

Universal Global Positioning System User Guide

APR 2011
UGPSUSERGUIDEvA

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1 UGPS User Guide

1.1 What is covered in this manual?

The audience for this document includes network planners, system operators, network administrators, and equipment installers. This guide covers the UGPS product details as well as UGPS installation instructions.

1.2 Version information

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

Version	Date of issue	Description
A	APR 2011	Initial release

1.3 Purpose

Motorola Solutions, Inc. documents provide the information to operate, install, and maintain Motorola Solutions, Inc. equipment. It is recommended that all personnel engaged in such activities be properly trained by Motorola Solutions, Inc.

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Motorola Solutions, Inc. appreciates feedback from users about our customer documents. Contact the technical support team in your area with any feedback or issues with the documents.

1.4.1 U.S. and Canada

E-mail: EMS-EICC-RM@motorolasolutions.com

Telephone: 1-866-961-9288

1.4.2 Latin and Central America

E-mail: EMS-EICC-RM@motorolasolutions.com

Table 1: Latin and Central America Contact Telephone Numbers

Country	Telephone Number
Argentina	0800-666-2789
Brazil	0800-891-4360
Columbia	01-800-912-0557
Mexico	001-800-942-7721
Peru	0800-70-086
All other Latin and Central American countries	+420 533 336 946

1.4.3 Europe, Middle East, and Africa

E-mail: EMS-EICC-RM@motorolasolutions.com

Table 2: Europe, Middle East, and Africa Contact Telephone Numbers

Country	Telephone Number
Denmark	043682114
France	0157323434
Germany	06950070204
Italy	0291483230
Lithuania	880 030 828
Netherlands	0202061404
Norway	24159815
Portugal	0217616160
Spain	0912754787
Russia	810 800 228 41044
Saudi Arabia	800 844 5345
South Africa	0800981900
United Kingdom	0203 0277499

1.4.4 Asia and Pacific

E-mail: EMS-EICC-RM@motorolasolutions.com

Table 3: Asia and Pacific Contact Telephone Numbers

Country	Telephone Number
Australia	1 800 457 439
China, local DID	+86 21 6108 6109
China, northern	10 800 713 0885
China, southern	10 800 130 0867
Hong Kong	30 027 861
India	000 800 100 3098
Indonesia	001 803 015 20 20530
Japan	221626765
Malaysia	1 800 812 384
New Zealand	0 800 448 472
Philippines	63 29 003 057
Singapore	64 155 110
South Korea	080 681 0880
Taiwan	00 801 14 8690
Thailand	001 800 441 0950

1.4.5 All Other Countries

Customer Support: <http://motorola.wirelessbroadbandsupport.com/support/technical.php>

Telephone: +420 533 336 946

2 Product Description

2.1 Overview

The Motorola Solutions, Inc. Universal Global Positioning System (UGPS) is a stand-alone GPS antenna and receiver with the capability to provide a 1PPS GPS synchronization signal to Motorola Solutions, Inc. access points (APs), backhaul masters (BHM), or cluster management modules (CMMs).

The UGPS features two timing ports for sending GPS timing sync. One or two access points/backhaul masters/cluster management modules may be synchronized directly by the two timing ports.

Currently the UGPS may be used with the following Motorola Solutions, Inc. equipment:

- PMP 100 FSK AP
- PTP 100 FSK BH
- PMP 430 OFDM AP
- PMP 400 OFDM AP
- PTP 200 OFDM BH
- PTP 230 OFDM BH
- CMM3 (Slave mode)
- CMM4 (Slave mode)

NOTE

To use the Motorola Solutions, Inc. UGPS in a PMP 320 system operators must configure the UGPS to provide synchronization to the PMP 320 access points through a CMM3 or CMM4 (the UGPS is connected to the CMM unit that manages the PMP 320 access points).

The connector interface for the UGPS is detailed in [Figure 1](#) below:

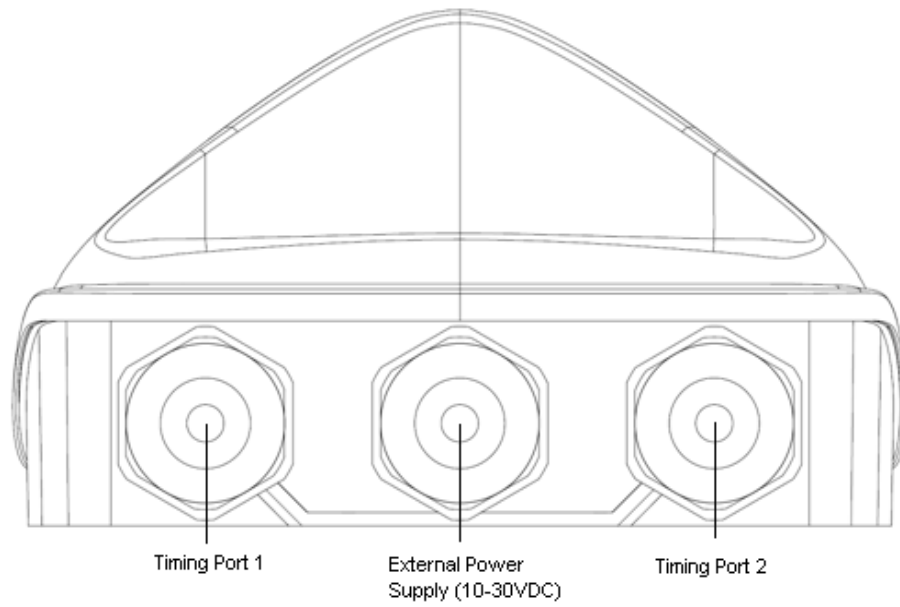


Figure 1: UGPS Connector Interface

2.2 UGPS Power Source Configurations

The UGPS module may be powered by an external source via the UGPS Auxiliary Power Port, and the UGPS may also be powered by a backhaul master via one of the UGPS Timing Ports. When the UGPS is powered by a backhaul master via one of the Timing Ports, the backhaul master provides the necessary power to enable 1 PPS synchronization timing and serial GPS location data by the UGPS (which is sent back to the backhaul master via the associated Timing Port). If the UGPS is receiving power on the Auxiliary Power Port (via 29.5V DC power supply or CMM port) *and* power on Timing Port 1 or Timing Port 2, the UGPS defaults to using the auxiliary power supply.

2.2.1 External Power Only

Shown below are examples of external only powering for PMP 100 and PMP 400/430 units. In this case the UGPS is powered via RJ-45 cable connected to a Motorola Solutions, Inc. 29.5V DC power supply. The UGPS may also receive power through the Auxiliary Power Port via a power-over-Ethernet port on a CMM4. The radios receive thier GPS sync through an RJ-11 cable connected to either Timing Port 1 or Timing Port 2 of the UGPS.

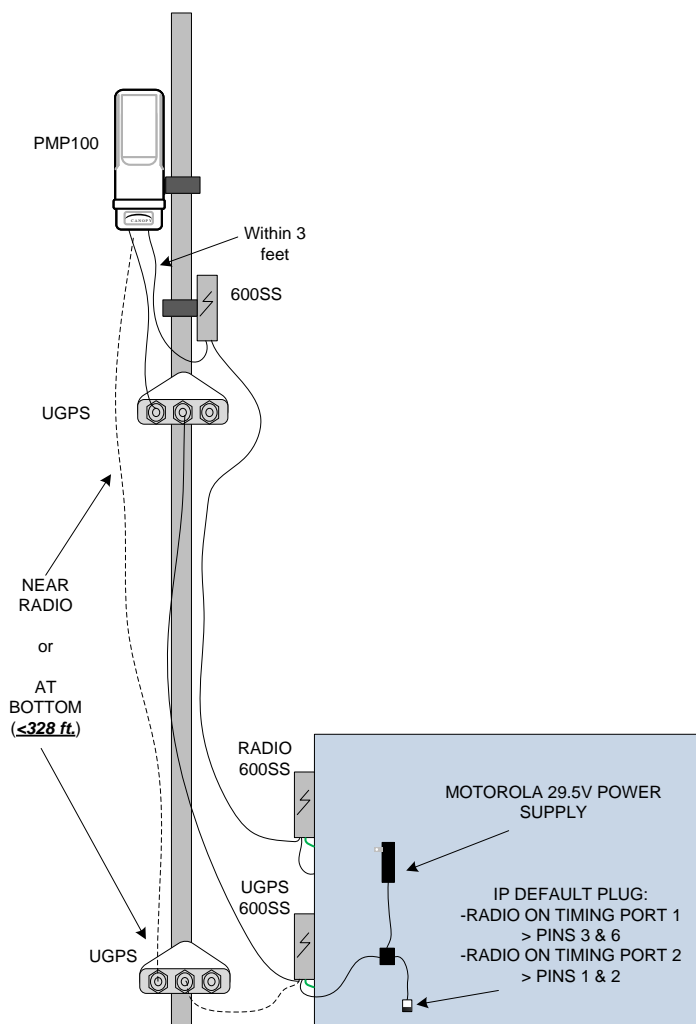


Figure 2: PMP 100 AP Receiving Synchronization from Auxiliary Powered UGPS

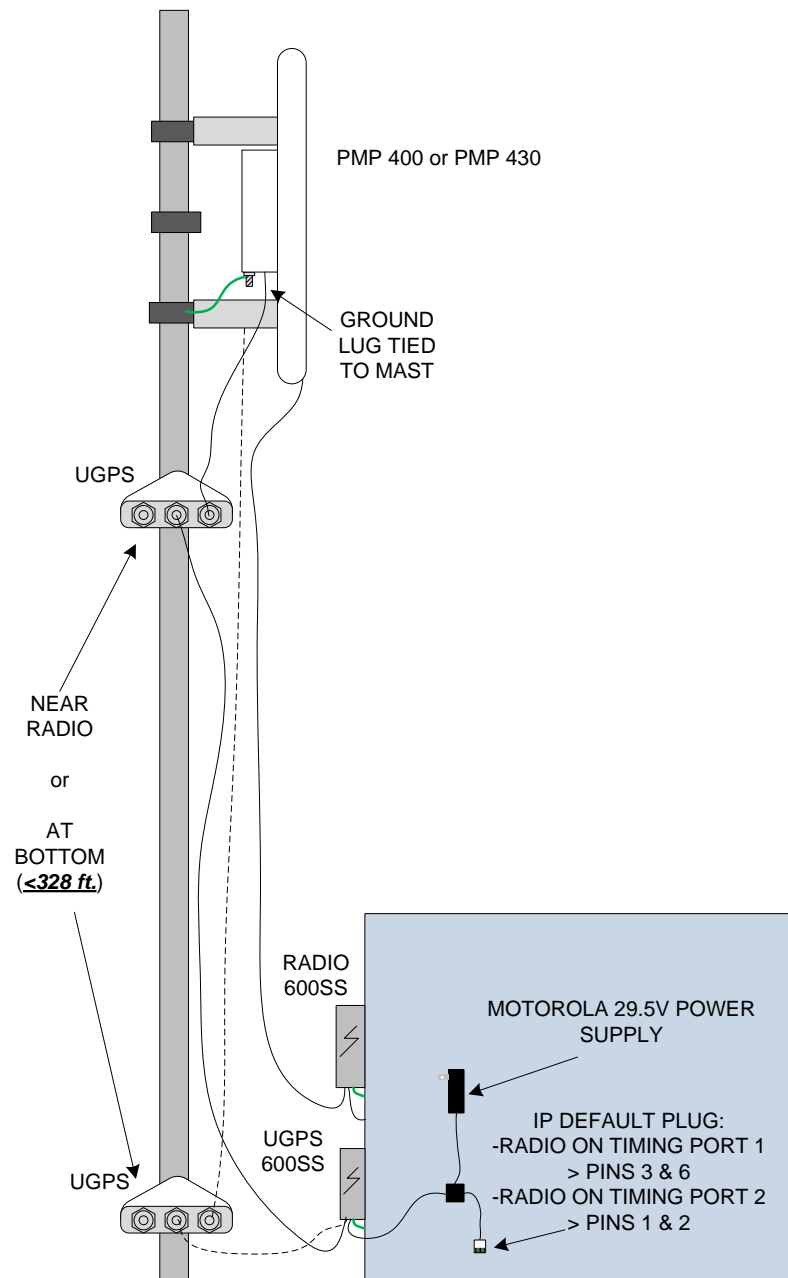


Figure 3: PMP 400 or PMP 430 AP Receiving Synchronization from Auxiliary Powered UGPS

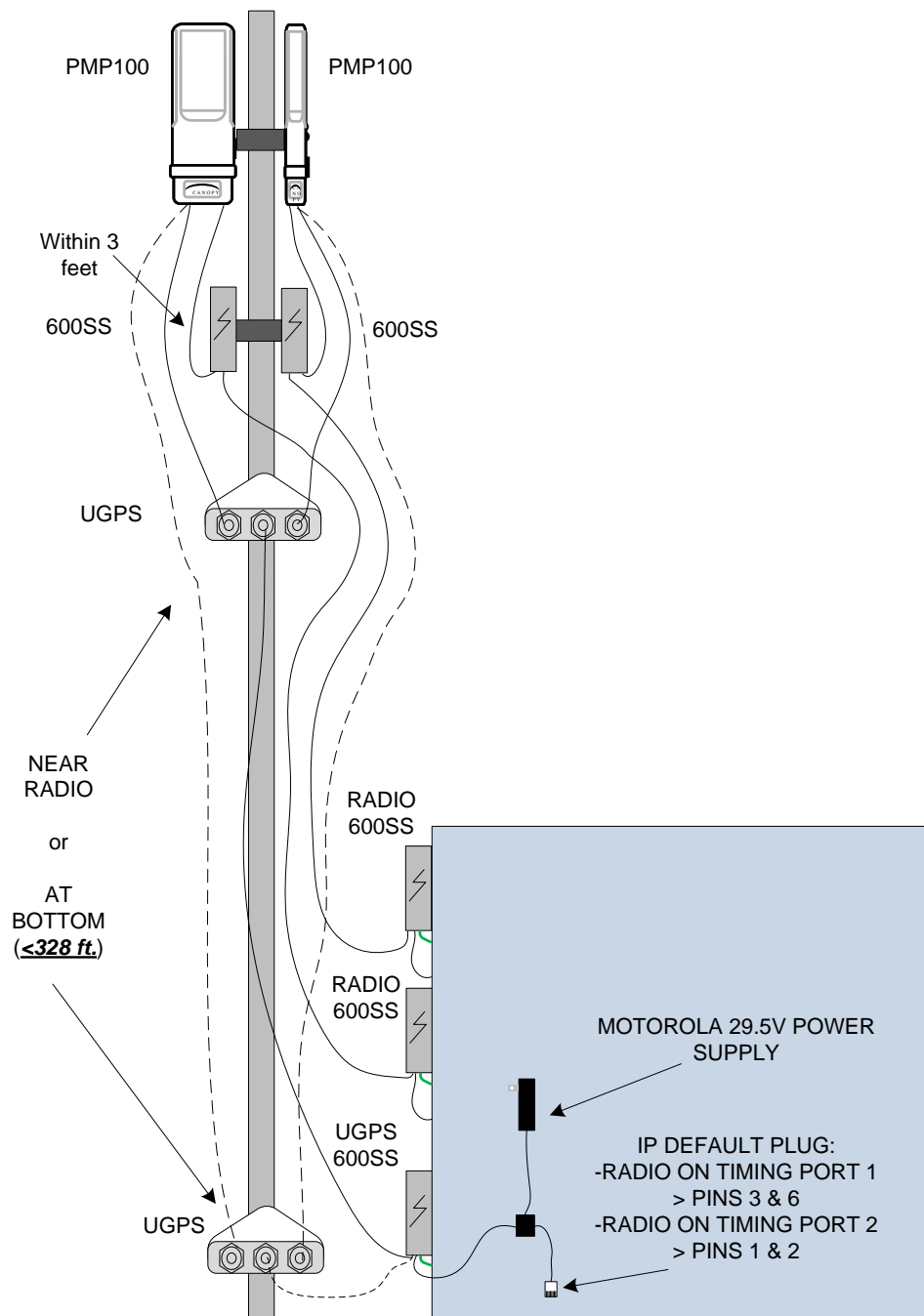


Figure 4: Two PMP 100 APs Receiving Synchronization from Auxiliary Powered UGPS

2.2.2 Power from the Backhaul Master via Timing Port 1 or Timing Port 2

Shown below is an example of a UGPS unit powered from a PTP 230 BHM through an RJ-11 cable connected to either Timing Port 1 or Timing Port 2 of the UGPS. The UGPS may be powered by either Timing Port, and one or two radios may receive sync over the Timing Ports when the UGPS is powered in this fashion.

NOTE

This UGPS powering mode is currently supported only by PTP 230 BHM . Future Motorola Solutions, Inc. hardware releases will also support providing power to the UGPS.

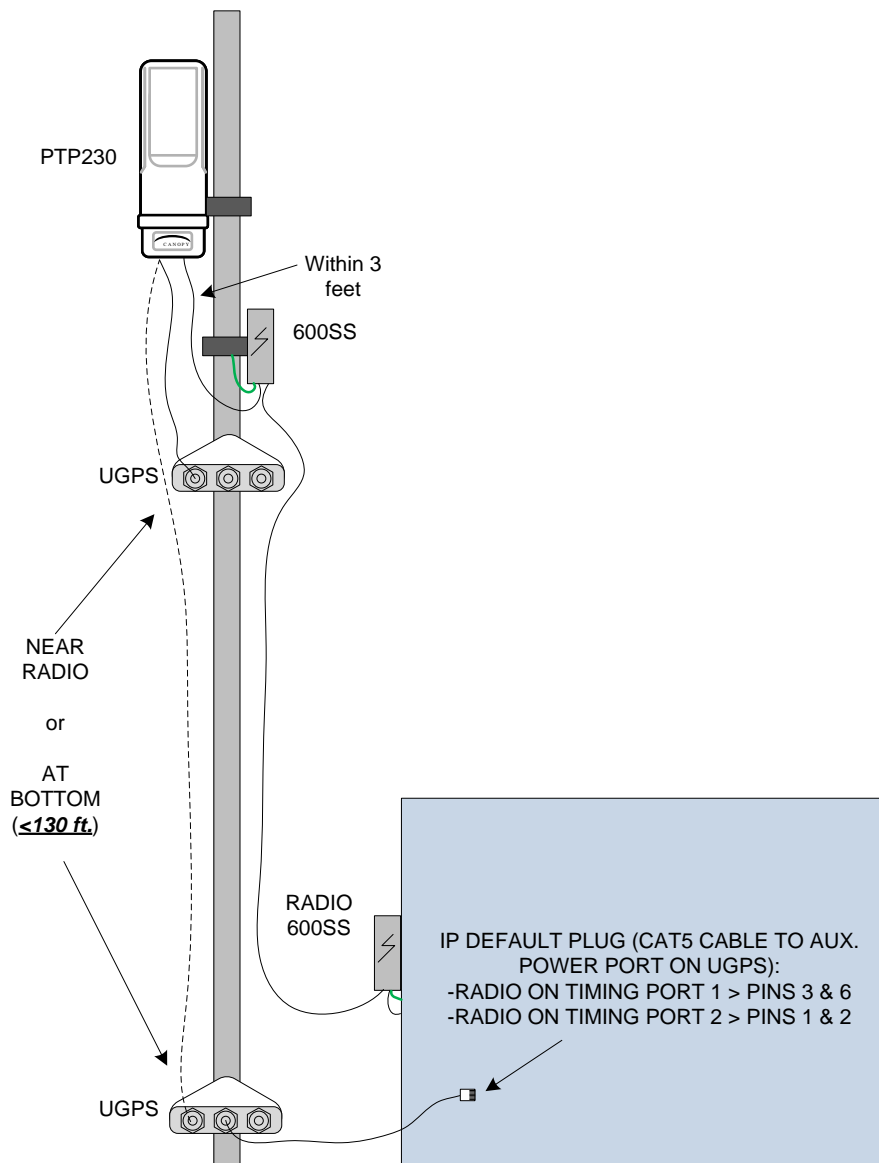


Figure 5: PMP 100 AP Powering UGPS and Receiving Synchronization

2.3 UGPS and CMM Configurations

The UGPS may be used as a GPS synchronization source for Motorola Solutions, Inc. CMM3 and CMM4 (Cluster Management Module) units. The UGPS provides GPS synchronization to the CMM unit via the CMM's sync port. This allows any access points or backhaul masters connected to the CMM to receive sync. This configuration requires that the CMM3 or CMM4 be configured to "Slave" mode via the CMM GUI. When using the UGPS as a synchronization source for a CMM3 or CMM4, a special sync cable must be used. This cable may be constructed from the an RJ-11 cable using the pin configuration in [Table 3](#).

2.4 Product Specifications

Antenna

Frequency Band.....	L1 (1575.42 ±10 MHz)
Polarization.....	Patch

Receiver

Tracking Channels.....	12 (Min.) Continuous Tracking
Update Rate.....	1 Hz (NMEA)
Timing Accuracy (1PPS).....	100ns RMS
Position Accuracy	<3 m (Vertical), <10m (Horizontal)

Data Interface

Communications Standard	NMEA-0183
Interface Technology.....	1PPS (8Vp-p Level-Shifted Pulse, 100ms Duty Cycle) TX GPS LOCATION DATA (8Vp-p Level-Shifted – Serial 8/N/1 9600bps)

Acquisition

Cold Start	35 seconds (Typical and under open clear sky)
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Sensitivity

Acquisition	-148dBm
Tracking	-165dBm

Electrical

Voltage.....	4.3V - 6V DC (Timing Ports 1 & 2: +Vap) 10V - 30V DC (External Power Port: +Vext)
Power	250mW (2 APs Loaded; Vap=4.3V DC) 500mW (2 APs Loaded; Vap=0V DC; Vext=30V DC)
Cable Length	35m. (120 ft.) 2 APs Loaded; Vap(min) = 4.3V DC 100m. (330 ft.) 2 APs Loaded; Vap=0V; Vext=30V DC

Environmental

Operating Temperature	-40C to +85C
Humidity	95%
Ingress Protection	IP67

Mechanical

Dimensions	6 inch(Length) x 3.5 inch(Width) x 4 inch(Dome Height)
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Product Description

Electrical Interface..... RJ11-6 Position Shielded(x2), RJ45-8 Position Shielded
Connector..... IP67 Rated Connector (Lapp Cord Grip Style)
Weight 15 Oz.

3 UGPS Installation and Operation

3.1 General Installation Considerations


- The unit may be pole mounted or surface mounted (on a horizontal surface with an unobstructed view of the sky).
- The UGPS should NOT be installed as the highest object at the site.
- Orient the GPS antenna so that it has clear access to the southern horizon (if installed north of the equator) or clear access to the northern horizon (if installed south of the equator).
- Note locations of 600SS surge suppressors when installing the UGPS unit. Reference [UGPS Power Source Configurations](#) diagrams. Compatible power supplies for the UGPS are listed in [Table 1](#).
- Observe cable length specifications in [Table 2](#).
- Motorola Solutions, Inc. recommends using shielded Category 5E cables for outdoor installations.
- The UGPS Power over Ethernet pinout (Auxiliary Power Port) differs from IEEE Standard 803.3af, and the two should not be intermixed. The UGPS Power over Ethernet pinout is the same as Motorola Solutions, Inc. FSK broadband radios.

Table 1: Compatible 29.5V Power Supplies

Model	Description
ACPSSW-09B	US, UK and EU clips included
ACPSSW-10B	Argentina clip
ACPSSW-11A	Australia clip
ACPSSW-12A	Fixed Blade China
ACPSSW-13B	Fixed Blade US
ACPSSW-14A	Brazil clip
ACPSSW-20A	Infrastructure grade (shielded cable), US, UK and EU clips
ACPSSW-21A	Infrastructure grade (shielded cable), AC adapter clip (IEC 2-wire AC cord also required)

Table 2: Cable Length Specification

Configuration	Powering Method	Maximum Cable Length (feet)
Auxiliary power source, up to two access points/backhaul masters	29.5V DC AC/DC Adapter (see Table 1)	330
Access point/backhaul master power source, up to	Access Point/Backhaul master RJ-11 GPS	120

two access points/backhaul masters	power via UGPS Timing Port	
 NOTE This UGPS powering mode is supported only by PTP 230 BHM . Future Motorola Solutions, Inc. hardware releases will also support providing power to the UGPS.		

 **NOTE**

When using the UGPS as a synchronization source for a CMM3 or CMM4, a special sync cable must be used. This cable may be constructed from the an RJ-11 cable using the pin configuration in [Table 3](#).

Table 3: UGPS to CMM Cable Pin Configuration

UGPS Pin	CMM3/CMM4 Pin
1	1
2	2
3	3
4	4
5	5
6	6

3.2 Installation Procedure

Use the following procedure to install the UGPS module and to verify operation.

Procedure 3-1 UGPS Installation – Auxiliary Powered

1	Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.
----------	--

- 2** Configure (via web management interface) the access points/backhaul masters to sync to received GPS signal (via the timing port). Navigate to **Configuration > General** and set the **Sync Input** to **Sync to Received Signal (Timing Port/uGPS)**. Since the UGPS will be configured with an auxiliary power source, set the **uGPS Power** value to **Disabled**.

Sync Setting	
Sync Input :	Sync to Received Signal (Timing Port/uGPS) ▼
uGPS Power :	<input type="radio"/> Enabled <input checked="" type="radio"/> Disabled
Verify GPS Message Checksum :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled

Figure 6: Configuring the Sync Input and Disabling uGPS Power

- 3** Click **Save Changes** and reboot the radio.
- 4** If connecting the UGPS to a CMM3 or CMM4, configure the CMM (via the CMM web management interface) to Slave mode (access points/backhaul masters connected to the CMM will need to be set to receive GPS sync signal from the power port). Navigate to **Configuration > CMM** and set **Sync Source** to **Slave (RJ11 Port)**. A reboot on the CMM is required for these changes to take effect.
- 5** Connect an RJ-11 6 pin cable from Timing Port 1 of the UGPS to the RJ-11 utility port of the access point/backhaul master to receive GPS sync signal. If applicable, repeat this step for additional access points and backhaul masters. If the UGPS is to send sync to a CMM, use a special sync cable constructed per [Table 3](#).
- 6** Install a 600SS surge suppressor between the power supply and the UGPS module. Reference the diagrams in section [UGPS Power Source Configurations](#).
- 7** Connect an RJ-45 8 pin Ethernet cable from the UGPS power port to the 600SS surge suppressor.
- 8** Connect an RJ-45 8 pin Ethernet cable from the 600SS surge suppressor to the power supply.
- 9** Verify on the access point/backhaul master/CMM that the GPS synchronization signal is being received properly. Reference section [GPS Status and Location Data Readout](#).

Procedure 3-2 UGPS Installation – Powered by BH Timing Port

- 1** Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.

- 2** Configure (via the web management interface) the backhaul master to sync to received signal (timing port). Navigate to **Configuration > General** and set the **Sync Input** to **Sync to Received Signal (Timing Port/uGPS)**. Since the UGPS will be configured to receive power over the UGPS Timing Ports, set the **uGPS Power** value to **Enabled** to configure the radio to power the UGPS.

Sync Setting	
Sync Input :	Sync to Received Signal (Timing Port/uGPS)
uGPS Power :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled
Verify GPS Message Checksum :	<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled

Figure 7: Configuring the Sync Input and Enabling uGPS Power

- 3** Click **Save Changes** and reboot the radio.

- 4** Connect an RJ-11 6 pin cable from Timing Port 1 or 2 of the UGPS to the timing port of the access point/backhaul master providing power and receiving sync.

NOTE

This UGPS powering mode is currently supported only by PTP 230 BHM . Future Motorola Solutions, Inc. hardware releases will also support providing power to the UGPS.

- 5** Verify on the access point/backhaul master that the GPS synchronization signal is being received properly. Reference section [GPS Status and Location Data Readout](#).

Procedure 3-3 UGPS Installation – Powered by CMM PoE Port

- 1** Pole mount or surface mount the GPS antenna following the installation guidelines and specifications listed in this chapter.
- 2** Verify that the CMM is powered by a 29.5V Motorola Solutions, Inc. power supply. This ensures that the CMM can provide the proper power-over-Ethernet output via CMM ports.
- 3** Connect an RJ-45 8 pin Ethernet cable from the Auxiliary Power Port of the UGPS to an Ethernet port on the CMM4.

- 4** On the CMM4 web management GUI navigate to **Configuration > Ports**. In this configuration the CMM4 port connected to the UGPS via RJ-45 cable must be configured with **Power On** and **Device Type Canopy 29V** as Port 1 in [Figure 8](#).

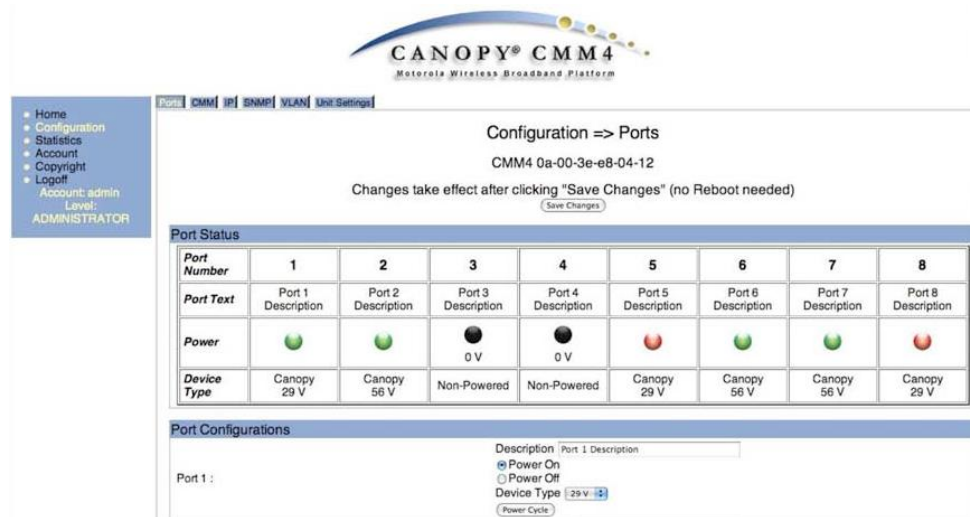


Figure 8: CMM Port Configuration for UGPS Power

3.3 IP Default Bypass

Since the UGPS is connected to the access point/backhaul master timing port, the UGPS module provides a bypass to perform an IP Default to a device connected on UGPS Timing Port 1 or 2. To perform an IP Default for a radio connected to the UGPS follow the procedures below:

Procedure 3-4 IP Default Procedure – UGPS receiving auxiliary power

- 1** Using the power adapter providing UGPS power, plug the “To Computer” RJ-45 plug of the power adapter cable into an RJ-45 coupler.
- 2** **Attach an RJ-45 8 pin Ethernet cable to the coupler listed in Step 1, and pin out the loose end of the cable.**

3	<p>Jumper the RJ-45 pins per the wiring table below:</p> <p>Table 4: UGPS IP Default Bypass Wiring</p> <table border="1"> <thead> <tr> <th>AP to Default</th><th>Wiring on Auxiliary Power Connector</th></tr> </thead> <tbody> <tr> <td>Timing Port 1</td><td>Connect Pins 3 and 6</td></tr> <tr> <td>Timing Port 2</td><td>Connect Pins 1 and 2</td></tr> </tbody> </table>	AP to Default	Wiring on Auxiliary Power Connector	Timing Port 1	Connect Pins 3 and 6	Timing Port 2	Connect Pins 1 and 2
AP to Default	Wiring on Auxiliary Power Connector						
Timing Port 1	Connect Pins 3 and 6						
Timing Port 2	Connect Pins 1 and 2						
4	<p>Reset the radio to be defaulted while the RJ-45 pins are jumpered. After the radio has finished resetting, the software will be restored to a factory default configuration.</p>						

Procedure 3-5 IP Default Procedure – UGPS receiving power from backhaul master timing port

1	<p>With the UGPS unit powered by the backhaul master's timing ports, connect an RJ-45 8 pin Ethernet cable to the Auxiliary Power Port on the UGPS and pin out the loose end of the cable.</p>						
2	<p>Jumper the RJ-45 pins per the wiring table below:</p> <p>Table 5: UGPS IP Default Bypass Wiring</p> <table border="1"> <thead> <tr> <th>AP to Default</th><th>Wiring on Auxiliary Power Connector</th></tr> </thead> <tbody> <tr> <td>Timing Port 1</td><td>Connect Pins 3 and 6</td></tr> <tr> <td>Timing Port 2</td><td>Connect Pins 1 and 2</td></tr> </tbody> </table>	AP to Default	Wiring on Auxiliary Power Connector	Timing Port 1	Connect Pins 3 and 6	Timing Port 2	Connect Pins 1 and 2
AP to Default	Wiring on Auxiliary Power Connector						
Timing Port 1	Connect Pins 3 and 6						
Timing Port 2	Connect Pins 1 and 2						
3	<p>Reset the radio to be defaulted while the RJ-45 pins are jumpered. After the radio has finished resetting, the software will be restored to a factory default configuration.</p>						

3.4 GPS Status and Location Data Readout

The UGPS provides location data to connected synchronized devices and may be retrieved by the access point/backhaul/cluster management module web GUI or by SNMP.

3.4.1 Retrieving GPS Status and Location Data via Radio Web Management GUI

Procedure 3-6 Retrieving GPS Status and Location Data via Radio Web Management GUI

- 1** With the UGPS powered and connected to the radio, navigate to **Home > GPS Status**.
- 2** GPS Location Data is displayed in section **GPS Status**.

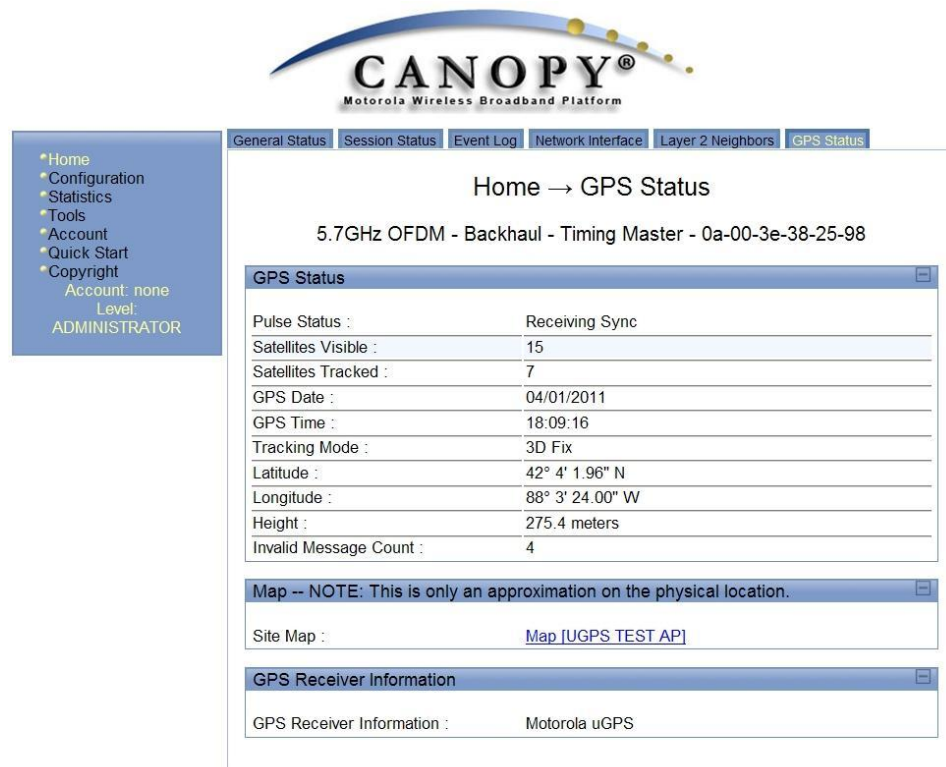


Figure 9: GPS Status and Location Data

3.4.2 Retrieving GPS Status and Location Data via SNMP

To retrieve GPS Status and Location Data via SNMP (Simple Network Management Protocol) from synchronized devices operators may use the following procedure.

Procedure 3-7 Retrieving GPS Status and Location Data via SNMP

- 1** With the UGPS powered and connected to the radio, on the radio web management GUI navigate to **Configuration > SNMP**.
- 2** Verify that the **Community String** and **Accessing Subnet** values are set as desired.

3

Perform an “snmpget” command for the OID desired based on [Table 6](#).

Table 6: SNMP Details

Object Name	OID	Description
whispGPSStatus	.1.3.6.1.4.1.161.19.3.1.3.1	GPS synchronization info (1: GPS Synchronized, 2: GPS Lost Sync, 3: Generating Sync)
gpsSyncSource	.1.3.6.1.4.1.161.19.3.1.3.2	Source of GPS sync pulse
gpsSyncStatus	.1.3.6.1.4.1.161.19.3.1.3.3	Current GPS sync status
gpsTrackingMode	.1.3.6.1.4.1.161.19.3.1.3.4	GPS tracking mode
gpsTime	.1.3.6.1.4.1.161.19.3.1.3.5	GPS time
gpsDate	.1.3.6.1.4.1.161.19.3.1.3.6	GPS date
gpsSatellitesTracked	.1.3.6.1.4.1.161.19.3.1.3.7	Current number of satellites GPS is tracking
gpsSatellitesVisible	.1.3.6.1.4.1.161.19.3.1.3.8	Number of satellites visible to the GPS
gpsHeight	.1.3.6.1.4.1.161.19.3.1.3.9	GPS height
gpsLatitude	.1.3.6.1.4.1.161.19.3.1.3.11	GPS latitude
gpsLongitude	.1.3.6.1.4.1.161.19.3.1.3.12	GPS Longitude

4 Regulatory, Legal, and Safety Notices

4.1 IMPORTANT NOTE ON MODIFICATIONS

Intentional or unintentional changes or modifications to the equipment must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and voids the manufacturer's warranty.

4.2 Universal GPS module label

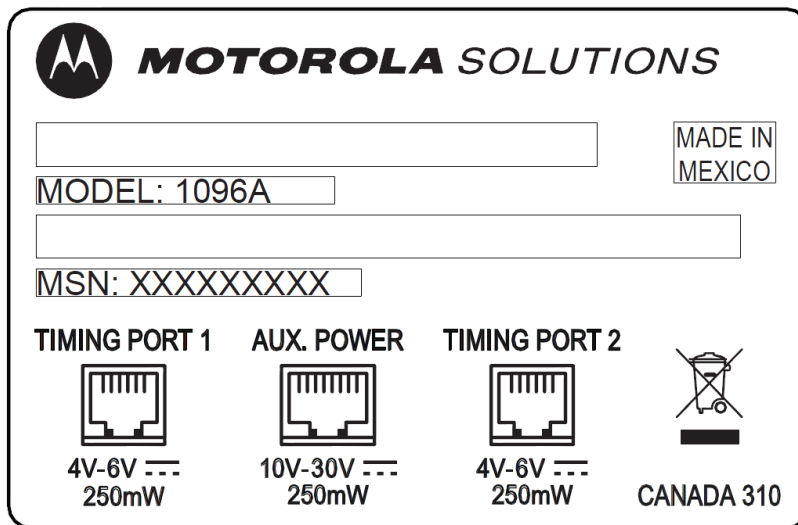


Figure 10: UGPS Label

4.3 NATIONAL AND REGIONAL REGULATORY NOTICES

4.3.1 U.S. Federal Communication Commission (FCC) Notification

This device complies with Part 15 of the US FCC Rules and Regulations. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the US FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help.

4.3.2 Industry Canada Notification

This Category II radiocommunication device complies with Industry Canada Standard RSS-310.

Ce dispositif de radiocommunication de catégorie II respecte la norme CNR-310 d'Industrie Canada.

Operation is subject to the following two conditions:

- This device may not cause harmful interference and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio-frequency energy and if not installed and used in accordance with these instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to correct the interference by one or more of the following measures:

- Increase the separation between the affected equipment and the unit;
- Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to;
- Consult the dealer and/or experienced radio/TV technician for help

4.3.3 Equipment Disposal

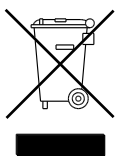


Figure 11: Waste Disposal of Electronic and Electric Equipment

Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or service center for information about the waste collection system in your country.

4.3.4 LIMIT OF LIABILITY

IN NO EVENT SHALL MOTOROLA SOLUTIONS, INC. BE LIABLE TO YOU OR ANY OTHER PARTY FOR ANY DIRECT, INDIRECT, GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR OTHER DAMAGE ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR ANY OTHER PECUNIARY LOSS, OR FROM ANY BREACH OF WARRANTY, EVEN IF MOTOROLA SOLUTIONS, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.) IN NO CASE SHALL MOTOROLA SOLUTIONS, INC. LIABILITY EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT.