



# pingStation 3 User and Installation Guide

REVISION A



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# 1 Revision History

Revision	Date	Comments
A	11/1/2021	Initial release
B	6/17/2022	Screen layout update, DHCP fallback and information broadcast

## **2 Warnings / Disclaimers**

All device operational procedures must be understood prior to operation.

uAvionix is not liable for damages arising from the use or misuse of this product.

### 3 Limited Warranty

uAvionix pingStation 3 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.

IN NO EVENT, SHALL UAVIONIX BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

#### Warranty Service

Warranty repair service shall be provided directly by uAvionix.

## 4 Contents

1	Revision History .....	3
2	Warnings / Disclaimers .....	4
3	Limited Warranty .....	5
5	Introduction .....	7
6	Installation .....	9
6.1	Mechanical Mounting Recommendations.....	9
6.2	Connection to the POE network .....	11
7	Configuration.....	12
7.1	POE Installation .....	12
7.2	Configuration URL .....	13
7.3	Connect.....	14
7.3.1	Configuration Items .....	16
7.3.2	Health Statistics.....	19
8	Update.....	20
8.1	Update the pingStation 3 system software .....	22
8.2	Update ADS-B receiver software.....	25
9	Virtual Radar Server Receiver .....	27
9.1	Configure pingStation 3 .....	27
9.2	Configure Virtual Radar Server.....	29
9.3	Configure Virtual Radar Moving Map Home Location .....	32
10	Support.....	35

## 5 Introduction

pingStation 3 is a dual band (978MHz and 1090MHz), networkable ADS-B receiver with a Power-Over-Ethernet (POE) interface enclosed in an IP67 rated protective enclosure. pingStation 3 provides ground surface or low-altitude ADS-B surveillance within line of sight of the antenna, with range dependent upon the output power of the transmitting ADS-B transceiver. pingStation 3 is robust enough to be permanently mounted outdoors in harsh environmental conditions, and small enough to be used as a mobile asset for roaming operations. Installation is simple with included pole-mount bracket, and a single POE cable which provides both power and data communications. Configuration is accomplished via a simple web interface. An integrated GPS provides precision timestamping for messaging.

Multiple pingStation 3's may be networked together to provide a wide area low-altitude surveillance volume. Data messages are available in multiple formats as described within the pingStation 3 ICD (UAV-1005951-001).

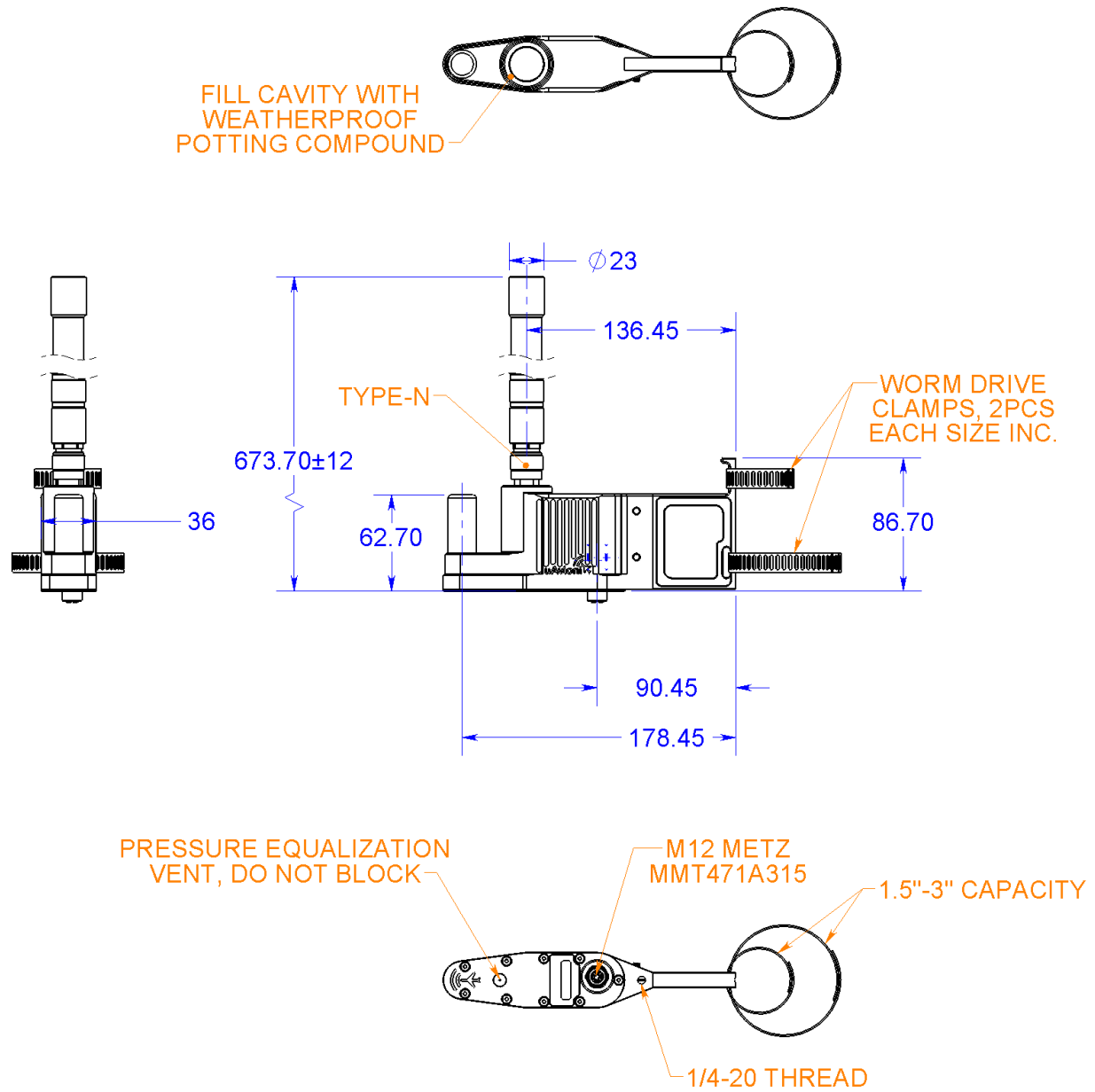


Figure 1:pingStation 3-dimensional drawing



## 6 Installation

### 6.1 Mechanical Mounting Recommendations

pingStation 3 is supplied with an installation bracket and hose clamps to mount to poles of various sizes.

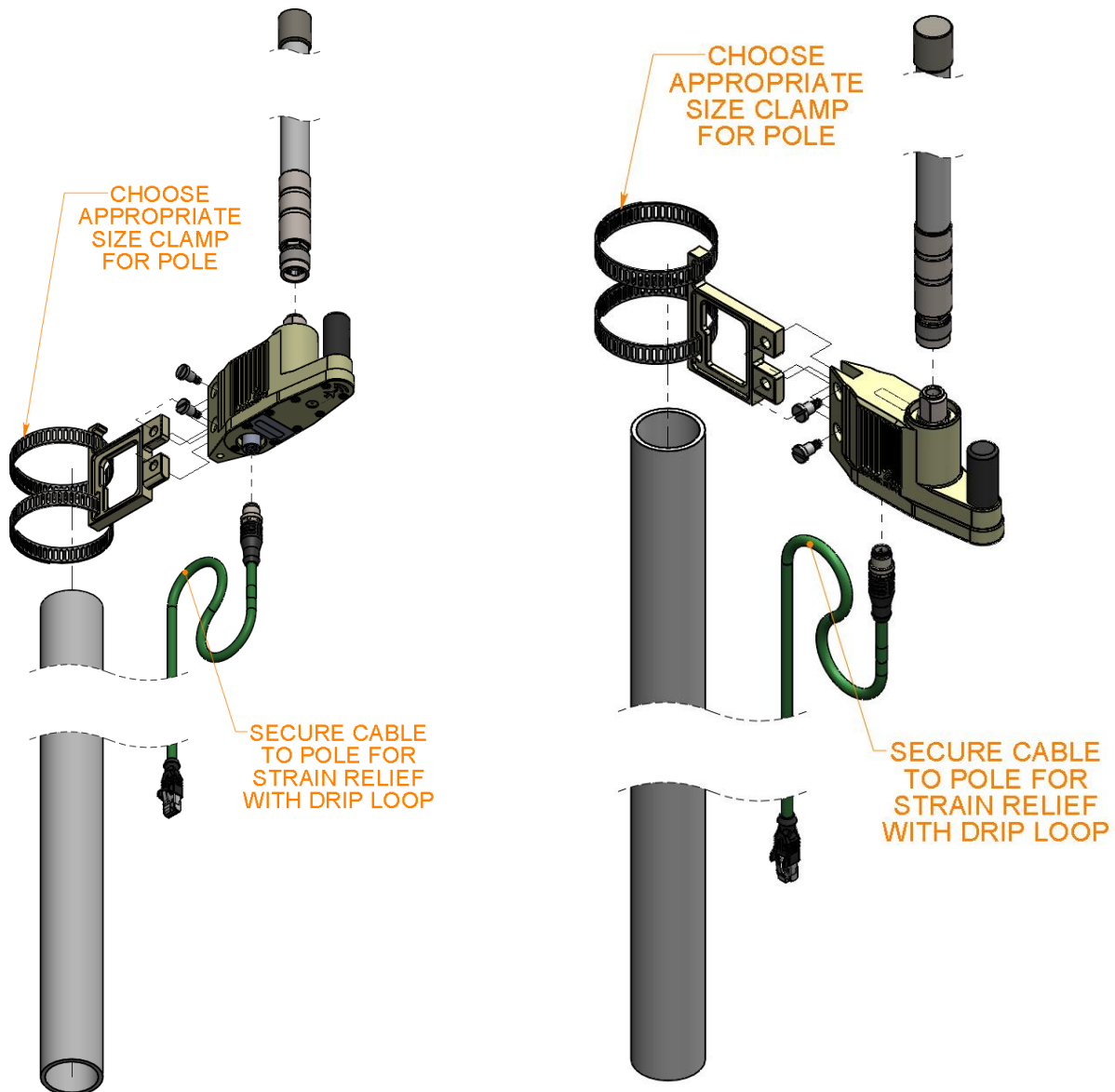


Figure 2: Installation views from below (left) and above (right)

Seat and tighten the hose clamp mount into the pingStation 3 and secure with provided screws using a screwdriver. Tighten hose clamps to secure pingStation 3 to the mounting pole.

Connect the pingStation 3 with the M12 connector using Cat5e or better ethernet cable. It is recommended to use shielded Cat5e cable to protect against EMI interference depending on your installation location.

Seat M12 plug into the pingStation 3 M12 receptacle then install and tighten the connector as shown. M12 X Code cables can be sourced to accommodate longer installation runs. Alternatively, a shielded, waterproof coupler can be installed to extend a cable run to the POE switch/injector location.

Mount pingStation 3 as high on the pole as possible, preferably at the top with an unobstructed 360° view of the sky.

Secure the ethernet cable to the pingStation 3 mounting arm or to the pole using a zip tie in a drip loop configuration for strain relief.

## 6.2 Connection to the POE network

The pingStation 3 connects to a network via POE using an M12 X-Coded connector.

POE Specifications:

Parameter	Value
Standard	802.3af (802.3at Type1)
Maximum power	15.4W
Voltage Range	37 – 57V
Maximum Current	350mA
Maximum Cable Resistance	20Ω
Supported Cabling	Shielded Cat 3 and Shielded Cat 5
Supported Modes	Mode A (endspan), Mode B (midspan)
Power Management	Power Class 0
Maximum Cable Length	100 meters

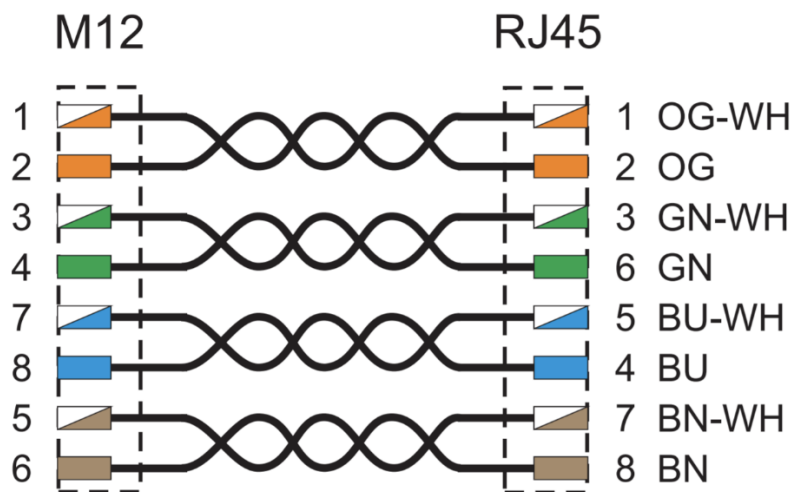


Figure 3: M12 to RJ45 wiring diagram

### Caution!



Absolute maximum DC voltage +57 V. A higher DC voltage value will permanently damage the equipment!

## 7 Configuration

### 7.1 POE Installation

pingStation 3 must be powered via POE. This can be accomplished with a POE capable switch, or with a standalone POE injector.

Connect the shielded POE cable to an active POE switch or a regular switch via a Class 0 POE power injector as shown below.

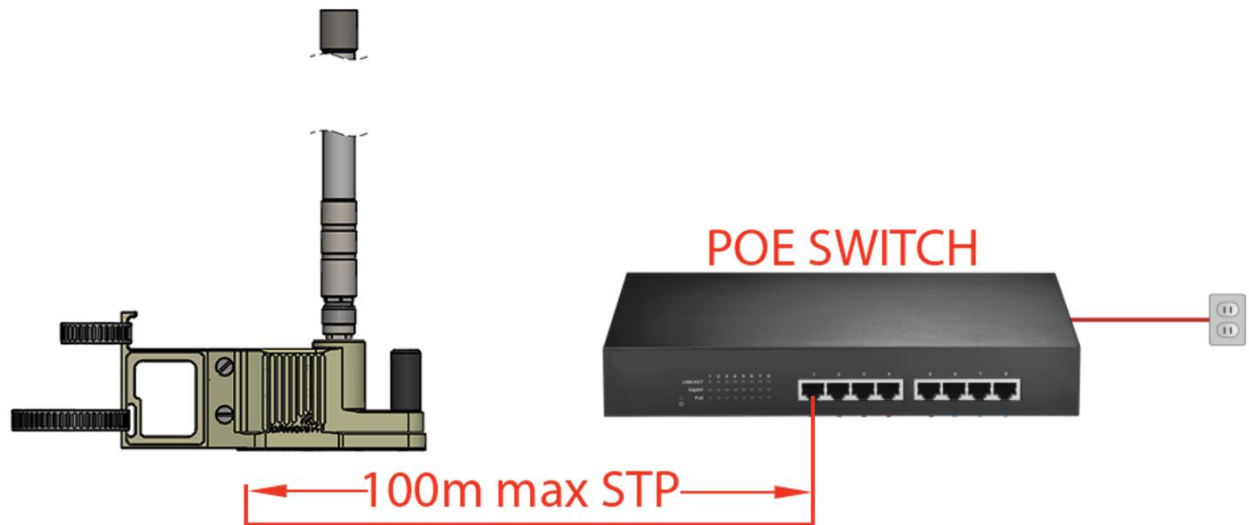


Figure 4: pingStation powered by POE switch

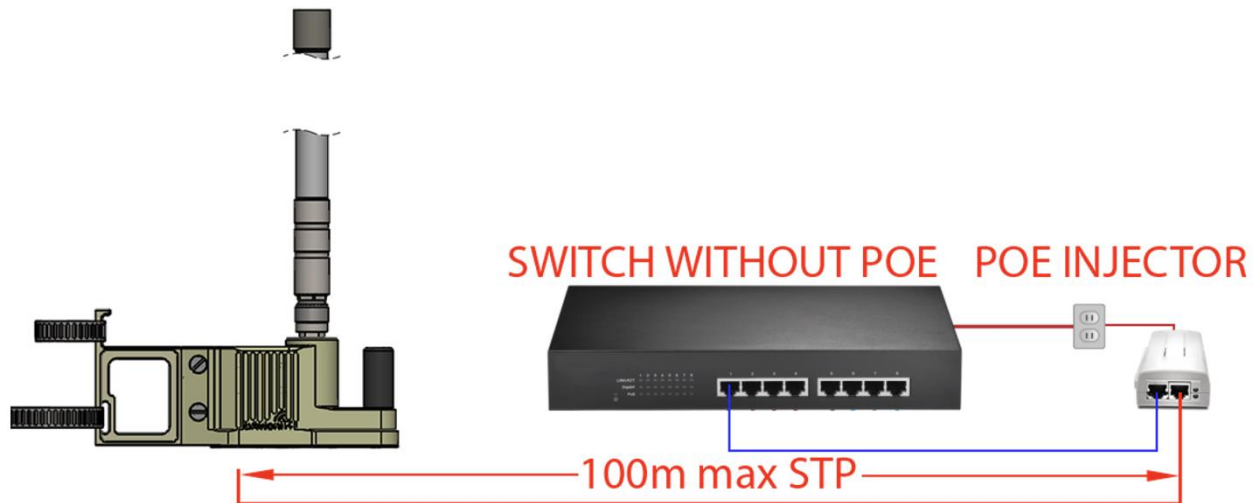


Figure 5: pingStation powered by POE injector

At power-up an IP address will be assigned to the pingStation 3 by the local DHCP server. This IP address is dynamic and assigned by your local network. Determining the assigned IP address is required for configuration. The pingStation 3 IP address can be determined by accessing the local DHCP server and reviewing the connected devices or by using industry accepted network scanning tools.

Directions for each DHCP server, router, or network scanning tool differ. Refer to the instruction manual for these devices or tools to help determine the IP address assigned to the pingStation 3. The MAC address for each pingStation 3 can be found on the device housing.

**Optional:** You may wish to configure your DHCP server to reserve an IP address for pingStation 3 in order to ensure its address does not change in the future. Refer to your router or DHCP server instructions for how to reserve IP addresses.

## 7.2 Configuration URL

pingStation 3 settings can be observed and changed by navigating via web browser from a PC or mobile device which is on the same Local Area Network (LAN) as the powered pingStation 3. The IP address assigned by the DHCP server serves as the base URL.

pingStation 3 base URL:

`http://###.###.###.###/`

Note “###.###.###.###” is the IP address of the device

Displays Health statistics, position and version information. Use to program the target UDP address and Port number.

pingStation 3 status URL:

`http://###.###.###.###/api/v1/status`

Displays the status json sentence/

pingStation 3 traffic URL:

`http://###.###.###.###/api/v1/traffic`

Displays the current traffic json sentences.

pingStation 3 update URL:

`http://###.###.###.###/update`

Provides ability to update firmware.

## 7.3 Connect

**Note: Any IP addresses shown in this document are examples only, and are not applicable to your pingStation 3 IP address.**

The base URL displays configuration items as well as dynamic pingStation 3 statistics.



## Configuration

UDP Output Format:

- ☐ UDP JSON  
☐ UDP JSON (Status Only)  
☐ UDP ASTERIX CAT021  
☒ UDP Disabled

UDP Target IP Address or Hostname:

UDP Target Port:

TCP Output Format:

- ☐ TCP Compressed VR  
☐ TCP ASTERIX CAT021  
☒ TCP Disabled

TCP Push IP Address or Hostname:

TCP Port:

pingStation3 Network Address:

Preferred Static IP Address:

 (0.0.0.0 for DHCP)

Subnet Mask:

Gateway IP Address:

DNS Address:

Advanced Recovery Options:

- ☒ Use DHCP Fallback For Static IP Recovery

Data Filters:

Altitude Ceiling In Feet:

 (0 = No Filter)

Max Radius In Miles:

 (0 = No Filter)

Station Info Interval In Seconds:

ASTERIX CAT021 Data Source ID Settings:

System Area Code:

System Identification Code:

## Health

UAT Basic: 0  
UAT Long: 11743  
1090 DF17: 11918  
1090 DF18: 52911  
Current Aircraft: 15  
GPS Fix Type: 3  
GPS Satellites: 11

Latitude: 42.010143 Longitude: -91.658119  
Receiver BPS: 921600 GPS BPS: 115200  
Version: 1.0.11  
ADS-B Version: 2.4.50 [Update](#)

[About / Copyrights](#)

Figure 6: Example configuration screen

### 7.3.1 Configuration Items

Configuration Category	Configuration Item	Description
UDP Output Format		The supported UDP delivery format. Only one option can be selected.
	UDP JSON	Aircraft data will be JSON formatted and pushed out a UDP pipe to the UDP target address on the UDP target port.
	UDP ASTERIX CAT021	Aircraft data will be ASTERIX CAT021 formatted and pushed out a UDP pipe to the UDP target address on the UDP target port.
	UDP Disabled	Disables UDP aircraft data output.
	UDP Target IP Address or Hostname	The IP address or hostname of the UDP listener on the server.
	UDP Target Port	The port number the UDP listener is listening on.
TCP Output Format		The supported TCP delivery format. One option can be selected.
	TCP Compressed VR	Aircraft data will be Compressed VRS formatted and delivered to a TCP for use with Virtual Radar Server.
	TCP ASTERIX CAT021	Aircraft data will be ASTERIX CAT021 formatted and delivered to the TCP target address on the TCP target port.
	TCP Disabled	Disables TCP aircraft data output.
	TCP Push IP Address or Hostname	The IP address or hostname that we will be sending TCP data to
	TCP Port	<p>If TCP Push IP Address or Hostname is valid this will be the port that we will connect to deliver the compressed VRS tracking data to the push receiver on the other end of the connection.</p> <p>If TCP Push IP Address or Hostname is not valid, this is the port that the TCP server will listen for incoming connections on to deliver the compressed VRS tracking data.</p>
pingStation3 Network Address		IP networking options for pingStation3. Default is DHCP, static IP optional. <b>Warning:</b> Only use static IP if necessary, it is possible to lock access out of pingStation3 if configured incorrectly.



Configuration Category	Configuration Item	Description
	Preferred Static IP Address	Fixed IP address number of the device which will not change. The network administrator assigns this number. Set this field to 0.0.0.0 to enable DHCP (Default). Updating this field causes a system reset.
	Subnet Mask	Mask used to the IP address into network and host address. Updating this field causes a system reset.
	Gateway IP Address	Address used to send packets out of the local network. Updating this field causes a system reset.
	DNS Address	This is the IP address of the Domain Name Service. Updating this field causes a system reset.
<b>Advanced Recovery Options</b>		The system will always enter DHCP client mode at power up. If a DHCP server is present on the network, it will override the Preferred Static IP address.
	Use DHCP Fallback for Static IP Recovery	This checkbox enables or disables the DHCP Fallback functionality for recovering units with bad or forgotten static IP addresses.
<b>Data Filters</b>		Options to reduce or increase the amount of data transmitted. These are useful on metered connections.
	Altitude Ceiling in Feet MSL	Entering a non-zero value will result in a filter which only returns aircraft data below the entered value in feet Mean Sea Level (MSL). Entering zero results in all aircraft data being returned.
	Max Radius in Miles	Entering a non-zero value will result in a filter which only returns aircraft data within the range from the receiver's GPS position in miles specified. Entering zero results in all aircraft data being returned.
	Station Info Interval In Seconds	This is the rate that the pingStation 3 information packet is returned. Mobile pingStation 3s will want a lower number in this field for more regular GPS updates. The default is once every 30 seconds.
<b>ASTERIX CAT021 Data</b>		User definable fields for CAT021 format. Not applicable to Compressed VRS or JSON.

Configuration Category	Configuration Item	Description
Source ID Settings		
	ASTERIX CAT021 System Area Code	Code allotted to the geographical area in which the ADS-B station operates.
	ASTERIX CAT021 System Identification Code	Code allotted to the ADS-B station providing traffic information.

**Note:** When modifying any configuration item, press the Update button to store the changes. These fields are non-volatile and persist through power cycles.

### 7.3.2 Health Statistics

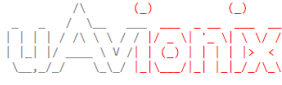
Statistic	Description
UAT Basic	The number of UAT basic aircraft messages received.
UAT Long	The number of UAT long aircraft messages received.
1090 DF17	The number of 1090 ADS-B aircraft messages received.
1090 DF18	The number of 1090 TIS-B messages received.
Current Aircraft	The number of aircraft currently being tracked. The aircraft are deprecated from the list after 60 seconds since last contact.
Current Range	The range in miles of the last processed aircraft from the pingStation 3.
GPS Fix Type	The gps fix type as follows: 0 = Not present 1 = Not locked 2 = 2D fix 3 = 3D fix 4 = Differential GPS fix
GPS Satellites	The number of satellites the pingStation 3 can currently see.
Latitude	The latitude of this pingStation 3.
Longitude	The longitude of this pingStation 3.
Receiver BPS	The communication speed to the ping receiver.
GPS BPS	The communication speed to the GPS
Version	The version of software this pingStation 3 running.

## 8 Recovery Methods

When in static IP mode and the user enters a bad network configuration or the user forgets the programmed Static IP Address, we provide 2 methods of recovery.

### 8.1 DHCP Fallback

- The system will always enter DHCP client mode on power up.
- If we have a static IP address configured, it will be loaded as the default into the network interface.
- **If we have a static IP address configured and the unit is on a network with a DHCP server, the DHCP address received from the DHCP server will overwrite the static IP address in the network interface.**
- If we have a static IP address configured, the DHCP requests will stop after 75 seconds. The 75 seconds was chosen because the default port configuration on some switches can take 60+ seconds for the link to come up.
- **If we have a static IP address configured and we have a hybrid network that supports both DHCP and static IP addresses, DHCP will overwrite the static IP address so the network administrator can create a DHCP reservation based on the MAC address for that IP address.**
- Note that the DHCP Fallback option can be disabled by unchecking the checkbox under “Advanced Recovery Options”.



## Configuration

UDP Output Format:

☐ UDP JSON  
☐ UDP JSON (Status Only)  
☐ UDP ASTERIX CAT021  
☒ UDP Disabled

UDP Target IP Address or Hostname:

UDP Target Port:

TCP Output Format:

☒ TCP Compressed VR  
☐ TCP ASTERIX CAT021  
☐ TCP Disabled

TCP Push IP Address or Hostname:

TCP Port:

pingStation3 Network Address:


Preferred Static IP Address:  (0.0.0.0 for DHCP)

Subnet Mask:

Gateway IP Address:

DNS Address:

Advanced Recovery Options:

 ☒ Use DHCP Fallback For Static IP Recovery

Data Filters:

Altitude Ceiling In Feet:  (0 = No Filter)

Max Radius In Miles:  (0 = No Filter)

Station Info Interval In Seconds:

ASTERIX CAT021 Data Source ID Settings:

System Area Code:

System Identification Code:

## 8.2 Power on information broadcast

- On power the system will do a UDP broadcast of system information when the static IP address has been set
- The broadcast will be to 255.255.255.255 port 6667
- The system will broadcast the system information once every 5 seconds when is static IP mode
- The information will be broadcast for 120 seconds to allow for link up and monitoring time
- The information broadcast will be as follows

- uAvionix signature
- MAC address
- IP address
- Subnet address
- Gateway address
- DNS address
- Lat
- Lan
- The format will be binary

Signature Bytes 0-18	uAvionixuAvionix
MAC Address Bytes 6-11	0x04714b107c85
IP Address Bytes 12-16	0xA16EA8C0
Subnet Mask Bytes 17-20	0xffffffff00
Gateway Bytes 21-24	0x016EA8C0
Latitude Bytes 25-28	0xFB9B1511
Longitude Bytes 29-32	0XFA88DCDD

## 9 Update

The pingStation 3 supports software upgrades thru a web-based flashing system. The user will launch the update webpage, select a firmware binary file and press a button to start the update process. There are two separate firmware files which can be updated through this process, the system software, and the ADS-B receiver software.

### 9.1 Update the pingStation 3 system software

The update process is started by launching <http://###.###.###.###/update>.

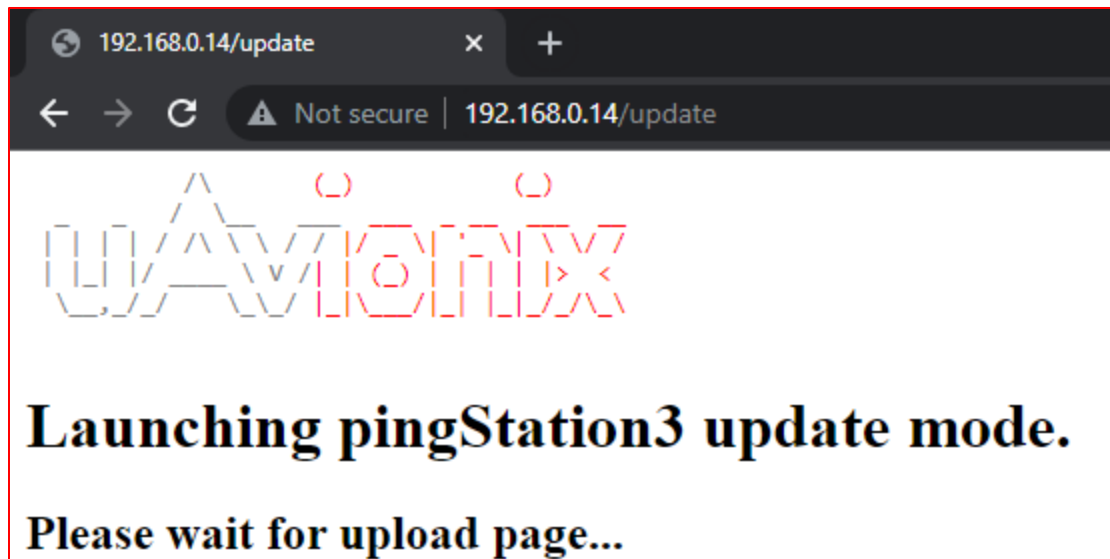


Figure 7: Example update entry screen

Choose the file to upload by pressing the “Choose File” button.

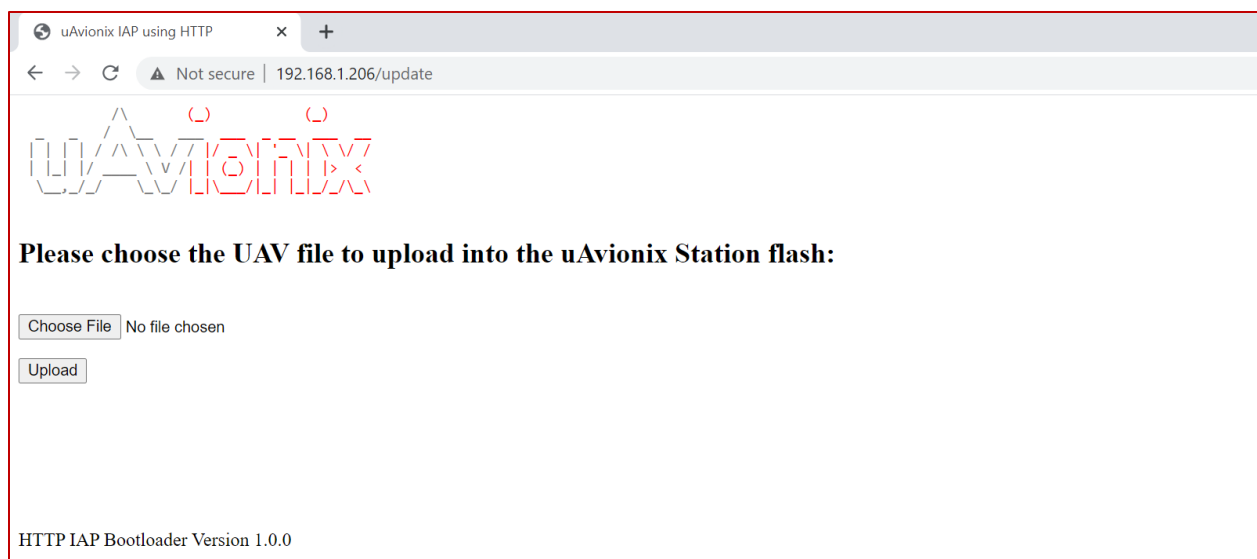



Figure 8: Example UAV file update selection screen

Press  to start the upgrade process. There will be an update % status at the bottom of the page.

When the upgrade is complete the pingStation 3 will reset.

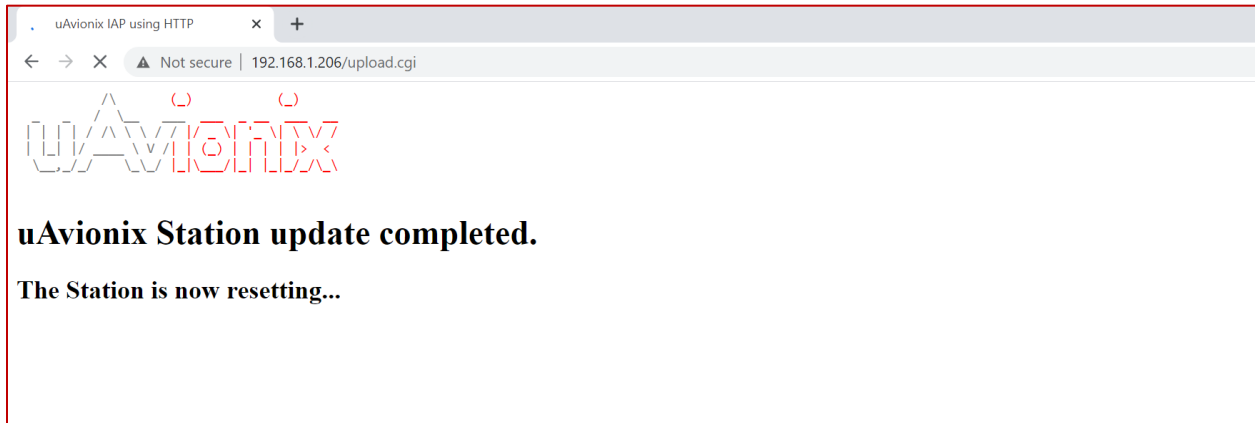


Figure 9: Example restart screen



## 9.2 Update ADS-B receiver software

The pingStation 3 system software supports in field updating of the ADS-B receiver software.

From the pingStation 3 configuration page <http://###.###.###.###/> select the “Update” link in line with the ADS-B Version report, or access the updater directly at <http://###.###.###.###/pingUpdate>

Latitude: 48.091732 Longitude: -114.105011  
Receiver BPS: 921600 GPS BPS: 115200  
Version: 1.1.5  
ADS-B Version: 2.4.36 [Update](#)  
[About / Copyrights](#)

Figure 10: ADS-B receiver software version

From the pingUpdate page select “Choose File” and select the latest receiver software. V2.4.43 is shown as an example.

**Ping Update**

PingTranscei...v2.4.43.uav

[Advanced](#)

Figure 11: ADS-B receiver file selection

Select “Start Update”

The progress bar will cycle during the update. At completion the updater will report the status of the update. The status will report “Update Complete” if successful.

## Ping Update

Update complete.



PingTranscei...v2.4.43.uav

[Advanced](#)

Figure 12: Update progress bar

Return to the pingStation 3 configuration page <http://###.###.###.###/> and verify the receiver version matches the version uploaded.

UAT Basic: 0

UAT Long: 7878

1090 DF17: 1267

1090 DF18: 2674

Current Aircraft: 141

GPS Fix Type: 3

GPS Satellites: 12

Latitude: 48.091732 Longitude: -114.105049

Receiver BPS: 921600 GPS BPS: 115200

Version: 1.1.5

ADS-B Version: 2.4.43 [Update](#)

[About / Copyrights](#)

Figure 13: Check updated ADS-B version

## 10 Virtual Radar Server Receiver

One option for displaying traffic received by pingStation 3 is through the use of open-source Virtual Radar Server (VRS) software. VRS is not a uAvionix product.

This is an example of creating a Virtual Radar Server receiver that will render the Compressed VRS data from the pingStation 3 on a local LAN VRS installation.

### 10.1 Configure pingStation 3

Open the pingStation 3 setup screen by visiting the pingStation 3 IP address using a web browser.

Enable the TCP Compressed VR output

Enter an IP Address or hostname i.e. 192.168.0.200 or vrs.uavionix.com

Enter the **assigned** TCP port i.e. 30003

**Note:** To display traffic on vrs.uavionix.com, please contact uAvionix support to obtain an assigned TCP port.

Click Update



## Configuration

UDP Output Format:

- ☐ UDP JSON  
☐ UDP ASTERIX CAT021  
☒ UDP Disabled

UDP Target IP Address or Hostname:

UDP Target Port:

TCP Output Format:

- ☒ TCP Compressed VR  
☐ TCP ASTERIX CAT021  
☐ TCP Disabled

TCP Push IP Address or Hostname:

TCP Port:

pingStation3 Network Address:

Static IP Address:  (0.0.0.0 for DHCP)

Subnet Mask:

Gateway IP Address:

DNS Address:

Data Filters:

Altitude Ceiling In Feet:  (0 = No Filter)

Max Radius In Miles:  (0 = No Filter)

Station Info Interval In Seconds:

ASTERIX CAT021 Data Source ID Settings:

System Area Code:

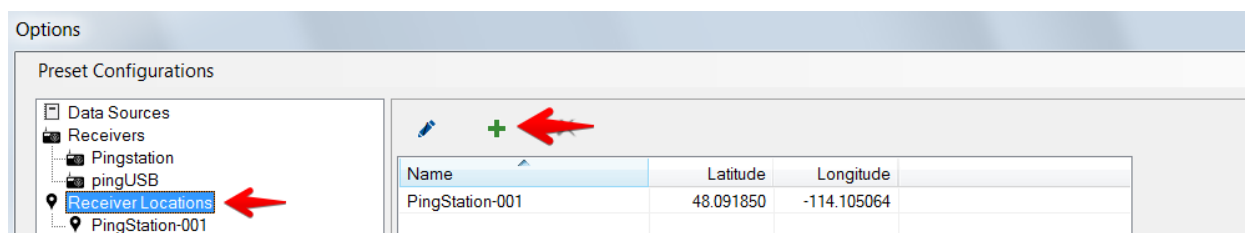
System Identification Code:

## 10.2 Configure Virtual Radar Server

Download and install Virtual Radar Server from:

<http://www.virtualradarserver.co.uk/>

1. Open Virtual Radar Server
2. Select *Tools > Options*
3. Select *Receiver Locations*
4. Click the + (plus sign)



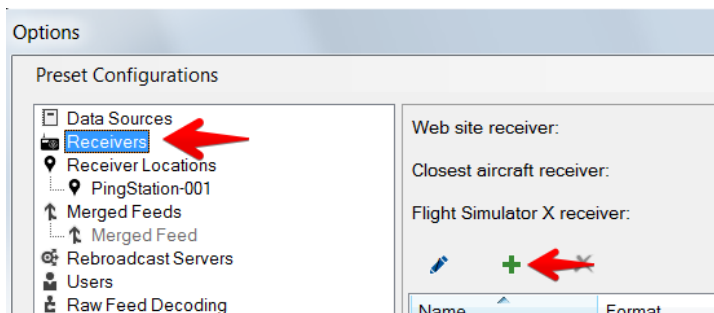
5. Enter a name for the receiver
6. Enter the latitude and longitude
7. Click *OK*

*Note: Receiver latitude and longitude are available from the pingStation 3 webpage*

The screenshot shows the configuration form for a new receiver. It has three input fields: 'Name' with the value 'PingStation-001', 'Latitude' with the value '48.091850', and 'Longitude' with the value '-114.105064'.

Name:	PingStation-001
Latitude:	48.091850
Longitude:	-114.105064

8. Select *Receivers* and click the + (plus sign).



9. Configure a receiver as shown below:

☒ Enabled Wizard  
 Name:   
 Format:  ☐ Is SatCom ACARS feed  
 Location:  x  
 Connection type:  Test Connection  
☒ Normal  
☐ Hide from web site  
☐ Merge only  
 Network  
☐ Push receiver  
 Address:   
 Port:   
 Passphrase:   
☒ Send keep-alive packets

Enable: Select *Enabled*  
 Name: Enter a name for the receiver  
 Format: *Compressed VRS*  
 Location: Choose the receiver location from the dropdown

Connection Type: Network

Push Receiver: Use to have the pingStation 3 create the TCP connect

Or

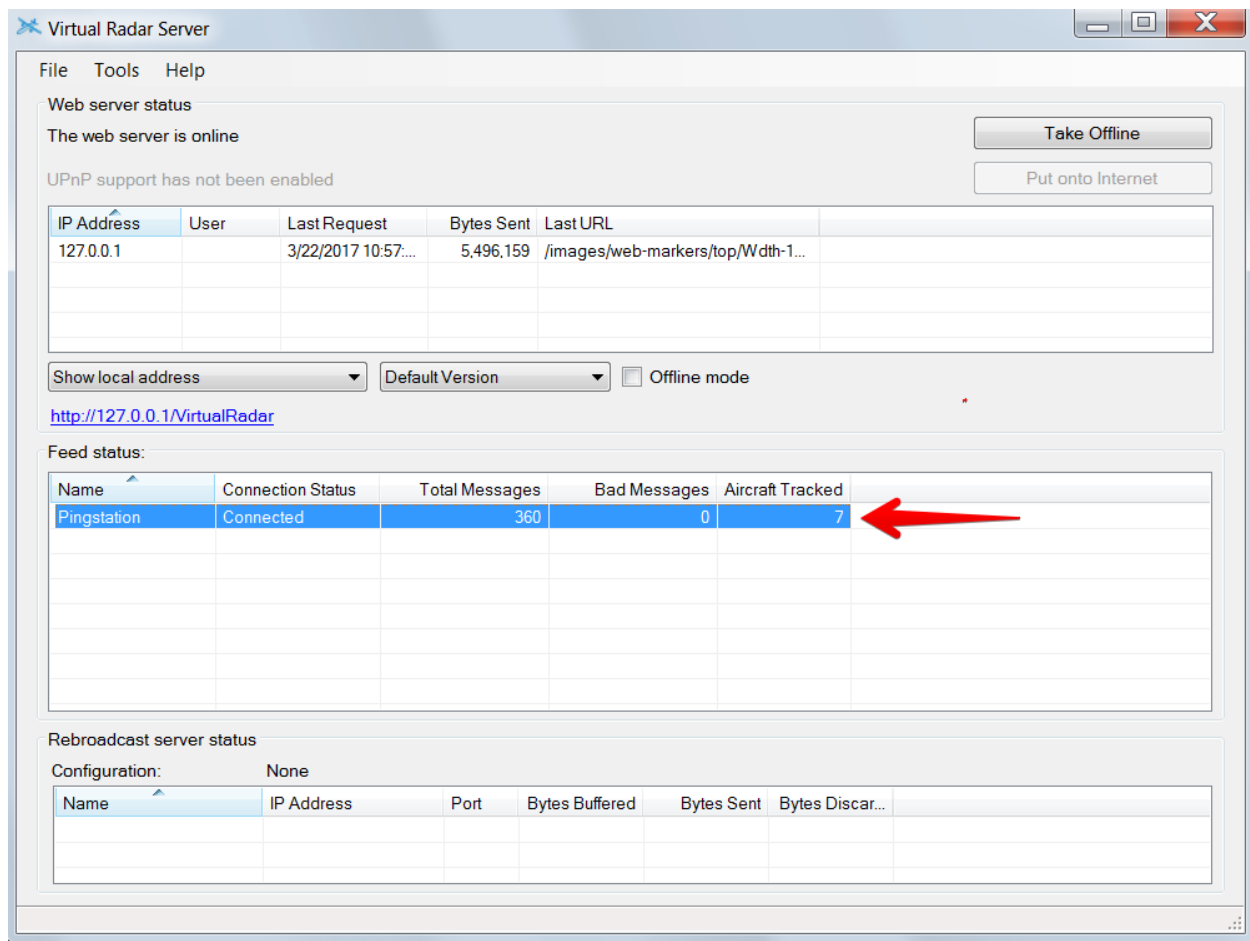
Address: Enter pingStation 3 IP address to TCP connect

Port: Enter the same TCP port as pingStation 3 setup

Send Keep-alive: Select *Enabled*

Click OK

10. After setup verify that the Virtual Radar Server shows a *Connected* status and that the message counter is increasing. Note that you may be required to have traffic before the state will change to *Connected*.

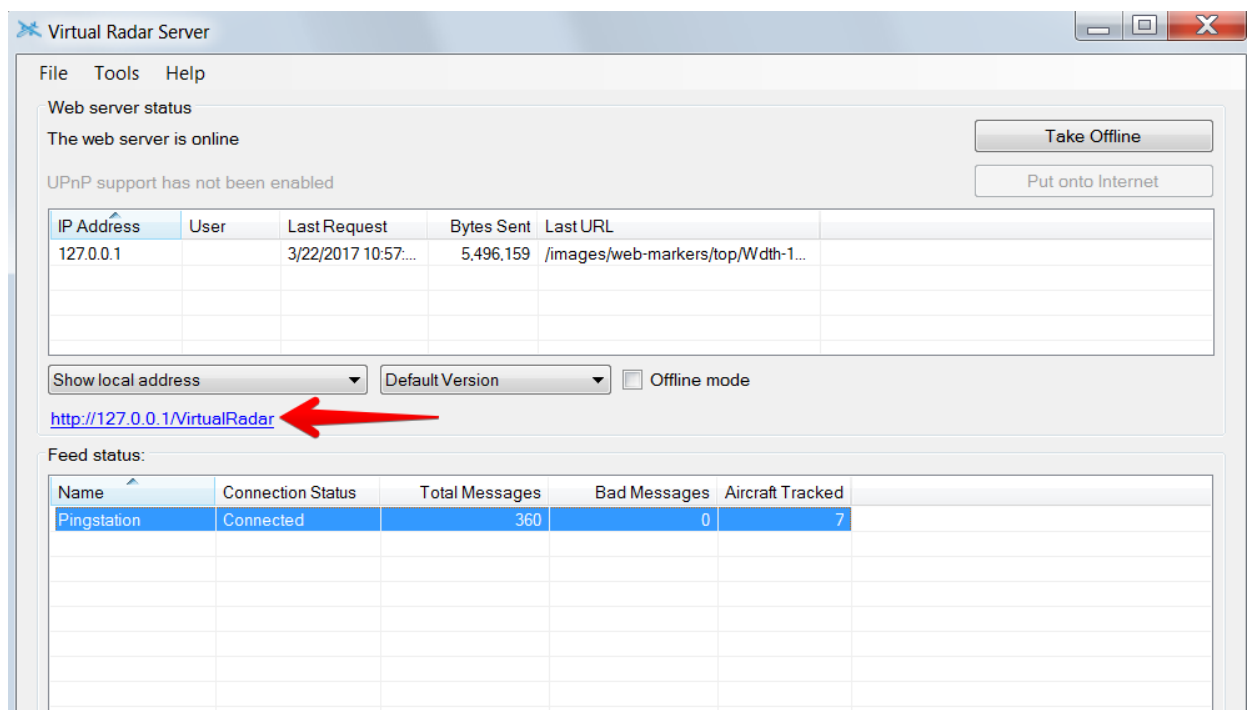


## 10.3 Configure Virtual Radar Moving Map Home Location

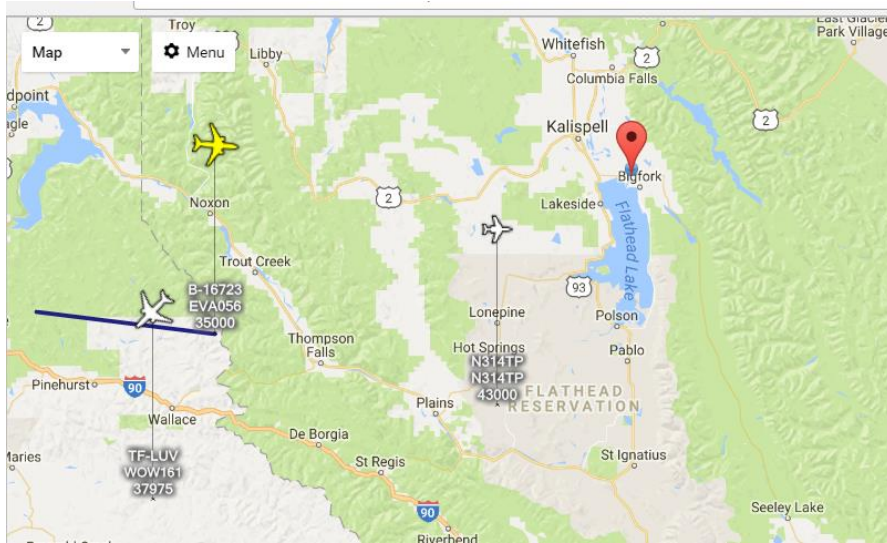
1. To view the aircraft on a moving map open a browser to your Virtual Radar installation. The default address is:

<http://127.0.0.1/VirtualRadar>

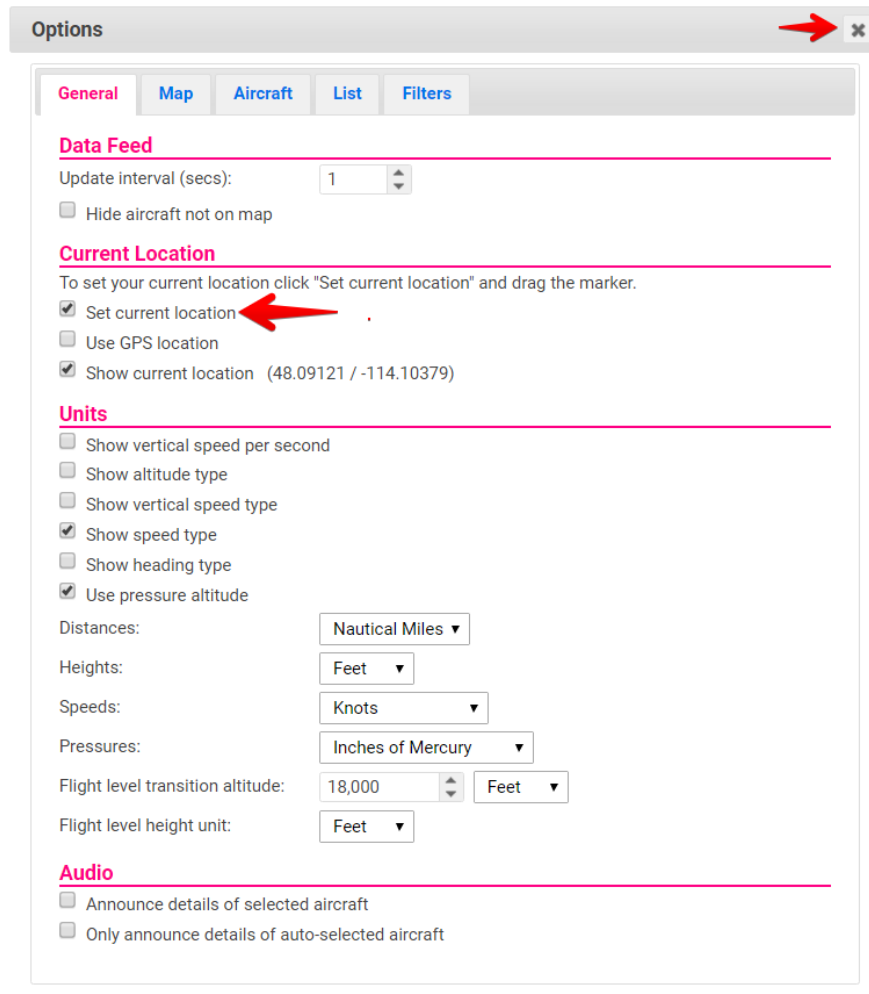
A clickable hyperlink to the page is located on the Virtual Radar Server window.







2. From the Virtual Radar webpage click *Menu > Options*
3. Select the *General* tab
4. Select *Set Current Location*
5. Click the *X* (close)



The screenshot shows the 'Options' dialog box with the 'General' tab selected. The dialog has a title bar with a close button (X) indicated by a red arrow. The 'General' tab is active, showing settings for Data Feed, Current Location, Units, and Audio. In the 'Current Location' section, the 'Set current location' checkbox is checked and highlighted with a red arrow. The 'Show current location' checkbox is also checked, displaying coordinates (48.09121 / -114.10379). The 'Units' section shows various settings for distances, heights, speeds, and pressures. The 'Audio' section has two unchecked checkboxes.

**Options** [Close]

**General** | Map | Aircraft | List | Filters

**Data Feed**

Update interval (secs): 1

☐ Hide aircraft not on map

**Current Location**

To set your current location click "Set current location" and drag the marker.

☒ Set current location

☐ Use GPS location

☒ Show current location (48.09121 / -114.10379)

**Units**

☐ Show vertical speed per second

☐ Show altitude type

☐ Show vertical speed type

☒ Show speed type

☐ Show heading type

☒ Use pressure altitude

Distances: Nautical Miles

Heights: Feet

Speeds: Knots

Pressures: Inches of Mercury

Flight level transition altitude: 18,000 Feet

Flight level height unit: Feet

**Audio**

☐ Announce details of selected aircraft

☐ Only announce details of auto-selected aircraft

6. Click and drag the red location icon to your location on the map.



For Virtual Radar Server documentation visit:

<http://www.virtualradarserver.co.uk/>

## 11 Support

For support with pingStation 3 visit <http://uavionix.com/support/>