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 sepately. Model **GPSR400** is meant to work with Indoor Head-End Unit model **GPSR116**.

GPS Repeater Models

Model	Description
GPSR116	Indoor head-end receiver, 16 RF output, 1RU
GPSR400	Outdoor GPS signal transmitter, 4 antenna inputs, US version

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)
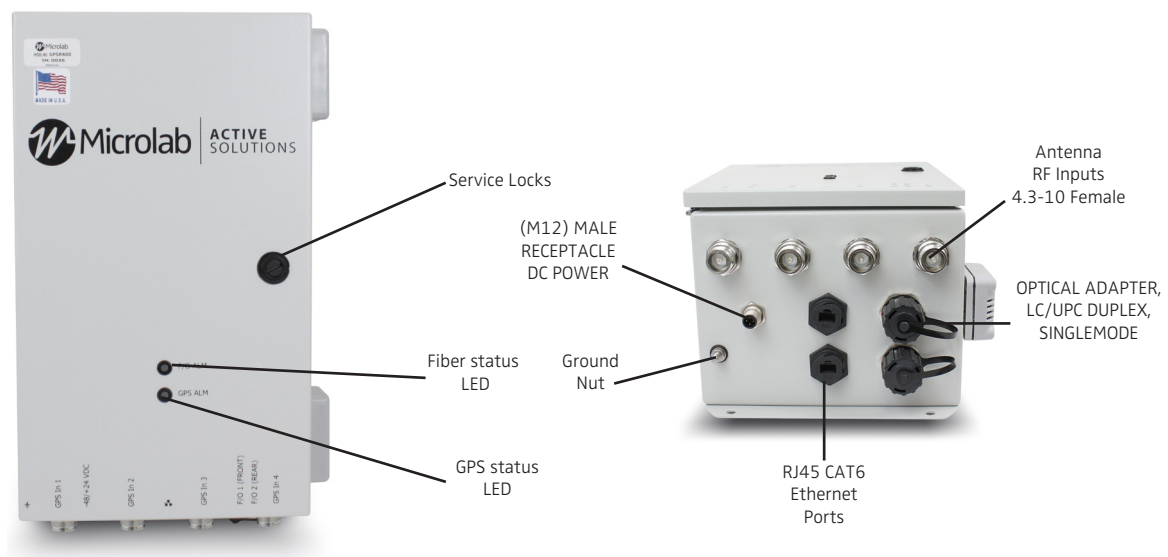- Quick Start Guide

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.

GPSR400 - Front and Bottom Panels

Note: Product appearance varies by model

Service Locks

(M12) MALE RECEPTACLE DC POWER

Fiber status LED

Ground Nut

GPS status LED

Antenna RF Inputs 4.3-10 Female

OPTICAL ADAPTER, LC/UPC DUPLEX, SINGLEMODE

RJ45 CAT6 Ethernet Ports

System Connection Diagram

The following diagram illustrates how the GPS repeater system is utilized

GPS Repeater System
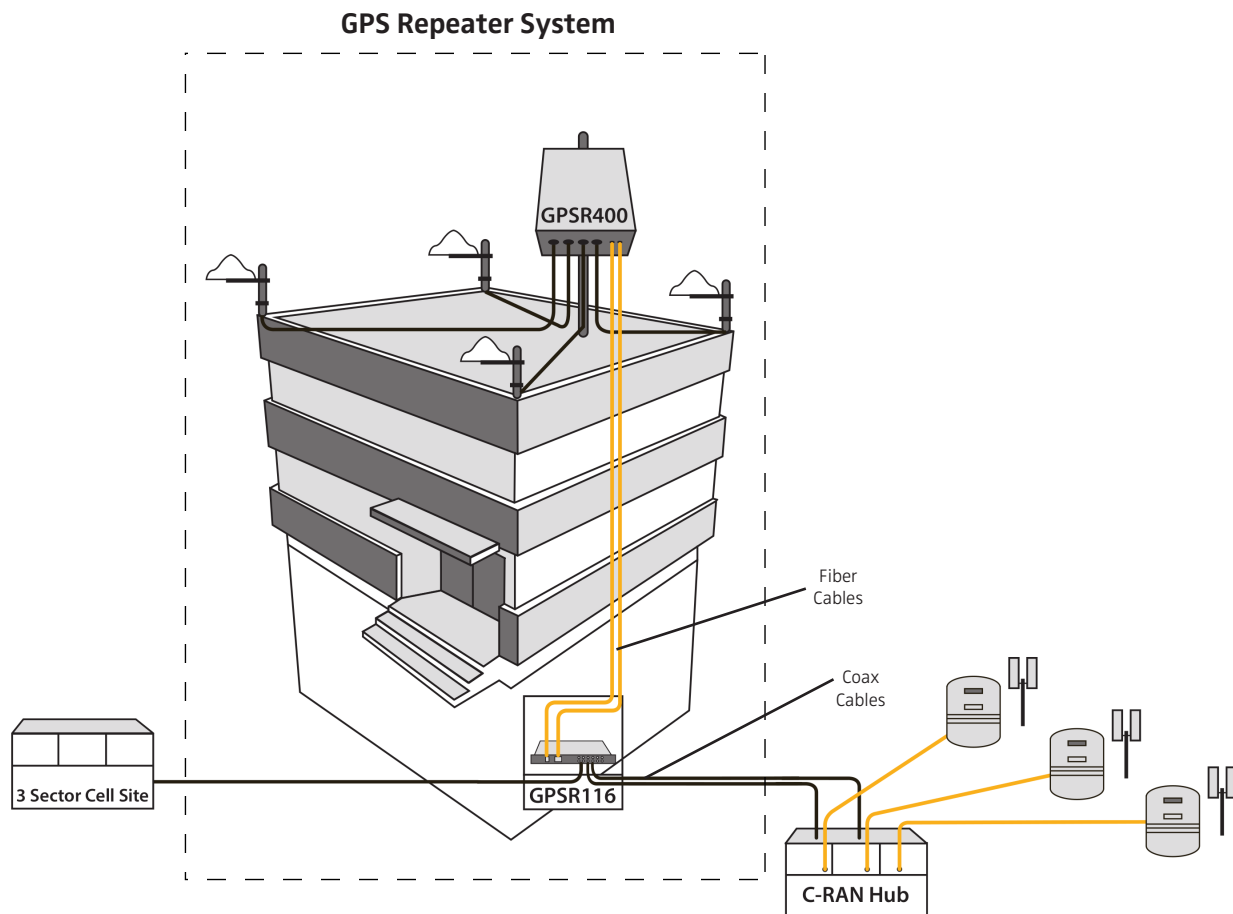
Mounting Installation

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:
1. Connect System Ground.
   - 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*

Connections RF, Optical, and Ethernet (Continued)

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.*

F/O 1
F/O 2
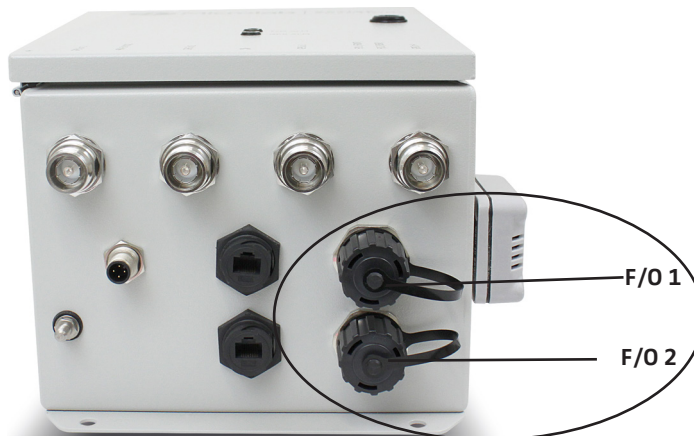
LC/UPC Duplex Interface

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''*

Local
Local/ Debug

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)

Contact Layout
Female

Connect DC Positive and Negative terminals as follow:

1. **Brown /Positive** (+)
2 **White /Positive** (+)
4. **Black /Negative** (-)
3. **Blue /Negative** (-)
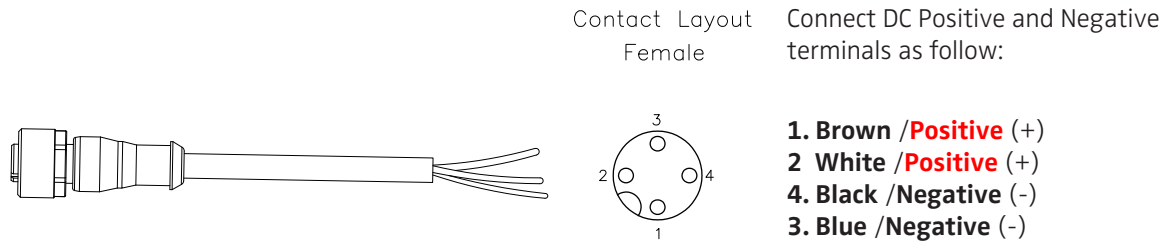
1. Carefully align and mate the power cable M12 Female connector to the remote unit's **Power** M12 Male Receptacle

-48/+24 VDC

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.

LED/System Verification

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 illumilate LED **GREEN**.
       - GPS Status:
           - Allow up to 5 minutes for GPS signal acquisition.
           - If GPS signal is locked, LED will illuminate **GREEN**.

F/O ALM LED					
GPS ALM LED					
Proper Operation	**Bootup**	**No GPS Lock/ Fiber Link Down**	**No GPS Lock/ Fiber Link Up**	**GPS Lock/ Fiber Link Down**
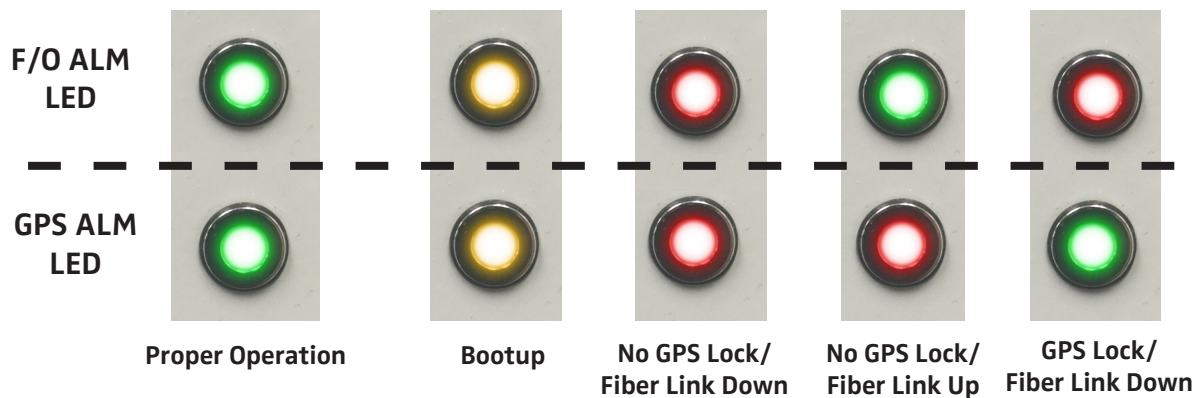
LED Indicators

• 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.
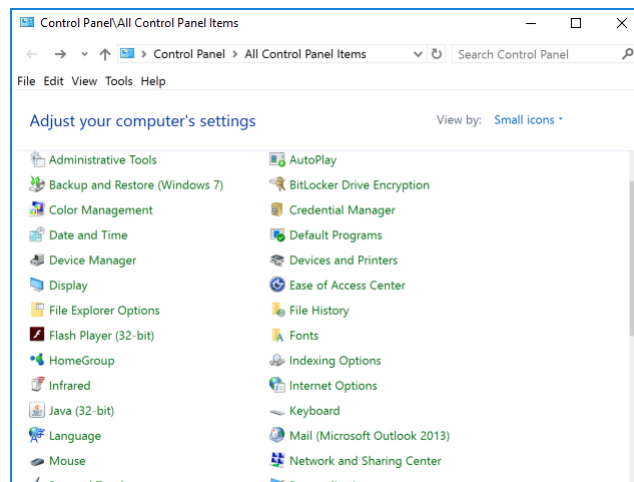
2. Open ''Network and Sharing Center''
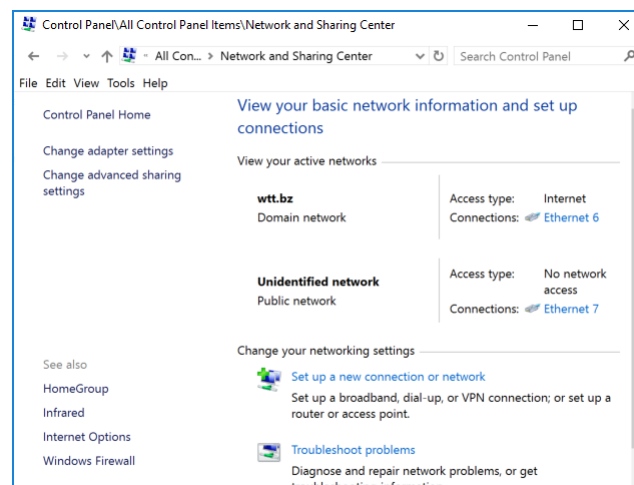
System Configuration and Operation (Continued)

3. Click ''Change adapter settings''
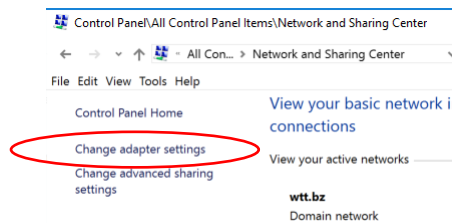
4. Right click the Network Adapter and open its Properties
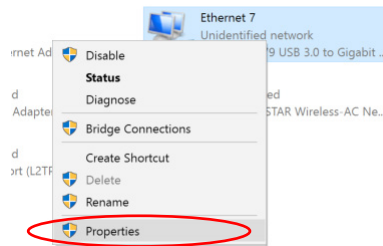
5. Double click ''Internet Protocol Version 4 (TCP/IPv4)''
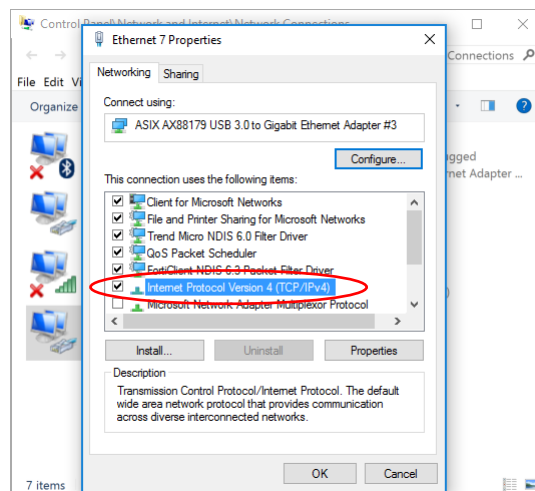
System Configuration and Operation (Continued)

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
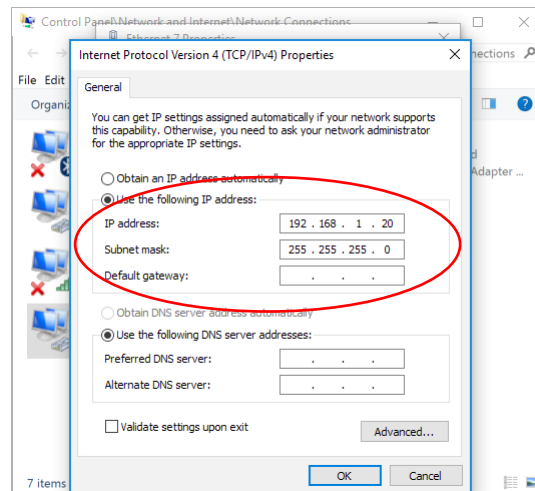
Web Console

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
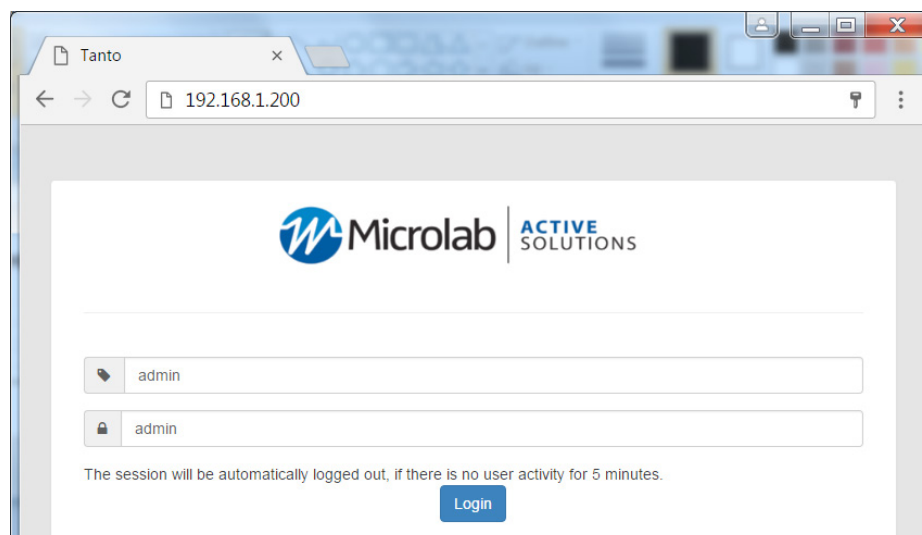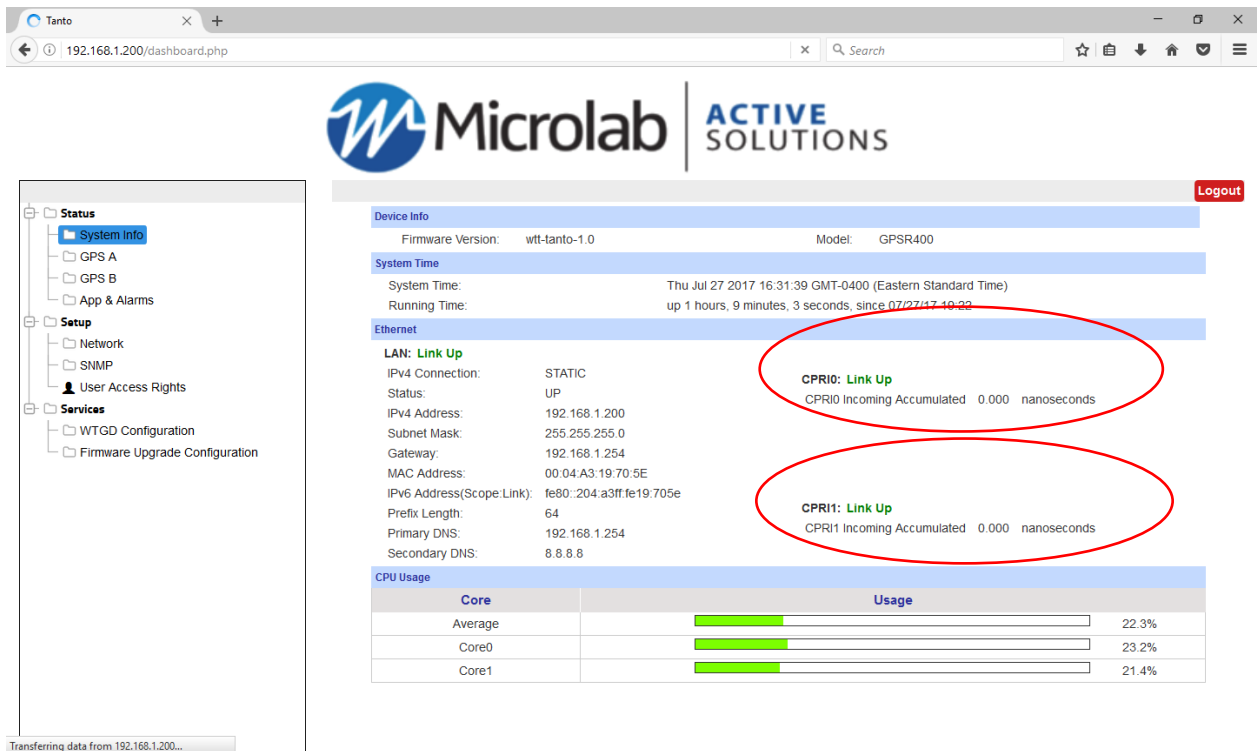
Web Console (System Info)

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**

Microlab

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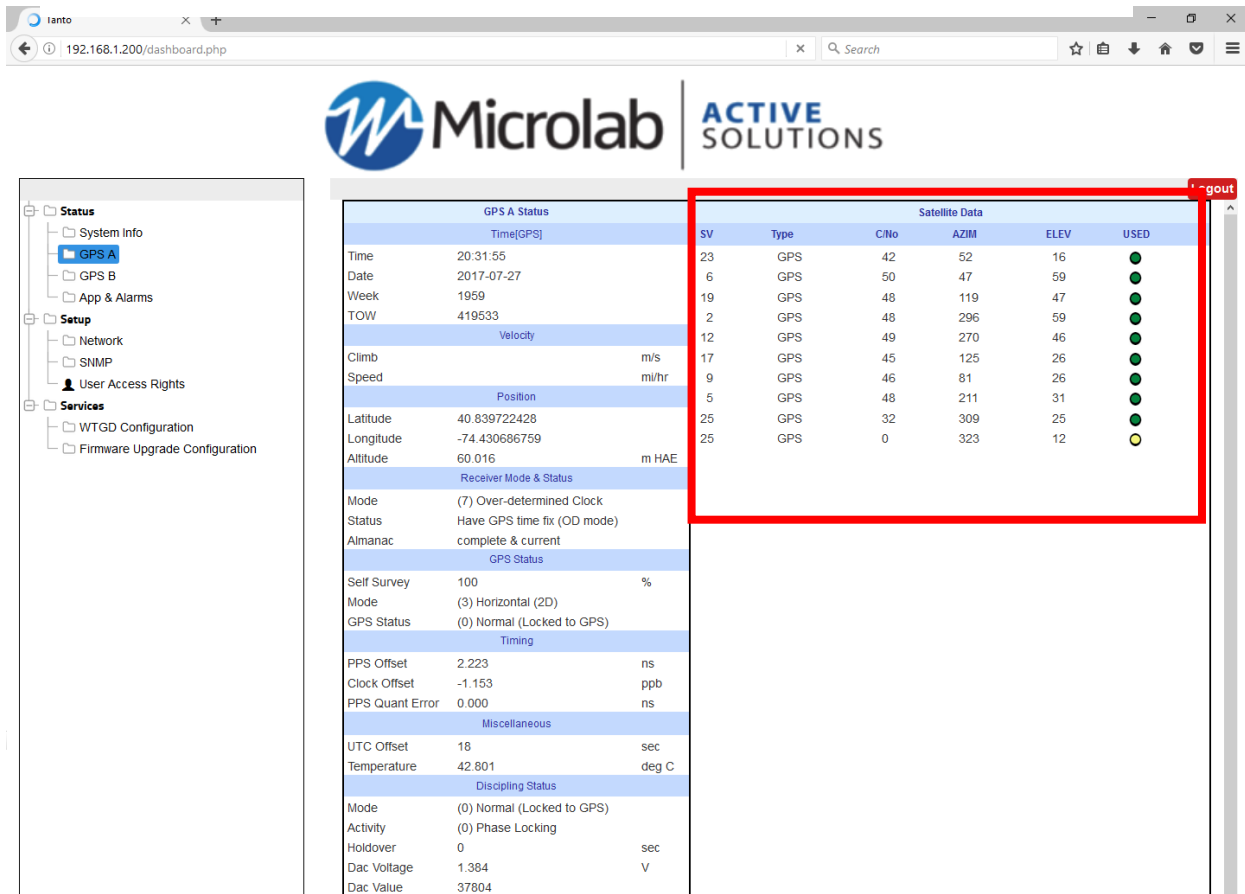
Each receiver monitors the following antennas:
- **GPS A:** "GPS In 1 (Antenna A)" & "GPS In 2 (Antenna B)"
- **GPS B:** "GPS In 3 (Antenna C)" & "GPS In 4 (Antenna D)"

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

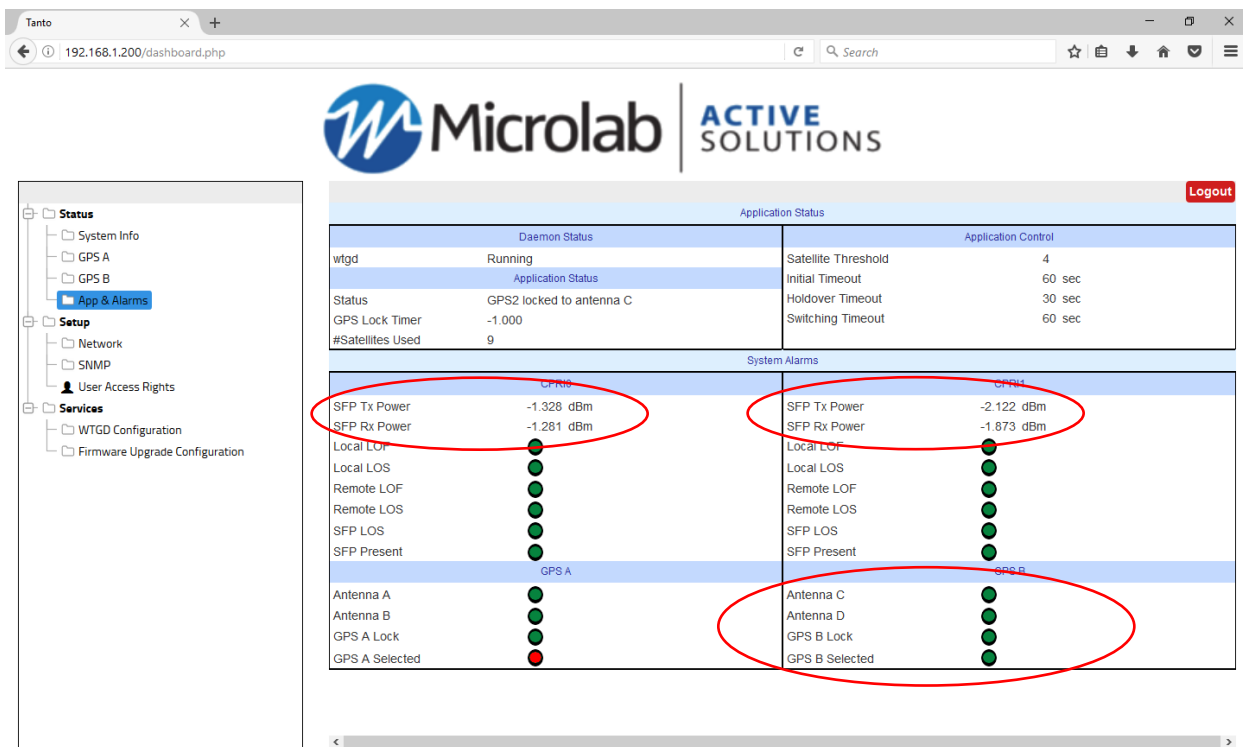## Web Console (App & Alarms)

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.

Alarms:	Cause	Resolution
Local LOF	loss of CPRI frame including frame synchronization	check optical fiber cable, connection and optical power on both ends
Local LOS	loss of CPRI signal	
Remote LOF	remote loss of CPRI frame including frame synchronization	
Remote LOS	remote loss of CPRI signal	
SFP LOS	loss of SFP signal	
SFP Present	SFP module not present	call tech support to replace the SFP module
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 recevier A not locked to GPS satellite signals	check antenna A, Antenna B, cable, conection and +5VDC as above
GPS A Selected	GPS recevier 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 recevier B not locked to GPS satellite signals	check antenna C, antenna D, cable, conection and +5VDC as above
GPS B Selected	GPS recevier 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 Seconday 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.
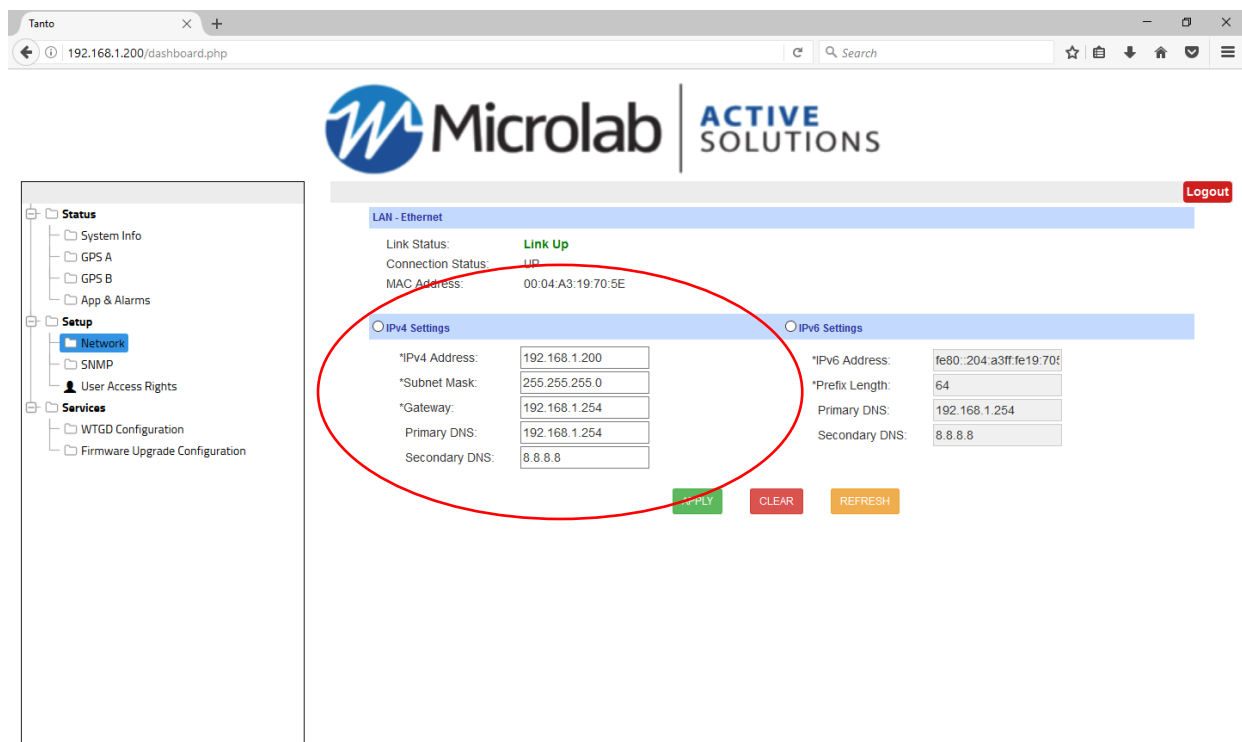
Disconnecting/Uninstalling

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. Disconnet 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.