some cases, a number of the links may not work at all. This is due to interference between the units, and the levels of interference can worsen when the links are operating on the same or adjacent channels.

Simple example of cross-interference when three links of different lengths are mounted on a mast and operating on the same or adjacent channels

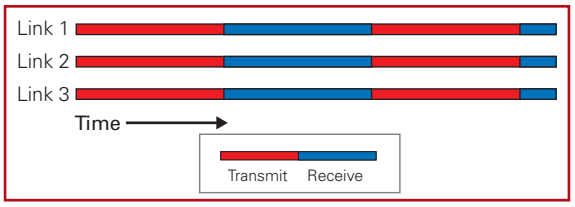


The effect of this cross interference between units can be reduced by ensuring that the radios are in synchronism, meaning that transmit and receive frames of the units are synchronized so they do not interfere with each other. The Motorola PTP 600 Series radios include TDD Synchronization technology, which introduces a fixed TDD framing mode and allows frame timing in a PTP 600 link to be synchronized with an external reference – a Global Positioning System (GPS) unit.

The result is that the PTP 600's TDD synchronization capability minimizes the interference between the links and promotes optimal spectral re-use while greatly enhancing link performance. By timing and synchronizing transmit and receive signals, network operators can co-locate multiple PTP radios on a rooftop or tower with greatly reduced interference.



Before TDD Synchronization



After TDD Synchronization

System Overview

To meet the high performance standards of a Motorola PTP broadband wireless network, Motorola has partnered with Memorylink to deploy the Memorylink UltraSync™ GPS-100M in a Motorola wi4 Fixed Point-to-Point (PTP) 600 Series network. With its integrated GPS receiver and internally-mounted antenna, the UltraSync GPS-100M generates a precise, highly stable signal that provides the PTP 600 system with a time reference from which the PTP network can synchronize the radios' transmit and receive signals. Having an accurate time reference is critical to the network's efficiency and reliability as the PTP 600 radios transport TDD data over the link, particularly in a high-interference area where multiple radios and channels are in use.

The UltraSync GPS-100M's high-quality components, including an active antenna that functions even in low-signal environments, and its NEMA 4X and UL 508 outdoor-rated enclosure, ensure highly reliable performance. Like the Motorola PTP 600 Series units, the UltraSync GPS-100M is rugged, performing consistently in harsh climates and challenging radio-frequency (RF) environments.

Memorylink UltraSync GPS-100M Synchronization Unit (Motorola Part Number WB3001)

The robust, reliable UltraSync GPS-100M's time signal originates from the atomic clocks on the GPS satellites that orbit the earth. Then that signal is fed to the PTP 600 and used as the timing reference for the PTP 600's TDD functionality. Using GPS enables network-wide synchronization which, when combined with an asymmetric frequency setting, can improve the frequency reuse by a factor of two, enabling a separate frequency plan for master and slave reception.

Both existing and prospective operators of a Motorola PTP 600 Series network can reap the benefits of the UltraSync GPS-100M's superior GPS signal synchronization since the UltraSync GPS-100M comes pre-wired for new PTP 600 systems, and can be retrofitted for existing PTP 600 links.

Product Features and Benefits

UltraSync™ GPS-100M Features:

- Integral GPS receiver – 12 channel
- Passes 1000 Base-T protocol
- Supports Ethernet cable lengths of up to 330 feet (100 meters) from the PTP 600 PIDU Plus to the UltraSync GPS-100M Eth1/PWR port
- Robust enclosure weighing approximately 23 ounces (650 grams)
- Small footprint – 5.92" (150 mm) height, 3.95" (100 mm) width and 2.79" (71 mm) depth
- Includes internally mounted GPS antenna, mounting bracket, screws, Ethernet cables and cable glands for waterproof ingress/egress
- Connects via RJ-45 connector to PTP 600 Series radios equipped with a sync port
- Operates at temperatures from – 40° F to +140° F (-40° C to +60° C), even in high humidity

UltraSync GPS-100M Benefits:

- Accurately provides a timing reference for PTP 600 Series links
- Internally mounted GPS antenna requires no antenna change to the PTP 600 Series link
- Robust operating features allow continuously high performance
- Small footprint and lightweight form factor allow easy installation

Benefits of PTP 600's TDD Synchronization Capability:

- Minimizes interference between multiple links on a single mast
- Improves frequency re-use
- Reduces spatial / angular separation between PTP links when installed on the same mast

Ordering

The Memorylink UltraSync GPS-100M can be ordered directly from Motorola under the following part number and product description:

WB3001 – Memorylink UltraSync GPS-100M for PTP 600

Installation

Enabling TDD synchronization is a two-stage process:

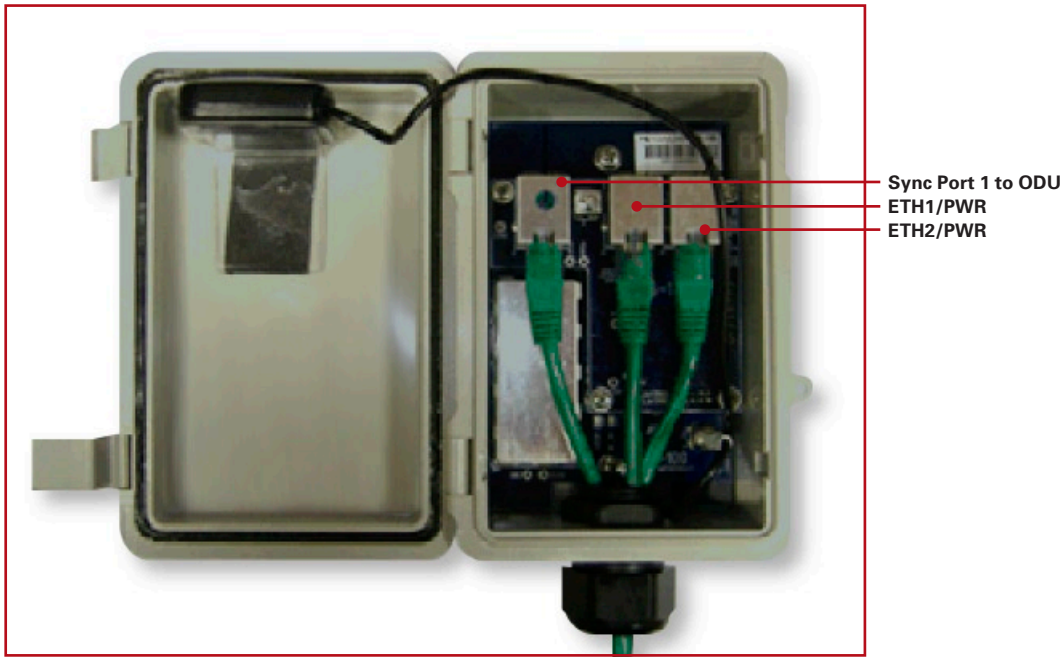
- Install the GPS Synchronization Unit (Motorola part number WB3001)
- Enable TDD synchronization mode on the PTP 600 radio and configure related parameters using the PTP 600 Web GUI interface

The following are deployment considerations for an UltraSync™ GPS-100M with a PTP 600 Series link:

- Fixed-frequency operations only
- Fixed TDD operation only – all synchronized links have the same ratio master to slave
- Not presently available when radar avoidance is enabled
- Networks need to be planned carefully

The following illustration shows the connections in the UltraSync GPS-100M:

UltraSync GPS-100M Connections



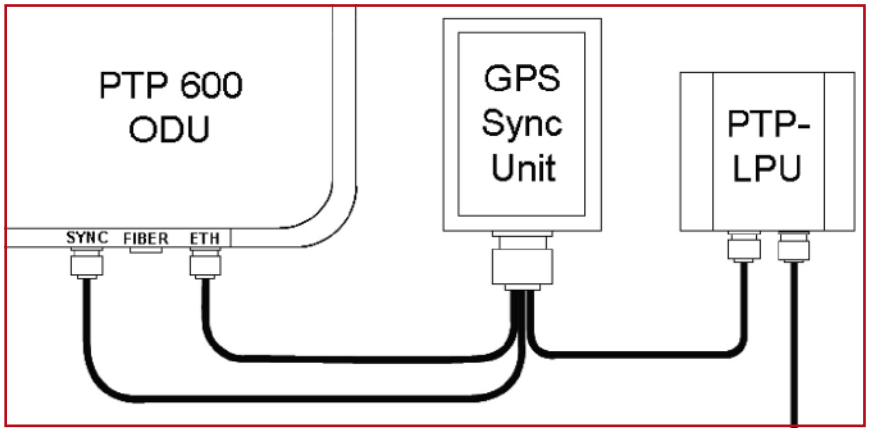
- Interface Specifications
  - > Sync Port (Port 1): Motorola proprietary differential 3.3V (nominal) peak-to-peak signal presented on pins 4(+) and 5(-) of Port 1 (RJ-45 connector)
  - > Ethernet pass-through on Ports 2 and 3

- Maximum Cable Lengths
  - > Sync Port: 2′ (0.6 m)
  - > Ethernet Port 2: 330′ (100 m)
  - > Ethernet Port 3: 2′ (0.6 m)

Motorola strongly recommends purchasing and installing the Motorola wi4 Fixed PTP Lightning Protection Unit (PTP-LPU) as an integral part of a PTP 600 Series network. Because PTP 600 Series radios are often located in situations that can attract lightning, the PTP-LPU shields the radio from sudden power surges caused by electro-magnetic activity (lightning) before they can harm the unit. Two Lightning Protection Units are required for each radio – one installed on the wall, tower or mast adjacent to the PTP 600 radio, and one installed at the cable entry point of the building in which the network resides. When correctly installed, the Motorola PTP-LPU gives the PTP 600 Series radio the best protection from the harmful effects of lightning. However, 100% protection is neither implied nor possible.

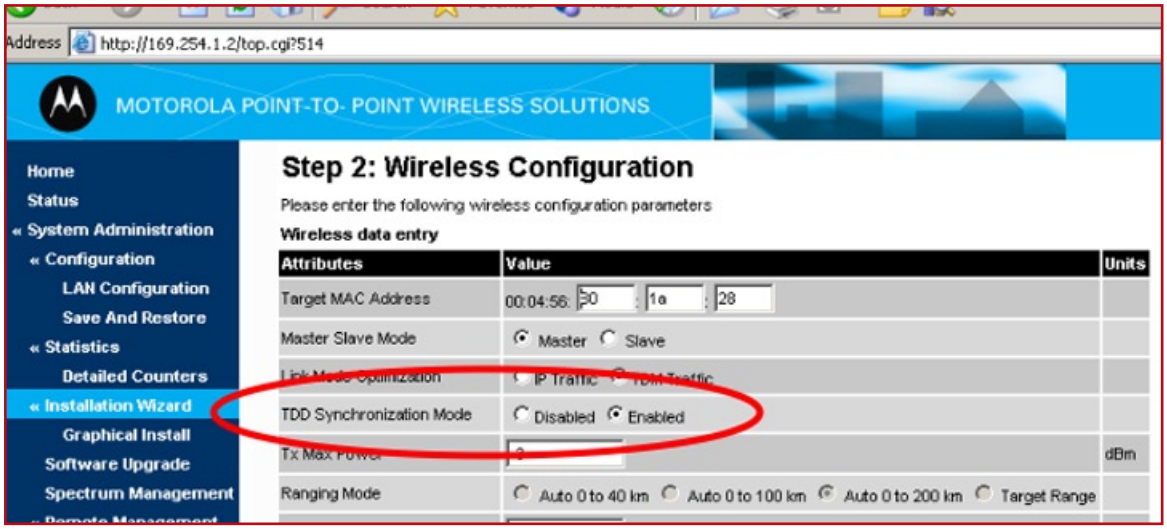
The following diagram shows how to connect the UltraSync™ GPS-100M to the PTP 600 ODU fitted with a Lightning Protection Unit (PTP-LPU):

UltraSync GPS-100M deployment diagram with a PTP 600 Series radio and a PTP Lightning Protection Unit

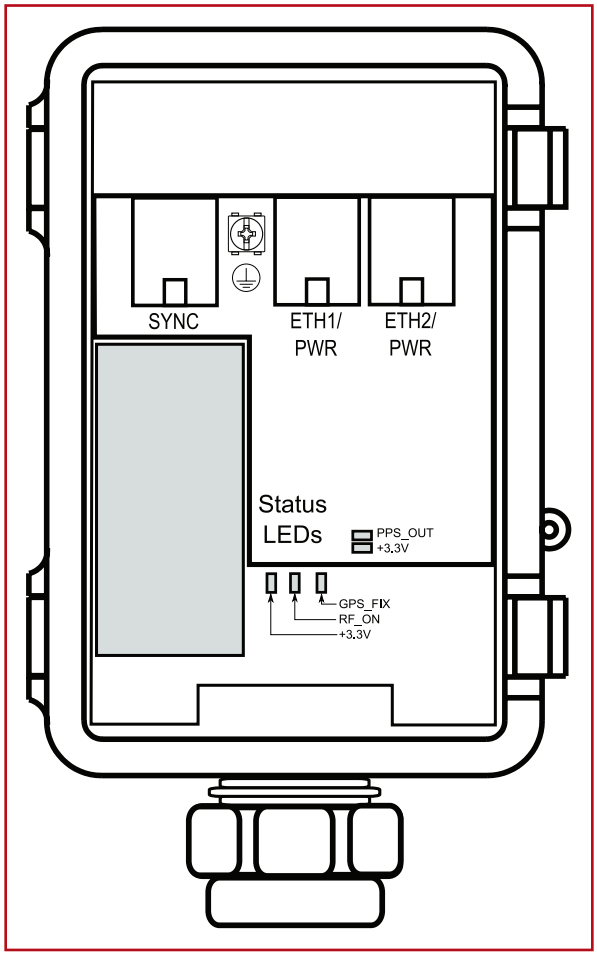


The UltraSync GPS-100M sits between the Lightning Protection Unit and the ODU (outdoor unit) of a PTP 600 Series link. One UltraSync GPS-100M is required for each link. The unit receives a stable, accurate timing signal from its integrated GPS receiver, which obtains signals generated concurrently from 12 medium-earth-orbit satellites. That signal is fed to the PTP 600 ODU via its SYNC port, giving the link a reference point for timing synchronization.

Once the UltraSync GPS-100M has been installed, the PTP 600's TDD synchronization capability can be enabled and configured using the PTP 600's installation wizard.



After enabling the TDD Synchronization Mode and applying power to the PTP 600's PIDU Plus (Power Indoor Unit), the following Status LEDs inside the UltraSync™ GPS-100M will become active:



+3.3V – When lit, this LED indicates that the daughterboard and motherboard have power.

RF_ON – When lit, this LED indicates that the UltraSync GPS-100M's radio circuitry has power.

GPS_FIX – A few minutes after the +3.3V and RF_ON LEDs, the GPS_FIX LED will light, indicating that GPS synchronization has been established with the medium earth-orbit GPS satellites.

PPS_OUT – Subsequent to the GPS_FIX LED lighting, the PPS_OUT LED will begin blinking faintly at one pulse-per-second to indicate that synchronization has been initiated.

For complete installation instructions, refer to the UltraSync GPS-100M User Manual and the PTP 600 User Manual.

MOTOwi4™

The wi4 Fixed PTP 600 Series bridges and the wi4 Fixed PTP Lightning Protection Unit are part of Motorola's MOTOwi4 portfolio of innovative wireless broadband solutions that create, complement and complete IP networks. Delivering IP coverage to virtually all spaces, the MOTOwi4 portfolio includes wi4 Fixed, wi4 Mesh, wi4 Indoor and wi4 WiMAX solutions for private and public networks.

UltraSync™ GPS-100M installed with a PTP 600 radio and a PTP Lightning Protection Unit

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