GPSR400
Quick Start Guide
Introduction

Microlab’s digital GPS repeater system can be used for cellular communications UTC synchronization for locations where the GPS signals are not readily available. The system is built with Microlab’s patent-pending Digital SkyTiming Technology™ offering industry-first GPS signal transmission via CPRI for highly accurate timing and location. The system offers several configurations for indoor and outdoor applications.

The GPS timing system is configured with indoor unit and outdoor unit. Both models sold separately. Model GPSR400 is meant to work with Indoor Head-End Unit model GPSR116.

GPS Repeater Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPSR116</td>
<td>Indoor head-end receiver, 16 RF output, 1RU</td>
</tr>
<tr>
<td>GPSR400</td>
<td>Outdoor GPS signal transmitter, 4 antenna inputs, US version</td>
</tr>
</tbody>
</table>

Unpacking and Inspection

Carefully unpack the GPSR400 remote unit and check for damaged or missing parts. The remote unit ships with the following:

- **GPSR400 Remote Unit**
- **Two (2) 59” DC Power Cables** (Part #: 1-2273029-1)
- **Quick Start Guide**

GPSR400 - Front and Bottom Panels

Note: Product appearance varies by model

Hardware Needed

The following items are recommended for Setup and operation:

- M10 Mounting Screws
- -48/+/24VDC power supply with included power cable OR Microlab GPSA003 AC/DC Adapter (not included)
- One ethernet cable (RJ45 connectors)
- One PC or Laptop with an ethernet port or ethernet USB adapter
- Singlemode duplex fiber < 2km in length (with Duplex LC/UPC Interfaces)

Please contact Sales for other fiber length requirements.
System Connection Diagram

The following diagram illustrates how the GPS repeater system is utilized.

Mounting Installation

This GPS signal transmission system is designed to be setup by professional communications systems installers.

Remote model **GPSR400** should be mounted securely using the four enclosure mounting brackets provided. **GPSR400** remote units should be mounted flat against a wall or column with connection panel at bottom. Provide adequate space of at least 1 foot at the bottom for all system connections.

In a well structured support wall that it is reinforced with a 3/4 inch thick plywood of additional backing, mount the enclosure using four (4) M10 screws (not included) to bear the unit weight.
Connections RF, Optical, and Ethernet

Follow these steps for connecting and disconnecting RF and optical fiber cables to the unit. Make all connections before powering up the remote unit.

Connect fiber optic and RF cables as shown in the System Connection Diagram.

It is recommended that the companion Head End Unit has been properly installed, Fiber-Fed, and Powered ON before Installing the Remote unit. Please refer to Head End Unit User Manual.

If Head-End unit is not installed, skip the Fiber LED status verification in the “LED/System Verification” section.

Sequence to connect:
   - The remote unit comes with a .25-20FLANGENUT grounding lug. A grounding wire of suitable gauge must be used to ground to a common bus bar in the Telecom room according to local and building regulations.

2. Connect GPS Antennas to ports GPS In 1, GPS In 2, GPS In 3, and GPS In 4.
   - Two (2) antennas required for operation.
   - Apply coupling torque of 5 Nm to 4.3-10 connectors
   - Only use operator approved GPS Antennas
3. Connect Singlemode duplex fiber with Duplex LC/UPC Interfaces to optical port F/O 1 *(Other Interfaces available)*
   - Fiber length must be shorter than 2km Please contact Sales for other fiber length requirements
   - Clean fiber before connecting
   - Optical ports can be connected in any manner
   - Only one optical fiber connection needed for operation.
   - Recommended second fiber connected to optical port F/O 2 for redundancy.

4. *(Optional)* Connect Ethernet Cable to the unit’s Ethernet Local port
   Local/Debug port used for on-site debugging while maintaining connection to the NOC (Network operations center)

   Note: Both Ethernet ports on the GPSR400 are a transparent bridge. Both Remote Unit and Head-End supports Ethernet over CPRI. Either unit can provide a local network connection to the other. See section “System Configuration and Operation”

DO NOT CONNECT THE REMOTE UNIT AND HEAD-END TO THE SAME SWITCH. CONNECTING BOTH UNITS ON THE SAME LAN WILL CREATE A BRIDGE LOOP
Connecting Power

Power up Sequence:

Required:
- -48/+24VDC power source with the included power cable. Follow wiring diagram shown
- OR use the Microlab GPSA003 AC/DC power supply (not included)

Power Cable (Part#: 1-2273029-1)

1. Carefully align and mate the power cable M12 Female connector to the remote unit’s Power M12 Male Receptacle

2. Turn on DC power source or plug-in the Microlab GPSA003 to the 100-240VAC outlet.
   - If the remote unit is deployed with the power supply, both LEDs will illuminate.
   - Off Status LEDs indicate that power supply is not functioning or not connected.

Note: Bootup time is approximatelly 60 seconds. During this time both front panel LEDs will be Yellow. After system bootup, LEDs will illuminate RED while waiting for GPS signal lock and Fiber Link connection.
3. Verify GPS and Fiber Link status LEDs turn **GREEN** to ensure proper GPS repeater operation
- **Fiber Status:**
  - Allow up to 5 seconds for fiber/CIPRI connection between Head End and Remote unit to be established and illuminate LED **GREEN**.
- **GPS Status:**
  - Allow up to 5 minutes for GPS signal acquisition.
  - If GPS signal is locked, LED will illuminate **GREEN**.

**LED Indicators**

- **Fiber Status:**
  - Illuminates **Yellow** during bootup
  - Illuminates **RED** while waiting for link with the head-end
  - Illuminates **GREEN** when link is established with Head-End Unit connected to fiber ports **F/O 1** OR **F/O 2**

- **GPS Status:**
  - Illuminates **Yellow** during bootup
  - Illuminates **RED** while waiting for GPS signal acquisition
  - Illuminates **GREEN** when GPS signal has been locked on any antenna

Note: If there is an error during bootup. Both LED’s will remain **Yellow**. Disconnect and reconnect DC power to the unit. If problem persists, please contact Customer Service for troubleshooting assistance.
System Configuration and Operation

The web interface is accessed as described in the following sections. First, the unit must be connected to a router or directly to a computer or laptop via an ethernet cable (Use designated Local/Debug port on the GPSR400).

System Access
Default TCP/IP: 192.168.1.200 (Remote Units)
Default TCP/IP: 192.168.1.201 (Head-End Units)

If the unit is connected directly to a PC/laptop (Windows 10 Recommended)

1. Open the start menu and click on Control Panel.

2. Open “Network and Sharing Center”
System Configuration and Operation (Continued)

3. Click “Change adapter settings”

4. Right click the Network Adapter and open its Properties

System Configuration and Operation (Continued)

6. Check “Use the following IP address” and enter the following settings. Press “OK” to save the settings

   IP address: 192.168.1.20 (address must be within the range of the GPSR400 subnet)
   Range: 192.168.1.1 - 192.168.1.254
   Subnet mask: 255.255.255.0
   Default gateway: 0.0.0.0

Web Console

After following the steps in the previous section. Open an internet browser and type the address http://192.168.1.200. The system log-in page should appear. Type in the default admin username and password.

Username and Password

Username: admin
Password: admin

Note the password is case sensitive
Web Console (System Info)

Viewing System Info:

1. Click “System Info” in the menu tree on the left.
2. View the status of each fiber connection to the head-unit under the “Ethernet” section.
   Working Interfaces **CPRI0** and **CPRI1** will display **Link Up**.
   Otherwise, they will display **Link Down**.
Web Console ("GPS A" and "GPS B")

The GPSR400 unit has two GPS receivers on board for redundancy. These are referred to as "GPS A" and "GPS B". Each receiver has the ability to automatically switch over from a primary GPS antenna to a secondary GPS antenna if there is an antenna failure. The GPSR400 actively monitors the health of all four GPS antennas connected and will seamlessly switch to the best antenna.

Each receiver monitors the following antennas:
- **GPS A**: "GPS In 1 (Antenna A)" & "GPS In 2 (Antenna B)"
- **GPS B**: "GPS In 3 (Antenna C)" & "GPS In 4 (Antenna D)"

View Satellite Data:

1. Click "GPS A" or "GPS B" in the menu tree on the left.
2. Satellite information will be displayed under "Satellite Data" if the respective GPS receiver has successfully locked to a GPS signal on one of it’s corresponding antennas. Otherwise, no data will be displayed for that GPS receiver.

- **Satellite Indicators:**
  - Good/Used Satellites **WILL** be shown in **GREEN**
  - Satellites **NOT** used will be shown in **Yellow**
Web Console (App & Alarms)

View Fiber loss

1. Click “Apps & Alarms” in the menu tree on the left.
2. Scroll down to “System Alarms”
3. Verify fiber loss for each CPRI interfaces (SFP Rx Power / SFP Tx Power)
   If SFP Rx Power is less than -10 dBm, verify all fiber connections

View Antenna Alarms

Any system Alarms triggered will display RED

1. Under “Apps & Alarms”
2. Scroll down to “System Alarms”
3. Verify that the connected antenna(s) are working properly
   Alarms will be GREEN if antennas are working properly
   Alarms will be RED if antennas are failing, disconnected or shorted
Web Console (App & Alarms)

The table below shows the list of alarm causes and resolutions. All alarms listed are available on the web interface of **GPSR400** and **GPSR116**. All alarms are also reportable via SNMP.

<table>
<thead>
<tr>
<th>Alarms</th>
<th>Cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local LOF</td>
<td>loss of CPRI frame including frame synchronization</td>
<td>check optical fiber cable, connection and optical power on both ends</td>
</tr>
<tr>
<td>Local LOS</td>
<td>loss of CPRI signal</td>
<td></td>
</tr>
<tr>
<td>Remote LOF</td>
<td>remote loss of CPRI frame including frame synchronization</td>
<td></td>
</tr>
<tr>
<td>Remote LOS</td>
<td>remote loss of CPRI signal</td>
<td></td>
</tr>
<tr>
<td>SFP LOS</td>
<td>loss of SFP signal</td>
<td></td>
</tr>
<tr>
<td>SFP Present</td>
<td>SFP module not present</td>
<td>call tech support to replace the SFP module</td>
</tr>
</tbody>
</table>

**GPS A:**

| Antenna A       | Antenna port A not connected (open or short)        | check antenna A, cable, connection and +5VDC at “GPS In 1” port of GPSR400 |
| Antenna B       | Antenna port B not connected (open or short)        | check antenna B, cable, connection and +5VDC at “GPS In 2” port of GPSR400 |
| GPS A Lock      | GPS receiver A not locked to GPS satellite signals  | check antenna A, Antenna B, cable, connection and +5VDC as above            |
| GPS A Selected  | GPS receiver A is not selected as signal source     | OK if the other GPS is selected, otherwise check GPS A Lock as above         |

**GPS B:**

| Antenna C       | Antenna port C not connected (open or short)        | check antenna C, cable, connection and +5VDC at “GPS In 3” port of GPSR400 |
| Antenna D       | Antenna port D not connected (open or short)        | check antenna D, cable, connection and +5VDC at “GPS In 4” port of GPSR400 |
| GPS B Lock      | GPS receiver B not locked to GPS satellite signals  | check antenna C, antenna D, cable, connection and +5VDC as above            |
| GPS B Selected  | GPS receiver B is not selected as signal source     | OK if the other GPS is selected, otherwise check GPS B Lock as above         |

**Local GPS:**

| GPS Lock        | local GPS receiver is not locked                    | check CPRI, SFP and antennas as above                                      |

**Notes**

- CPRI: Common Public Radio Interface
- SFP: (Small Form-factor Pluggable) A transceiver for optical fiber cable
- GPS A is connected to either Antenna A (“GPS In 1”) or Antenna B (“GPS In 2”)
- GPS B is connected to either Antenna C (“GPS In 3”) or Antenna D (“GPS In 4”)
- Either RF path of GPS A or RF path of GPS B is selected as input to Local GPS and BS
Web Console (Network)

Change Default IPv4 Network Settings

1. Click “Network” under “Setup” in the menu tree on the left.
2. Select the IP version to be configured (IPv4)
   2.1 Set the desired IP address of the GPSR400. It should be within the range of the gateway.
   2.1.1 Default IP Address: 192.168.1.200
   2.2 Set the subnet mask of the router
   2.2.1 Default Subnet Mask: 255.255.255.0
   2.3 Set the gateway of the router (the router's IP address)
   2.3.1 Default Gateway: 192.168.1.254
   2.4 Set Primary and Secondary DNS addresses
   2.4.1 Default Primary DNS: 192.168.1.254
   2.4.2 Default Secondary DNS: 8.8.8.8
3. Click the Apply button (Current page will not refresh)
4. Reopen internet browser and type the newly configured IP address
   4.1 Popup will appear confirming “Successfully configure the Network”. Press “OK” to continue
   4.2 The system log-in page should appear.
   4.3 Type in the admin username and password.
Disconnecting/Uninstalling

Sequence to Disconnect:

1. Remove/Disconnect DC power to the device
2. Disconnect the RF Antenna connections of the unit.
3. Disconnect optical input of the unit.
4. Disconnect Ethernet connection of the unit (if ethernet-fed).
5. Disconnect Ground
6. Unmount Unit

Disclaimer

GPS and GNSS re-transmission to an antenna requires regulatory approval. These approvals are granted on an individual basis by regulating bodies. Microlab cannot grant these approvals, and cannot be held responsible for violating these regulations using the system.

The FCC requires commercial users within the US to acquire and maintain a Part 5 experimental license to re-broadcast GPS signals. Licenses are not required if they are inside an RF shielded environment. European regulations vary by country. Consult local authorities for additional details.

Contact Microlab - Active Solutions

To contact Microlab, visit our website at www.microlabtech.com or send email to sales@microlabtech.com. For operating assistance in the USA, call (973) 386-9696.

Safety Information

To avoid possible electric shock or personal injury, the following general safety precautions must be observed during all phases of operation, service, or repair of the Microlab Unit. Failure to comply with these precautions or with specific warnings in this guide violates the safety standards of design, manufacture, and intended use of the Microlab Unit. Microlab assumes no liability for the customer's failure to comply with these requirements.