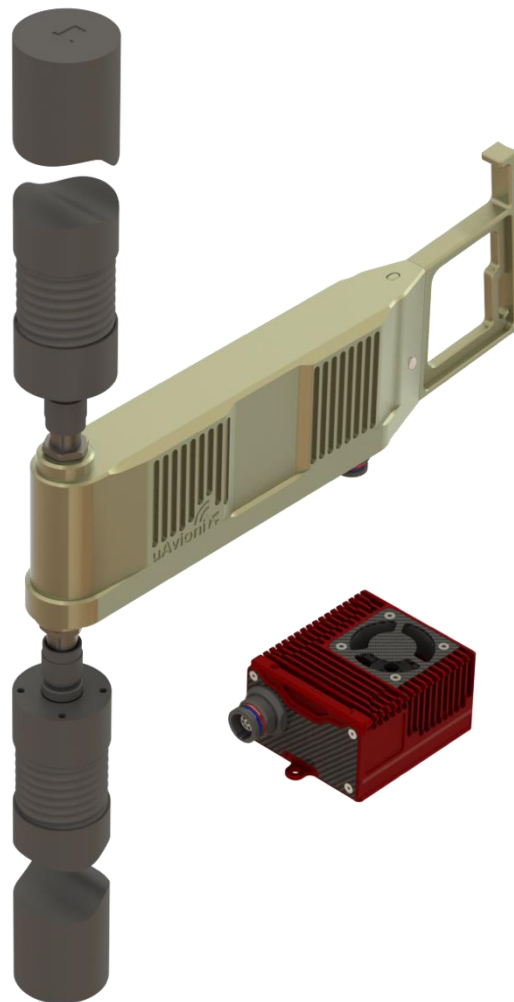




SkyLink

User and Installation Manual

REVISION B



1 Proprietary Rights

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2 Warranty

uAvionix products are warranted to be free from defects in material and workmanship for one year from purchase. For the duration of the warranty period, uAvionix, at its sole option, will repair or replace any product which fails under normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost.

This warranty does not apply to cosmetic damage, consumable parts, damage caused by accident, abuse, misuse, water, fire or flood, damage caused by unauthorized servicing, or product that has been modified or altered.

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Warranty repair service shall be provided directly by uAvionix.

3 Revision History

Revision	Date	Comments
A	January 2022	Initial Release
B	April 29 2022	Updates to installation procedures and updated diagrams

4 Regulatory Statements

4.1 FCC Statement

The following required statement from the Federal Communications Commission (FCC) applies to United States based entities with the exception of direct sales to the U.S. Government and units directly exported by uAvionix:

This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.

4.2 SkyLink Use Prior to FCC Authorization

Those wishing to use SkyLink airborne and ground radios before they receive FCC authorization must request one or more Experimental FCC Transmit Licenses.

First, though, one or more FAA Coordination Numbers must be requested and obtained, signifying the FAA's approval to use its protected C-band frequencies. Once obtained, each FCC transmit authorization applies to:

- One or more center frequencies
- Over a specific geographic area centered on a particular Latitude and Longitude
- Up to a specific maximum flight Altitude or antenna Height
- A specific duration of calendar time (e.g., six months)

For help with the FAA and FCC application processes, contact support@uavionix.com.

You can also reach out to Jim Davis, Director of Policy and Regulatory Affairs, at jim.davis@uavionix.com.

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6 Introduction

SkyLink is an aviation-protected C-Band (5030-5091 MHz) bi-directional, Multiple Input Single Output (MISO) dual Control and Non-Payload Communications (CNPC) radio system. Compliant with the RTCA DO-362A standard, SkyLink provides the information exchange required for operators to safely control, monitor, and manage Unmanned Aircraft Systems (UAS).

SkyLink radios seamlessly integrate with uAvionix SkyLine infrastructure, the first enterprise managed command and control (C2) network. Skyline includes autonomous make-before-break roaming between SkyLink ground radios and applications for planning, operating, and monitoring real-time missions.

7 System

SkyLink Kit Components

	Component	Part Number
1	SkyLink Ground Radio System (GRS)	UAV-1006090-001
2	SkyLink Airborne Radio System (ARS)	UAV-1006082-001
3	SkyLink Hub	UAV-1006103-001
4	truFYX GPS	UAV-1004957-001
5	Two GRS Directional Antennas	UAV-1006176-001
6	Two ARS Omnidirectional Antennas	UAV-1006288-001
7	GRS to Hub Wire Harness	UAV-1006647-001
8	M12 X-Coded Ethernet Cable	UAV-1005899-001
9	ARS Wire Harness	UAV-1006648-001
10	GRS Pole Mounting Kit	UAV-1006267-001
11	Hub Pole Mounting Kit	UAV-1006270-001
12	RS-232 to TTL Pixhawk Adapter	UAV-1006282-001
13	SMA Coaxial antenna leads	
14	SkyLinkApp and Documentation	

SkyLink GRS and ARS Radios

Each SkyLink radio system is a purpose-built diversity system with two receive channels and one transmit channel. The system includes built-in link management that handles remote configuration and performance statistics.

User Data Link

- Transparent bi-directional CNPC data link between GRS and ARS

Control Data Link

- Link management signaling between GRS and ARS including roaming functions when passing pilot control from Serving GRS to Target GRS.

SkyLink Hub

The SkyLink Hub provides a GPS receiver, POE++ power supply, and network access to the ground system.

truFYX GPS

The truFYX provides GPS signal to the airborne system. Internal and external mount configurations are available.

Figure 1 shows a typical system with a SkyLink Ground Radio System (GRS) and a SkyLink Airborne Radio System (ARS) managed by uAvionix SkyLine infrastructure.

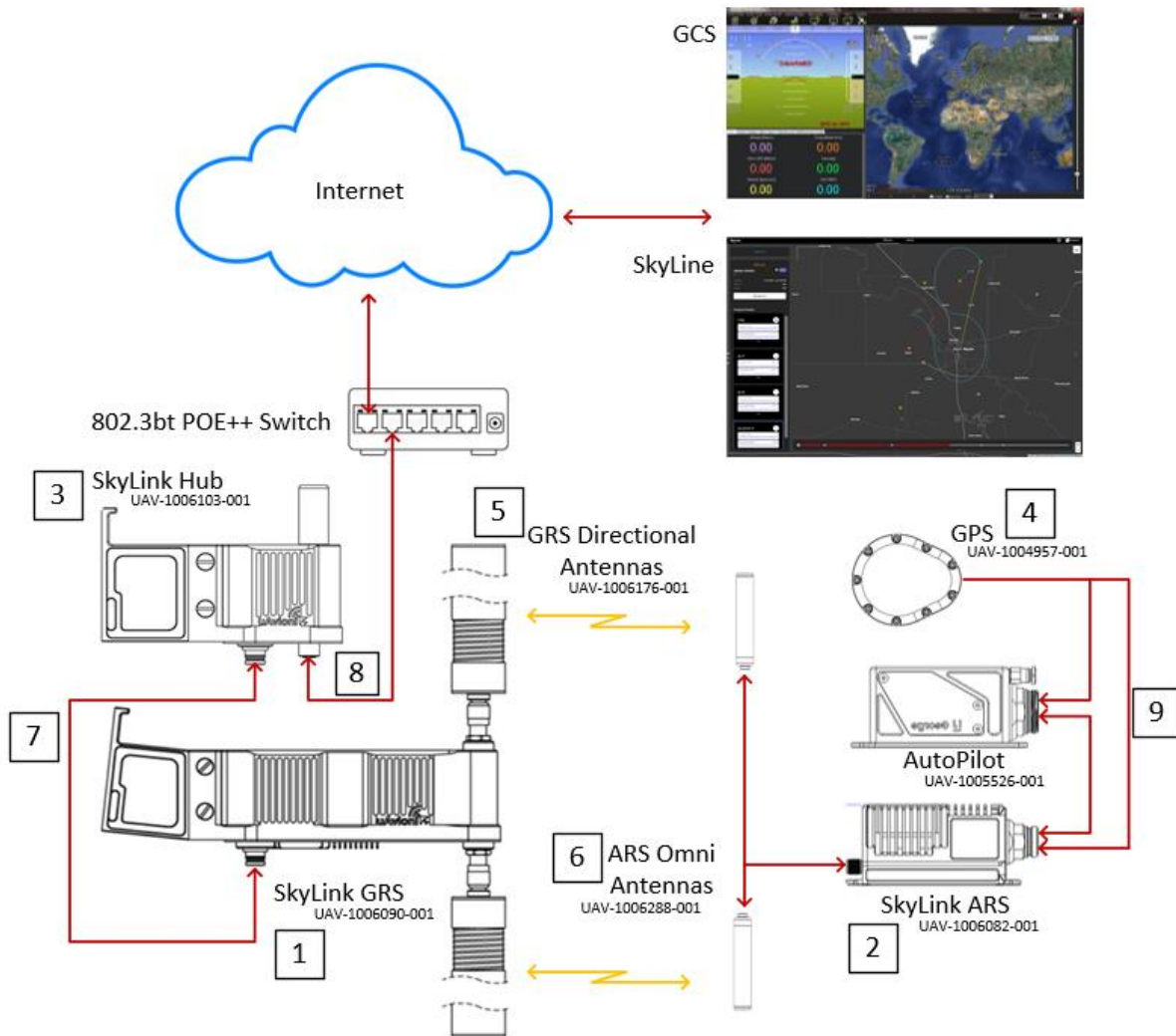


Figure 1 - SkyLink Radios with SkyLine Infrastructure

8 Installation

8.1 Ground Radio System (GRS)

8.1.1 Mounting SkyLink GRS

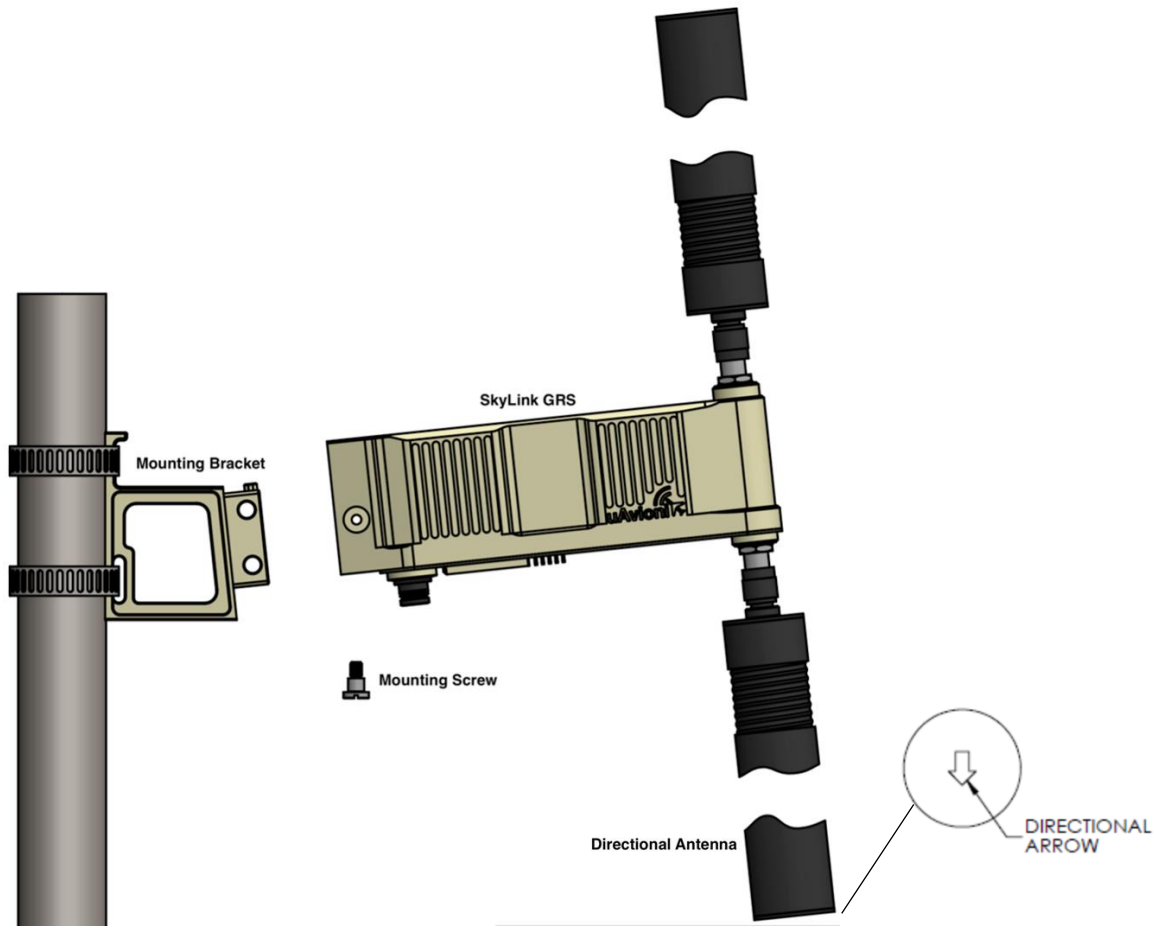


Figure 2 - Mounting SkyLink GRS

The SkyLink Mounting Bracket is angled 6 degrees upward to maximize airborne coverage.

1. Secure the SkyLink Mounting Bracket to a pole with the included stainless steel hose clamps.
2. Align the GRS with the Mounting Bracket and slide the GRS into place over the end of the bracket. The bracket will now hold the GRS in place.
3. Use the included mounting screw to fasten the GRS to the bracket.
4. Attach the GRS Directional Antennas, tighten, and adjust orientation.

5. A directional arrow on the end cap of each antenna denotes the transmit and receive direction of the antenna. The antennas have 110 degrees of horizontal sector coverage (55 degrees on either side of the directional arrow). Point both antenna arrows in the direction of your ARS for best performance.

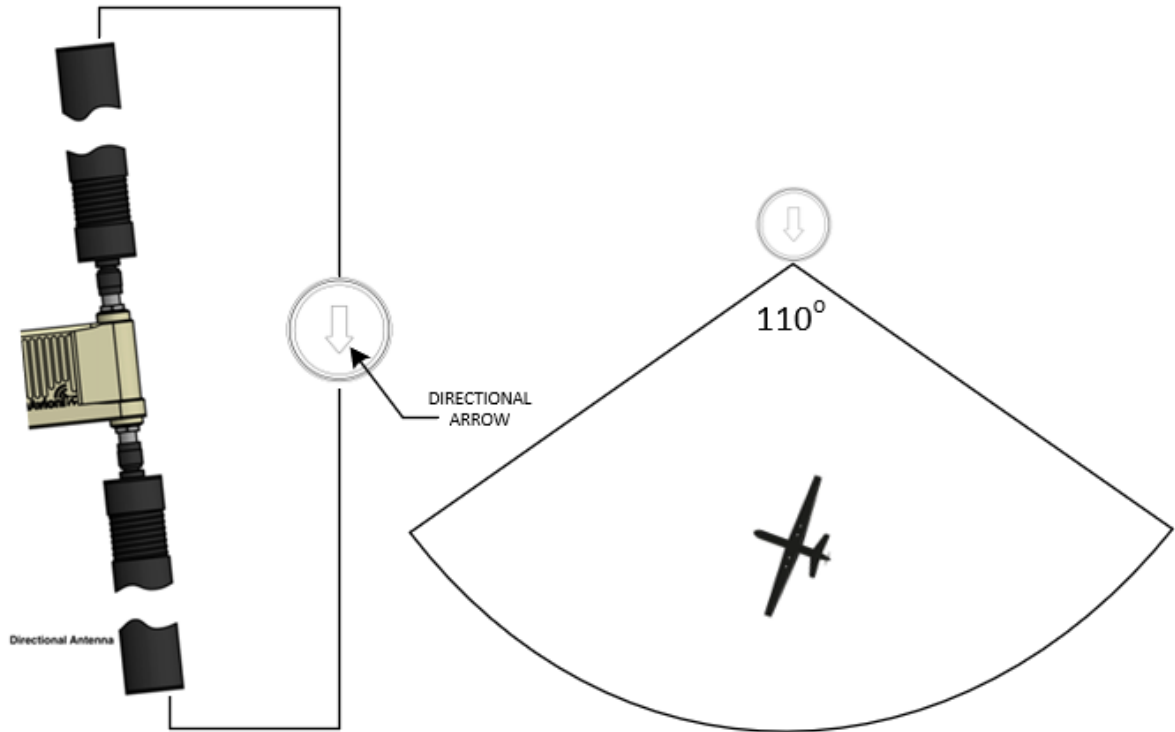


Figure 3 Directional Antenna Orientation

8.1.2 Mounting SkyLink Hub

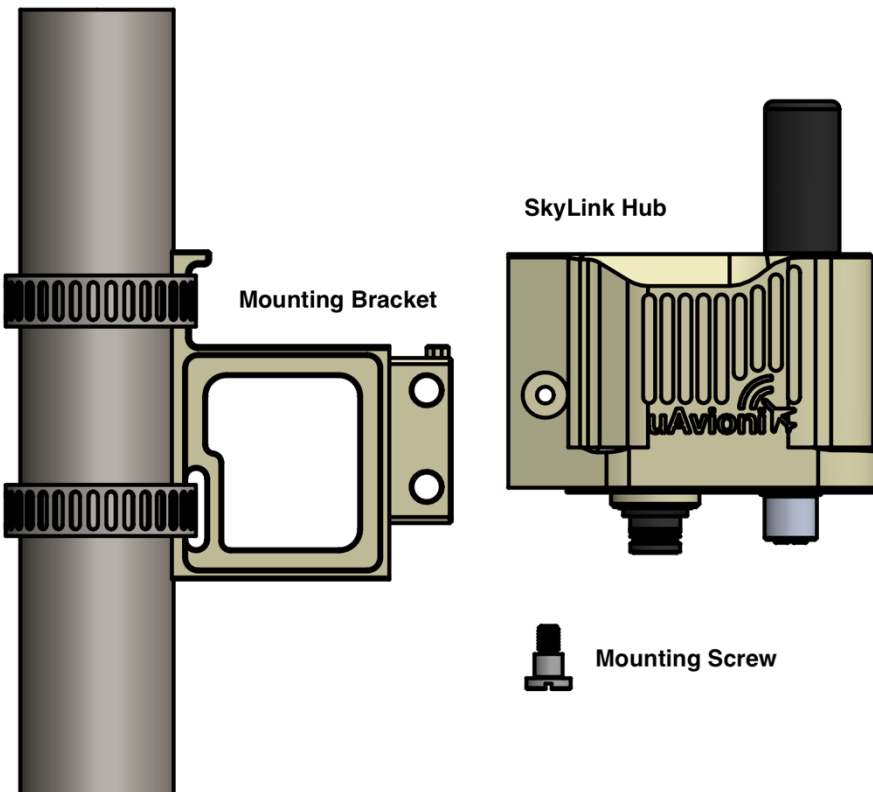


Figure 4 Mounting SkyLink Hub

The SkyLink Hub Mounting Bracket is *not* angled. The Hub mounts perpendicular to the pole, and the GPS antenna should point up.

1. Fasten the Hub Mounting Bracket to a pole with the included stainless steel hose clamps.
2. Align the Hub with the Mounting Bracket and slide the Hub into place.
3. Use the included mounting screw to fasten the Hub to the bracket.

8.1.3 Connections

Connect SkyLink GRS to the SkyLink Hub and connect the Hub to a POE++ switch with network access. Ensure that the two directional antennas or RF loads are attached to both RF ports on the GRS before powering on.

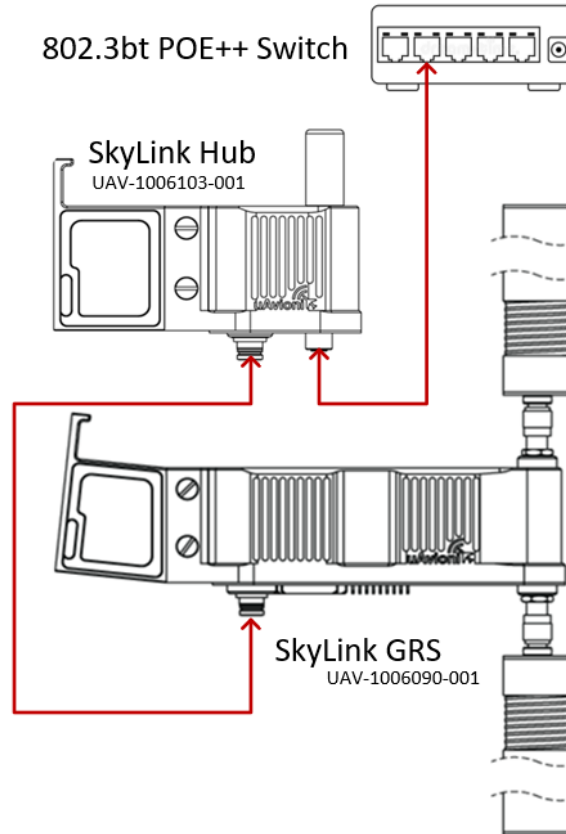


Figure 5 - SkyLink GRS Connections

The SkyLink GRS connects to the Hub with the provided LEMO harness. Table 1 below shows the connector pinout.

Table 1 - SkyLink GRS Pinout

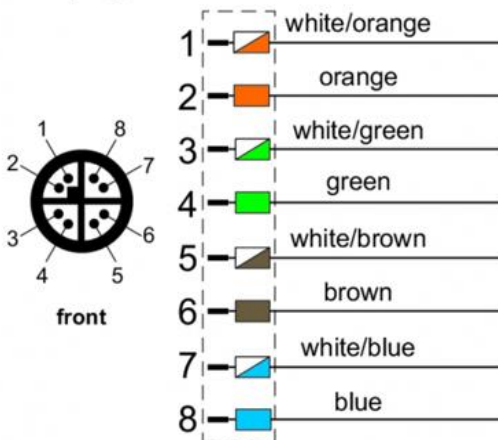
Pin	Type	GRS	Hub	LEMO 1M.308
1	GND			<p>PIN 1</p> <p>PIN 3</p> <p>DETAIL 1</p>
2	NAV	IN	OUT	
3	CTRL RX	IN	OUT	
4	CTRL TX	OUT	IN	
5	PWR	24V	24V	
6	USER RX	IN	OUT	
7	USER TX	OUT	IN	
8	PPS	IN	OUT	

Connect the Hub to the network via POE++ using the provided M12 X-Coded ethernet cable.

Table 2 - SkyLink POE Specifications

POE Specifications	
Standard	802.3bt POE++
Maximum Power	60W
Voltage Range	37 – 57V
Maximum Current	350mA
Maximum Cable Resistance	20Ω
Supported Cabling	Shielded Cat 5
Supported Modes	Mode A (endspan), Mode B (midspan)
Power Management	Power Class 6
Maximum Cable Length	100 meters

M12 plug



M12 jack

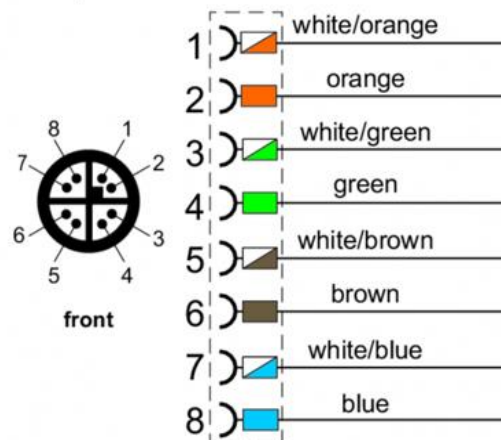


Figure 6 - SkyLink M12 Connector Pinout



Caution!

Absolute maximum DC voltage +57 V. Higher DC voltage will permanently damage the equipment.

8.2 Airborne Radio System (ARS)

8.2.1 Mounting SkyLink ARS

Install the SkyLink ARS in the airframe in a location that allows easy access to the autopilot and minimal RF coax length for antenna installation.

Install the omni antennas on the airframe in a location that reduces shadowing and interference between the omni antenna and the GRS. Ideally one antenna on opposite sides of the airframe. Refrain from installing the antennas near other antennas or other electronic equipment already on the airframe to reduce EMI.

The truFYX GPS needs to be installed on top of the airframe in a location that reduces shadowing and allows a clear view of the sky.

8.2.2 Connections

The SkyLink ARS offers seamless integration with the uAvionix George autopilot line, Pixhawk, or any autopilot that has an available RS-232 communication line.

A wire harness is included with the following three terminations:

- **GPS** source for truFYX
- **User** data link for autopilot connection
- **Control** data link for ARS device setup and configuration

Ensure that the two omni antennas or RF loads are attached to both RF ports on the ARS before powering on.

24v power source can be supplied through either the User data link or Control data link connector.

Connection to an autopilot is done via the User data link to an available telemetry or serial port. The SkyLink ARS uses RS-232 levels and has a default rate of 57600 8N1

George Autopilot

Connection to George autopilot will be made using serial 1 on the autopilots. For more information on George G2i and George G3 pinout, please review the respective manuals at

<https://uavionix.com/products/george/>

A Standard G3 Harness can be used instead of the included SkyLink Harness.

Pixhawk Autopilot

When connecting to a Pixhawk, use the included RS-232 to TTL adapter. Connect the Pixhawk via the User data link. SkyLink must have an external 24v power supply connected through the Control data link as the Pixhawk will not supply 24v.

The Figure below shows each component and its corresponding pinout.

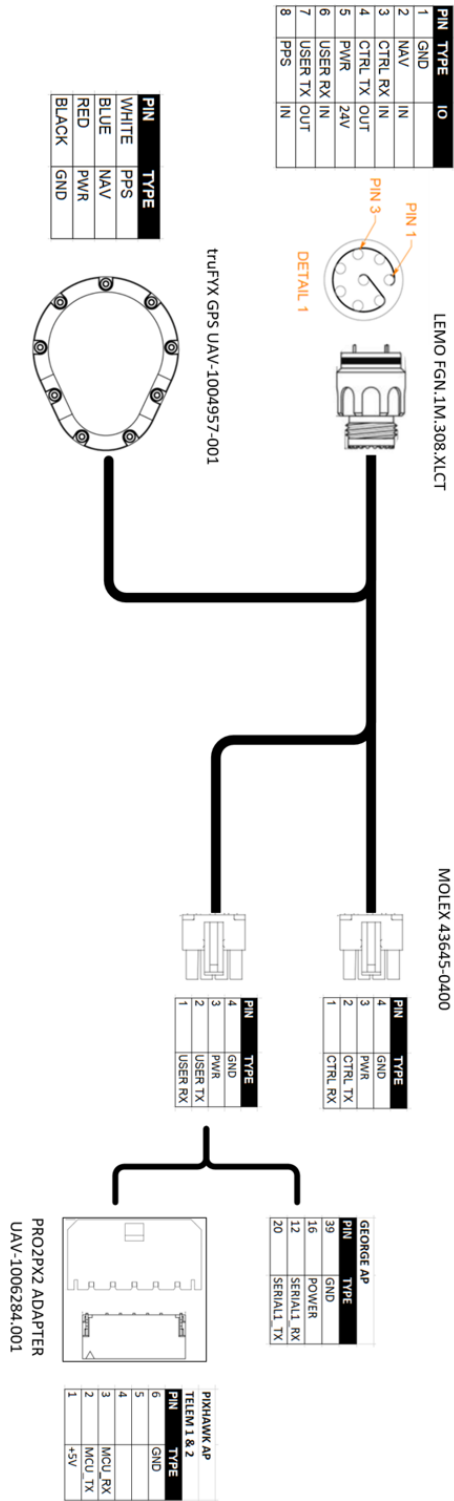


Figure 7 ARS Wiring Harness

9 Configuration

9.1 Ground Radio System (GRS)

9.1.1 SkyLink Hub Network Settings

SkyLink Hub settings are accessed via web browser from a PC or mobile device on the same Local Area Network (LAN) as the powered SkyLink Hub. The IP address assigned by the DHCP server is the base URL. An IP Scan can be used to find the IP address of the Hub. MAC addresses are printed on the Hub label.

Navigate to `http://###.###.###.###/`

NOTE: “###.###.###.###” is the IP address of the SkyLink Hub.



Figure 8 SkyLink Hub Web Page

Settings

Websocket URL	SkyLine only. Registers the GRS with a SkyLine network.
IP Address	Default 0.0.0.0 sets the GRS Hub to server mode. A valid IP Address to set the SkyLink Hub to client mode, and the Hub will attempt an outbound connection to the IP Address.
User Port	TCP port for User data link.
Control Port	TCP port for Control data link.

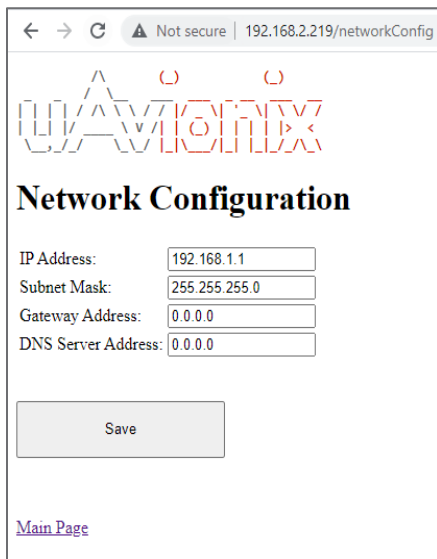
Press the Save button to store the settings changes. These fields are non-volatile and persist through power cycles.

Network Configuration

Advanced settings for network administrators.

On the main Hub settings page, click the Network Configuration link under Settings.

The Network Configuration settings are only used if the SkyLink Hub is connected to a network without a DHCP server. These settings are ignored in a typical system.



← → ↻ ⚠ Not secure | 192.168.2.219/networkConfig

Network Configuration

IP Address:

Subnet Mask:

Gateway Address:

DNS Server Address:

[Main Page](#)

Figure 9 SkyLink Hub Network Settings

In a network without DHCP, set the IP Address field to assign a static IP to the SkyLink Hub.

Fill in the appropriate values for Subnet, Gateway, and DNS in the network and press Save.

Note: If you add DHCP to your network or plug the Hub into a DHCP network, these values will be ignored, and the DHCP server will assign values. Using these static network settings within a DHCP network is not supported.

9.1.2 GRS Settings

Open the uAvionix SkyLinkApp application using a Windows computer with network access to your SkyLink GRS.

Input the IP Address of your SkyLink Hub and the Control Port from the SkyLink Hub Settings page in the COM Settings box.

Optionally, next to Device Name, type in a friendly name for the radio and press Save. This allows for quick switching between different radio connections.

When the Radios are linked, status data is shown for both the local and the remote radios on the Status tab.

The screenshot displays the SkyLinkApp v1.0 interface. At the top, the title bar reads 'skyLinkApp v1.0: LAPTOP-7FIQLAJ6 : 192.168.110.72'. The 'COM Settings' tab is active, showing a 'Device Name' field, a 'Mode' dropdown set to 'TCP', a 'skyStation IP' field with '192.168.110.59', and a 'Port' field with '42431'. A 'Save' button is next to the Device Name field. A 'Radio FW Update' button is highlighted with a blue box and an arrow. The 'Status' tab is also visible, showing 'Local Radio' and 'Remote Radio' sections. The 'Local Radio' section shows 'Radio Type: SkyLink', 'TX' and 'RX' queue statistics, 'Data Rate(bytes/s)', 'Frame Rate(fps)', and 'Radio' status including 'Link Status', 'Radio RSSI', and 'Board Temperature'. The 'Remote Radio' section shows 'Radio Type: Not Connected' and similar statistics. The uAvionix logo is in the top right corner.

Figure 10 SkyLink App GRS Connection

GRS Configuration

In SkyLinkApp, navigate to the Configuration Tab. This page is used for device settings and setup as well as selecting the Frequency scheme for the system. The frequency used MUST be within 5030 and 5091 MHz.

Figure 11 SkyLink App Radio Configuration

Station Type	SkyLink GRS = Ground SkyLink ARS = Air SkyLink GRS with SkyLine = Infrastructure
Frequency	Get / Set Radio C-Band Frequency in Hz
Versions	Get version details from connected SkyLink radios

9.2 Airborne Radio System (ARS)

9.2.1 ARS Settings

Connect the ARS Control data link termination to the provided serial connector.

Connect the serial connector to a Windows computer.

Open the uAvionix SkyLinkApp application.

In the COM Settings box, next to Mode, choose Serial then select the Port that corresponds with the connected radio (i.e. COM1).

Optionally, next to Device Name, type in a friendly name for the radio and press Save. This allows for quick switching between different radio connections.

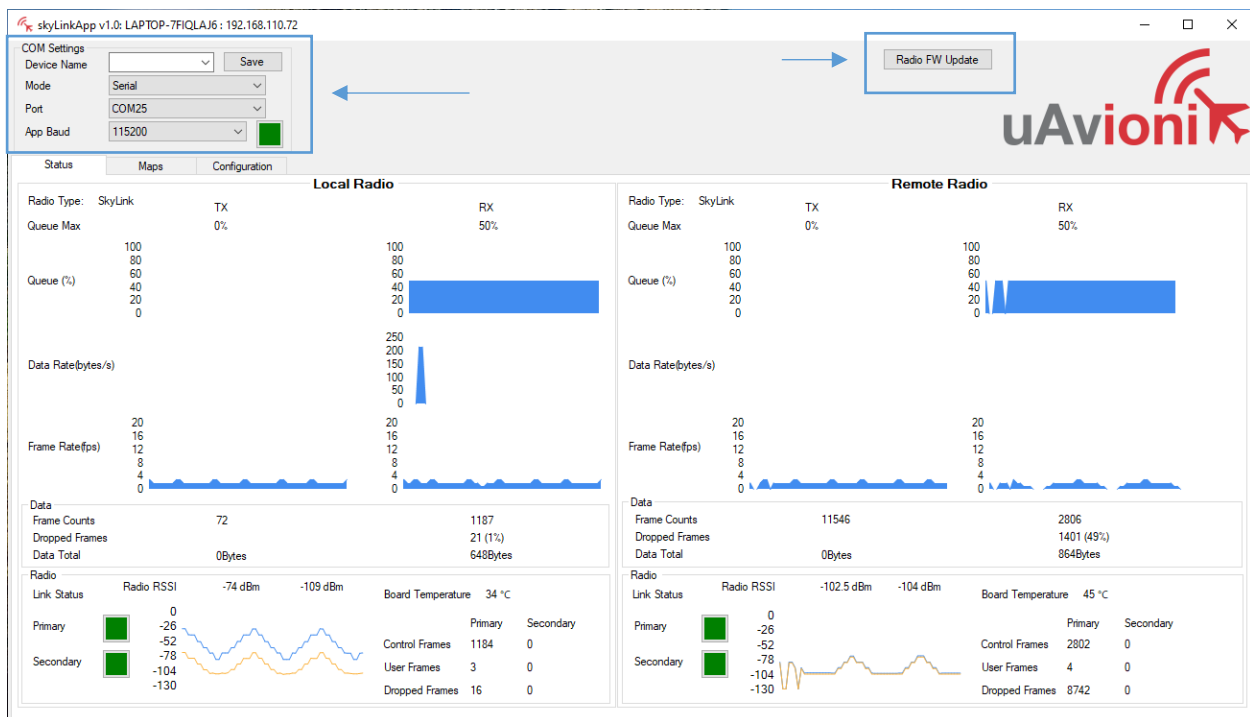


Figure 12 SkyLink App ARS Connection

ARS Configuration

See Section 9.1.2 – GRS Configuration.

10 Operation

10.1 Radio Link

To link the GRS and ARS radios both need to be configured to the same frequency scheme, have a GPS position lock, and a PPS timing signal.

To verify link, connect the GRS to the SkyLinkApp and go to the Status Tab. When the data arrives, skyLinkApp will begin graphing the radio link statistics.

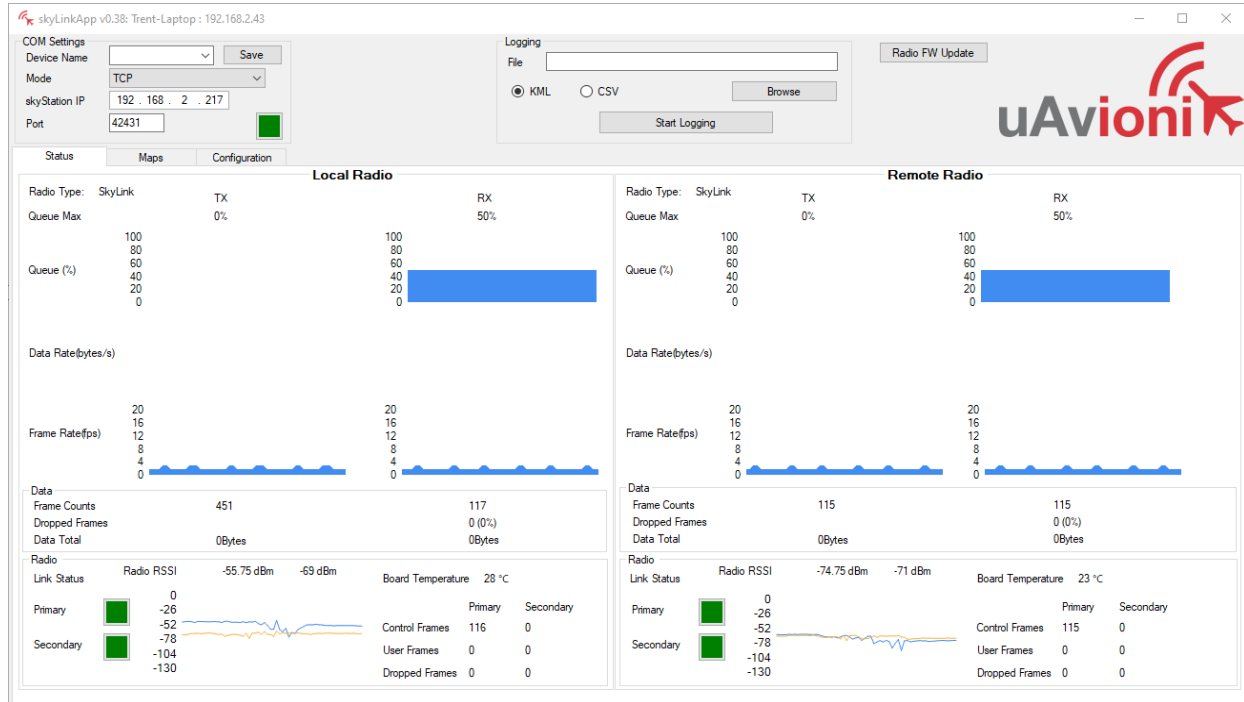


Figure 13 SkyLink App Radio Status

10.2 Mission Planner Example

1. Connect the skyLink ARS to an Autopilot via the User data link connection.
2. Verify the ARS and GRS have a link
3. Open ArduPilot Mission Planner application.
4. In the communication drop down menu (upper right corner), select TCP.
5. Press Connect.

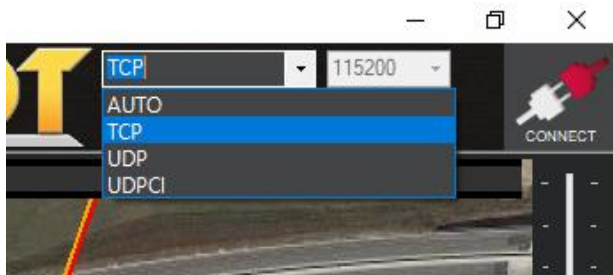


Figure 14 Mission Planner Connection

6. Enter the IP Address of the SkyLink Hub. Click OK.
7. Enter the User TCP Port of the SkyLink Hub. Click OK.
8. Mission Planner will connect and display aircraft and telemetry data.



Figure 15 Mission Planner Connection Status

11 Firmware Update

11.1 Hub Firmware Update

Navigate to the Hub webpage found in section 9.1.1. Hub firmware can be updated by clicking the Update link under Firmware Information.



Figure 16 SkyLink Hub Firmware Update Page

Choose the appropriate file to upload and click Start Update.

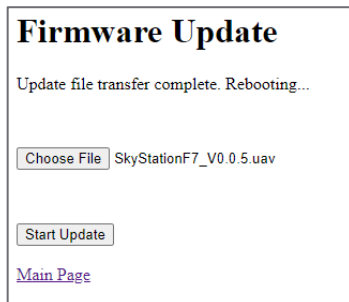


Figure 17 SkyLink Hub Firmware Updating

Note: The update is canceled if the Hub is powered off or the webpage is closed. Wait for the Hub to reboot before proceeding.

When the file transfer is complete, click the Main Page link to return to the SkyLink Hub Settings page. The version number on the Configuration Webpage should reflect the firmware version uploaded.

11.2 GRS Radio Firmware Update

The GRS Radio firmware can be updated via the SkyLinkApp.

Connect the GRS to the SkyLinkApp following the steps in section 9.1.2. Press Radio FW Update in SkyLinkApp. A new window will open.

Press Select File and select the correct firmware file.

Press Connect. When the GRS is connected, the Product Information window will populate with radio information and the PingBoot Status in the bottom left will change to "Idle."

Press Flash. DO NOT power off or disconnect the device until the flash is complete.

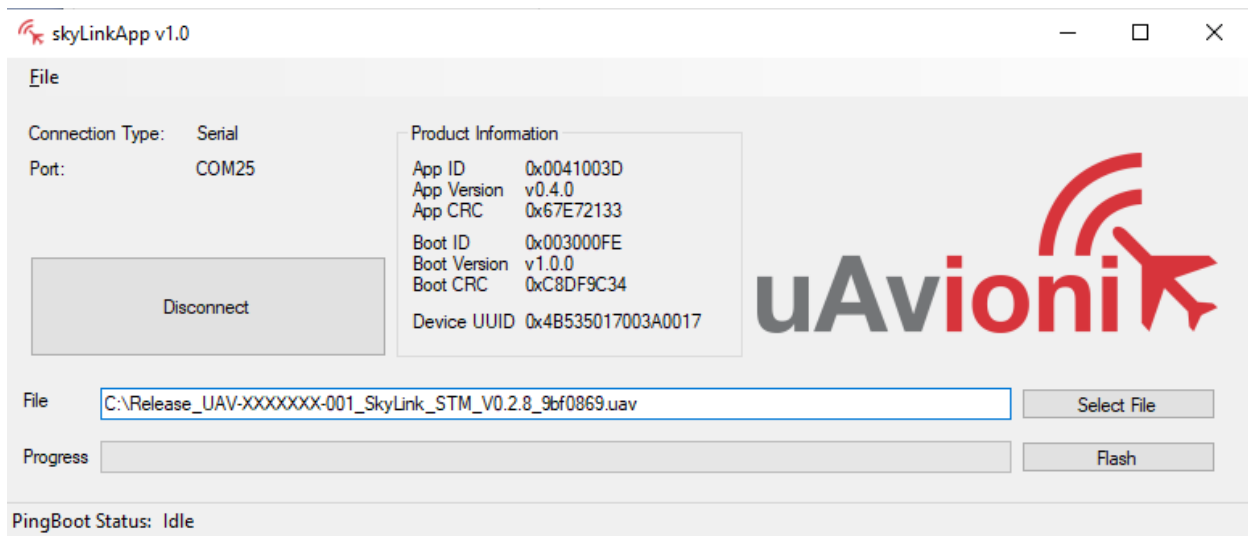


Figure 18 Ping Boot Flasher Application

11.3 ARS Radio Firmware Update

The ARS Radio firmware is updated using the SkyLinkApp.

Connect the ARS to the SkyLink following the steps in section 9.2.1 then repeat the steps in section 11.2

12 Support

For support visit <https://uavionix.com/support/>