Thank you for showing interest in installing a PilotAware ATOM Station in the UK!

With over 350 ATOM stations successfully installed, PilotAware has significantly contributed to aviation safety by enhancing situational awareness across the UK. Now, we're extending this groundbreaking technology to improve aviation safety across Europe, too. By joining this network, you're upgrading your flying experience and helping keep the skies safer for everyone.

We understand that setting up an ATOM station might seem a bit technical, but don't worry! We're here to support you every step of the way and are more than happy to help you get it up and running. To make things easier, we'll even **subsidise your installation by providing parts worth £150** free of charge and offer the parts you need at cost.

How PilotAware Supports You:

- **Subsidy & Parts at Cost:** We provide a **£150 subsidy** in parts towards the installation, along with a supply of key components (like antennas and cables) at cost if you prefer, saving you time and effort.

- **Guidance & Friendly Help:** Whether you're installing the system yourself or need help, we're available at every stage, with clear instructions and personal support whenever required.

- **Flexible Options:** You can build the ATOM station yourself or let us handle some trickier parts like configuring the software and assembling the electronics—whatever works best for you. However if you are technical and like a project, it is very satisfying and great fun.

**What You'll Get from your ATOM Station Installation:**

- **Contribute to Aviation Safety:** By linking your ATOM station with other local stations, you'll enhance situational awareness for yourself and others and have the best view of all traffic transmitting any form of electronic conspicuity.

- **Uplink FLARM and Mode-S Traffic:** Broadcast vital traffic information to PilotAware-equipped aircraft nearby to improve aviation safety.

- **Access to METARs:** Receive real-time weather data from METAR stations within 100 km.

- **Virtual RADAR Display:** Enjoy a full-featured flight display with bespoke RADAR screens available upon request.

- **Historic Data Storage:** Your ATOM station will help support Air Investigation and Airprox investigations.

- **Live Glider Tracking & SAR:** Provide FLARM data to The Open Glider Network for real-time tracking of gliders and FLARM users.

- **From December 2025:** Detects and rebroadcasts using EASA ADSL-4 Issue 2 O-Band protocol.

Typical VRS Screen. Bespoke screens are available for Flight Information Displays at regional airports.

To provide you with a benefit for installing an ATOM station at your location site we will provide you with the data of all aircraft received from other ATOM stations within a 60km radius.

This data can then be used to drive a real-time Virtual RADAR screen at no extra cost.

Just connect a computer and monitor screen to the same router that the ATOM station is connected

This will then provide real-time information on PilotAware, FLARM and ADSB-equipped aircraft in your location and also Mode-S aircraft using a normal MLAT delay of a few seconds.

This really is an exceptional facility to have at your airfield which can be used for situational awareness but not Air traffic control or deconfliction.

Building Your ATOM Station:

The installation includes setting up components like antennas, cables, and a Raspberry Pi single board computer, but **don't let that intimidate you!** We've provided detailed documentation and will be available to answer questions and offer support throughout. Here's what you'll need:

- **3 Antennas** (PilotAware 868MHz, FLARM 868MHz, ADSB/Mode-S 1090MHz)

- **Coaxial Cables, Pigtails, and Connectors**

- **A Raspberry Pi Computer and a PilotAware transceiver (which we provide for free)**

- **PilotAware Software (also provided for free)**

- **Other hardware**, such as a suitable enclosure Ethernet cables, power supplies, software defined radio receivers (SDR's) and a router to get to the internet.

- **Remember:** We can also supply parts that may be harder to find, such as antennas and dongles, at cost.

Installation Made Simple:

Every installation differs, but our documentation includes everything you need, including schematics and layout suggestions. If you'd like, we can assemble and configure the electronics for you before shipping them at cost, so all you'll need to do is install the antennas and power up the system!

PilotAware ATOM Station Build and Assembly Guide

This guide provides a detailed process of building and assembling a PilotAware ATOM station. Follow the steps below to ensure a successful installation, including procuring required components, hardware assembly, and software configuration.

The following slides show you how the above components are connected.

Firstly, the schematic diagram. This shows an installation using Power over Ethernet (PoE) as the power supply. This is useful if the box containing the electronics is far from the router or if shorter co-ax lengths are preferred.
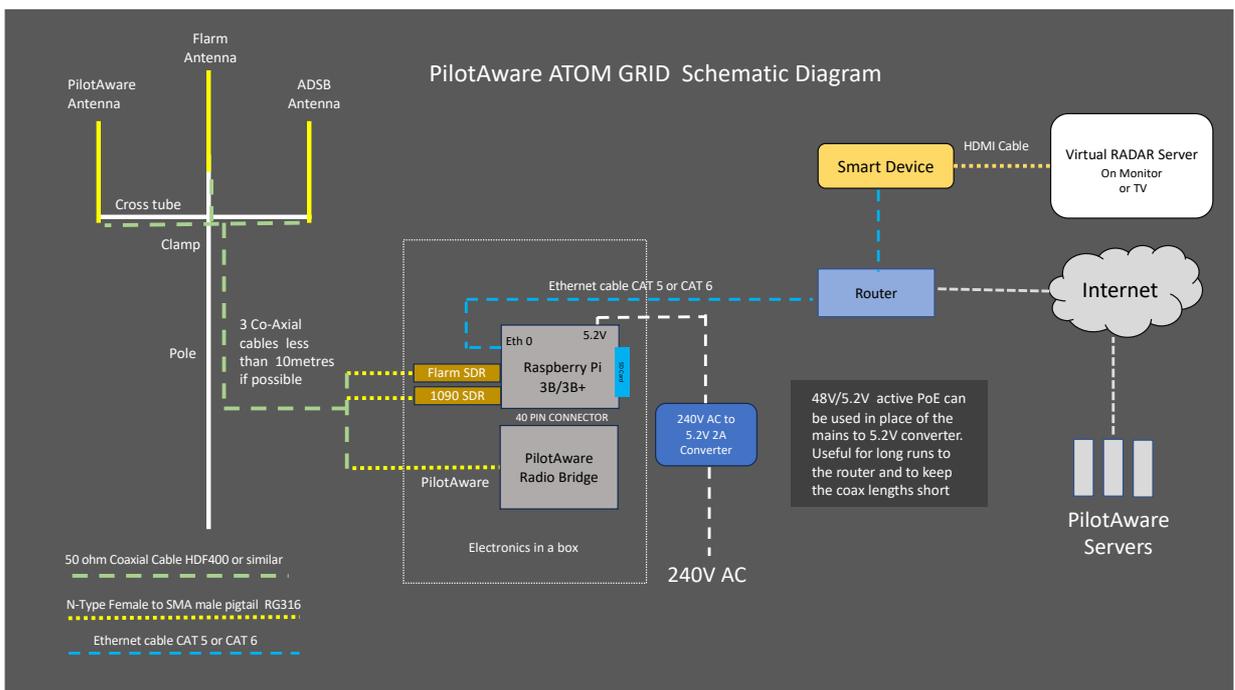
Fitting the antennas will be bespoke to each site. They can be fitted on individual poles, spread about, or, as shown below installed in a crucifix array.

The Antenna Array

This picture shows 3 typical antennas
From left to right they are:
(i) PilotAware
(ii) Flarm
(iii) 1090Mhz
These are mounted on a 2inch vertical pole with
a 1-metre cross tube connected using a shelly clamp.
Connection to the electronics box is via HDF 400 coax or
equivalent using N-type male connectors at each end.
The cables are dressed using cable ties.
The coaxial connectors are weather protected using
self-amalgamating tape.
In-line lightning protectors (discharge tubes) can be used
at vulnerable sites.

- The following picture shows examples of how the components in the schematic diagram can be connected.
- This uses PoE as the power supply; this can be replaced with a 240V to 5.2V voltage converter plus a separate ethernet cable if preferred.
- An ethernet passthrough gland is used to neaten the ingress of the ethernet cable.
- Individual sites will produce individual packing solutions. It's up to you.
- The secure software is kept up to date remotely over a secure link and cannot be modified locally.
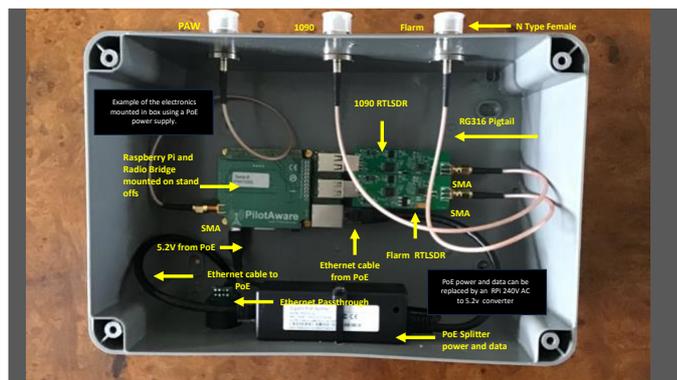
Building a PilotAware ATOM Station 2024
1. Required Components

- **PilotAware**
  - 1 Raspberry Pi Computer
  - 1 PilotAware Radio Transceiver Board
  - ATOM & Virtual RADAR Software
  - 1 SD card with configured software
- **Antennas:**
  - 1x FLARM antenna
  - 1x PilotAware antenna
  - 1x 1090MHz antenna (All available from PilotAware)

- **Cables:**
  - 3x 30cm pigtail cables (for connecting antennas to the RTLSDR)
  - CAT5/CAT6 Ethernet cables (length depends on your setup)
  - N-Type connectors for coaxial cables
- **Power Supply:**
  - PoE injector
  - PoE splitter or an alternative mains power supply (e.g., mains to 5.2V converter)
- **Radio Receivers:**
  - 2x RTLSDR (with R820T2-RTL2832U specification,
- **Enclosure:**
  - A weatherproof case, ideally 300x200x120mm, to house the electronics
  - RJ45 bulkhead pass-through for external Ethernet cable connections
  - Standoffs for mounting components inside the case
- **Miscellaneous:**
  - Tie wraps and self-amalgamating tape for cable management and waterproofing
- **Mounting Equipment:**
  - 3-4 meter pole for mounting antennas
  - Brackets for fixing the pole and securing antennas

Optional Tools:

- Crimping tool for coaxial cable assembly (can be rented or purchased for around £15)

---

2. Installation Steps

2.1 Electronics Location

- Choose a **dry** location for the electronics with access to 240V power and an internet connection.

- **Minimise the length of the coaxial cable** between the antennas and electronics. Use high-grade, low-loss HDF400 or RG8 coaxial cables. Up to 10m is acceptable, but a 16m run has been proven to work with HDF400. Runs shorter than 6M can use thinner quality coax such as RG8X or HDF200.

- Power can be supplied via **PoE (Power over Ethernet)** or a traditional mains supply (5.2V, 2.1A). The average power consumption is 8W, peaking at 12W.

2.2 Antenna Installation

- Mount the antennas as high as possible, spaced at least 30cm apart, avoiding obstructions such as chimneys or walls.

- Ensure the antennas are mounted vertically.

Typical Antenna Setup:

- You can use a single pole for all antennas or individual poles for each antenna. Secure the antennas firmly to avoid interference during operation.

2.3 Coaxial Cable Assembly

- Use **HDF400** or equivalent low-loss coaxial cables. For short runs (up to 5 meters), smaller cables like RG8X or LM240 can be used.

- Assemble N-Type connectors for each cable. Ensure the connections are firm and weatherproofed with self-amalgamating tape.

- Label each cable to identify which antenna it connects to this is important as two of the antennas are 868MHz and the third is 1090MHz

2.4 Electronics Assembly

- Use **N-Type to SMA Bulkhead** pigtails to connect the coaxial cables to the RTL-SDR dongles.

- Connect the antennas to the correct components via the coaxial cable and the Pigtails:

  - **The FLARM antenna** to the RTL-SDR which is inserted in the top left USB port of the Raspberry Pi.

  - **1090MHz antenna** to the RTL-SDR which is inserted in the bottom right USB port of the Raspberry Pi.

  - **PilotAware antenna** to the PilotAware Bridge using a pigtail.

- **Ethernet Setup:**

  - Connect an Ethernet cable from the Raspberry Pi Ethernet port to your router.

  - If using PoE, connect the PoE **injector** to the Raspberry Pi and router.

- **Power Supply:**

  - Connect the Raspberry Pi to the power supply, but do not turn it on.

2.5 Power Up and Testing

- Ensure all connections are secure and there is no strain on any components.

- Mount the equipment in a suitable enclosure.

- **Turn on the power** and verify the system is running by checking the LED indicators:

  - **Raspberry Pi:** A red LED indicates power and a green LED flashes during SD card access. If the green LED is solid, then the SD card is not inserted, or the software on it has not been loaded correctly or is corrupted.

  - **PilotAware Bridge:** Two LEDs indicate the TX/RX and status.

  - **Ethernet:** Yellow and Green LEDs on the RJ45 socket should be on to indicate a network connection. The Green LED flashes as data is transferred.

3. Software Configuration

3.1 Site Information

Before configuring the software, you need the:

- **Site location coordinates** (latitude and longitude in degrees decimal, accurate to <u>six decimal places</u>). NOT DEGREES, MINUTES, AND SECONDS.

- **The altitude** of the antennas above sea level in metres.(HAMSL)

- **The Station name** (up to 7 ASCII characters; airfield names should use ICAO codes).

Use an online tool such as Google Maps to determine your installation's exact latitude, longitude, and altitude.

You can record your unique configuration here.

Item Required	Description	Record Here
Host Name	Don't change this unless you are competent	OGNPAW
Station Name	See naming Rules above	
New Password for the Pi	For security, a new station password should be used to replace the initial one. Note if you forget the password it CANNOT be retrieved by PilotAware.	
Latitude	Include all 6 digits following the decimal point.	
Longitude	Include 6 digits following the decimal point.	
Altitude	Metres AMSL	
Geoidsepar	Metres using EMG 64	This is now calculated automatically.

3.2 Download and Install Software

1. Initially, PilotAware provides the latest SW. However, it can be done as follows.

2. Download the latest PilotAware OGN software from PilotAware Downloads.

3. Unzip the downloaded file and transfer all the contents to a formatted Micro SD card.

4. Insert the SD card into the **unpowered** Raspberry Pi.

5. Power up the Pi and allow the software to unpack (this can take around 20 minutes).

6. If you wish, you can monitor the progress using an HDMI cable connected to a display.

3.3 Accessing and Configuring the ATOM Station

- Connect to the ATOM station via a web browser:
    - Navigate to http://ognpaw.local (or use the IP address assigned by your router).

- Use the browser interface to configure the station with the coordinates and site name collected earlier.

- Set a new password for your ATOM station for greater security.

4. Additional Notes

- **Indicator Lights:**

- o Refer to the LED indicators on the Raspberry Pi and PilotAware Bridge for diagnostic purposes.

- 2 LEDs are located on the end of the Raspberry Pi 3B Single Board Computer next to the SD cardholder.

- In a typical operation, the RED LED shown will be permanently on, and the GREEN LED will flash occasionally when the SD Memory card is accessed. Fault conditions are a flashing red light, which indicates a power problem, and a constant green light, which means a dislodged or corrupt SD card.

- In addition, there are two LEDs on the PilotAware Radio Bridge for TX/Rx and status.
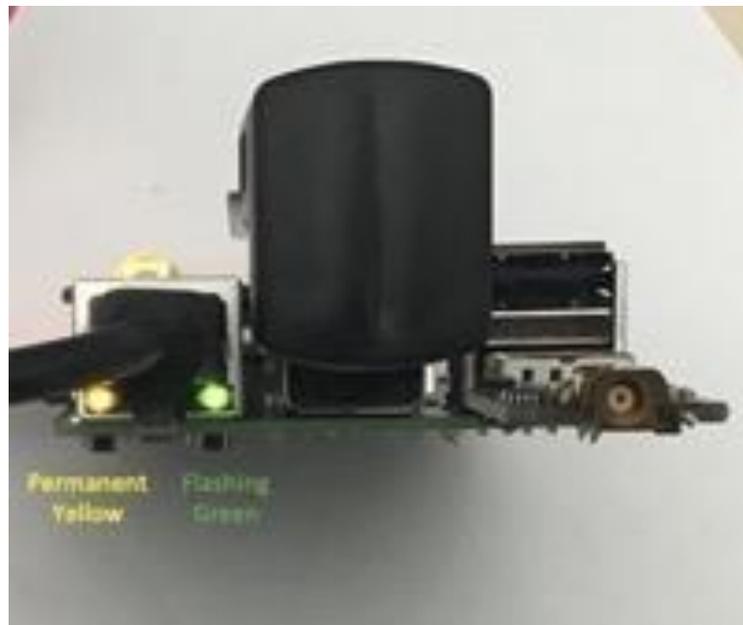
Finally, on the Raspberry Pi, there are two LEDs on the RJ45 ethernet socket. When a connection is made to the router the yellow LED will be permanently on and the green LED will flash in line with data transmissions. Similar lights are also on the end of the PoE splitter (if fitted) but these both remain on during normal operation.

- **Dynamic IP Addressing: DHCP**

    o The router may assign a new IP address if the station is powered down. Configure a static IP address for the ATOM station via your router settings to avoid this.

For a successful setup, ensure all connections are weatherproofed, components are secured, and the software is correctly configured for your location.

Configuring Your ATOM GRID Unit

Logging in

1. PilotAware ATOM GRID software has been developed so that you can run a command shell from within a web browser. (Google Chrome Safari or Firefox is recommended)

    When connected (either by WiFi or wired) onto the same network as the ATOM GRID Unit, navigate to **http://ognpaw.local (Note this is NOT https://).** You will probably get a prompt to say that this site is insecure - ignore this and continue to the address.

    (Not all routers will recognise ognpaw.local as they do not resolve the allocated IP address to the default host name, which is ognpaw.local. If this is the case you will have to revert to using the allocated IP address as shown in the next paragraph) .

2. To get the actual IPv4 address allocated to the ATOM GRID unit you may have to use an advanced menu on your router that is password-protected. See your local router instructions.

    For example, a UK SKY network router's generic log in is '**admin',** and the password is '**sky'.** Others will differ. Then choose Maintenance followed by Attached Devices. For example, if the IPv4 address allocated for your unit with the default hostname 'ognpaw' is 192.168.0.200, then use this. The assigned IPv4 address will vary from router to router.

    Alternatively, use IP scanning software such as **Angry IP Scanner,** which will list the IP addresses allocated to all devices connected to your computer.

Angry IP Scanner
Version: 3.5.3

*Also, please note that if the router is powered down, it **may** allocate a different IP address. This is called dynamic IP allocation. This can be overcome by giving the OGN-R a fixed IP address. How this is done varies between router makes and is not done in the PilotAware software.*

Configuring your Individual ATOM GRID unit.

When you have accessed your ATOM Grid Unit using **ognpaw.local** or the IP address (no extension) you will see the Home Page which looks something like this but with a temporary station name (unset) and no traffic will be shown.

Home	Metar	Radar	Login

Version 20200128 : Date 2020-02-12 21:17:52 (19ms) : Station PWWilmcot
P3I(data)=56222 MLAT=Connected Internet=Connected

ICAO	Reg	Type	Age	Amb(RND/ACT)	GS(KN)	Dist(KM)	Alt(FT)	Uplink
4CAAD8	EI-FAT	---Ar	-	-	164	8.9	7650(Q)	-
40755F	40755F	---Al	-	-	133	33.0	1625(Q)	-
406A50	G-FBJK	---Ar	-	-	177	42.1	3425(Q)	-
40755A	40755A	---Ar	-	-	113	46.5	1950(Q)	-
4CAFD6	-	--M-1	3	0.30/0.19 NM	232	48.2	4750(Q)	-
ACB4E4	N918FD	---Ar	-	-	212	67.7	8050(Q)	-
401153	G-JECY	---Ar	-	-	290	69.9	11000(Q)	-
4070A8	G-DHKE	---Ar	-	-	177	87.9	4175(Q)	-
406250	G-EUYI	---Ar	-	-	299	95.9	9775(Q)	-

Click the **Login** Box on the top line. You will get the login prompt. Your required responses are shown in **red** below. Notes are shown in **blue**. Things that can go wrong are shown in **Orange**

login: **pi (enter)** *(Ensure this is pi NOT PI or Pi)*

password: **12345678 (Enter)**   # This is the default Password. It is recommended that it be changed during the configuration. *(Note the password will not appear in the command line as you are typing it.)*

You will then be given a screen similar to this with options.

```
#####################################################
##           PilotAware ATOM Menu              ##
##        Last Reboot 2024-09-09 04:03:39      ##
#####################################################
1) Configure-ATOM     3) Report-ADSB      5) Report-PilotAware   7) TBD-2        9) List-SDR    11) Help
2) Configure-Weather  4) Report-FLARM     6) TBD-1               8) List-Network 10) Reboot     12) Quit
Please enter your choice: ^[{█
```

To run the config program select 1

You <u>may </u>see something like the following:

(21:26:34) FILESYS: Mount RW

Stopping Services

Do not plug in or remove any SDR dongles while this configuration script is running.

It is strongly advised to have the SDRs plugged in and then reboot the Pi before running this configuration script.

Found 2 SDR's:

WARNING: device 0 with serial number: 1090 cannot be found

Most likely the serial number has been altered and the Pi not rebooted before running this script.

Reboot required

If any of the SDR's are plugged into a powered USB hub then the hub will also need to be powered down at the same time.

Rebooting in 10 seconds

Please rerun config afterwards

If so the system will reboot so log back on using ognpaw.local or the allocated IP address and go back to

login: **pi (Enter)**

password: **12345678 (Enter)**

```
####################################################
##              PilotAware ATOM Menu             ##
####################################################
1) Configure
2) Update-Beta
3) Quit
Please enter your choice: ^[{
```

Select **1**

You should then see something like this

(21:32:48) FILESYS   : Mount RW
Stopping Services
Do not plug in or remove any SDR dongles whilst this configuration script is running.
It is strongly advised to have the SDR's plugged in and then reboot the Pi before running this configuration script.

Found 2 SDR's:
  USB Port Top Left   : USB hub or powered USB extension cable detected -> SDR detected ID=**1** currently allocated to OGN/FLA
RM reception on 868Mhz
  USB Port Bottom Right : SDR detected ID=**0** currently allocated to ADS-B reception on 1090Mhz
  USB Port Top Right   : no SDR detected
  USB Port Bottom Left : no SDR detected
One SDR is currently configured for OGN and the other is configured for ADS-B reception.
Do you wish to change the SDR(s) configuration [y/N]:

Type in **N (Enter)**

If the allocations are wrong, then choose Y and change the allocation. By convention, the Flarm RTLSDR is positioned in the top left USB slot (with the ethernet socket to its left) and should be connected to the Flarm antenna and have the ID 1. The ADSB RTLSDR is at the bottom right and should have the allocation 0.

If the RTL-SDRs are not detected, this will be because they are not seated correctly in the USB sockets on the Raspberry Pi single-board computer. They may have moved in transit, so push them securely. Or they are faulty, which is unlikely.

Do you want to change the Antenna Gain value () [y/N]:

This is for future use and can be ignored by typing N or carriage return.

Do you want to set a Password (recommended first time) [y/N]:

You should type in a new password rather than the default 12345678. Choose something that has 8 characters and numbers in upper and lower case. PLEASE NOTE THIS PASSWORD AS IT **CANN'T BE RETREIVED by PilotAware.**

Type in **Y followed by your new PASSWORD (Enter).**

Do you want to change the Station Name (Setup0n) [y/N]:

Type in **Y** *followed by your* **Station Name** *(7 Characters max)* **(Enter)**

Do you want to change the Station Latitude (DD.dddddd) [y/N]:

Type in **Y** *followed by your station* **Latitude** *in Decimal.* **(Enter)**

Do you want to change the Station Longitude (+/-DD.dddddd) [y/N]:

Type in **Y** *followed by your station* **Longitude** *in Decimal.* **(Enter)**

Note: West of the Greenwich Meridian is negative

Do you want to change the Station Altitude AMSL in Metres (77) [y/N]:

Type in **Y** *followed by your station* **Altitude** *in Metres.* **(Enter)** *This is the height of the antennas above Mean Sea level not the height above the local ground!*

 ** Altitude GEOID has been calculated from LAT/LONG as GG **
Do you want to change the email address for the station maintainer (JohnDoe@Gmail.com) [y/N]:

The altitude GEOID is an automatic calculation you need to do nothing.

Maintainer email address

Type in **Y** *and change the station maintainer from JohnDoe@Gmail.com to your* **email address. (Enter)**

Do you want to setup WiFi wlan0 [y/N]:

If you are using a Pi3 B with built-in WiFi, you will be given the option to set up WiFi. This is not available when using a Pi2. If you want to use WiFi rather than a wired connection and you are technically competent, you can do this by following the instructions given.

Testing --ppm=0 --gain=0

The program will now self-test the FLARM antenna by logging onto several local GSM stations. This will allow the program to set a frequency offset to tune the antenna. The receive gain will step slowly from 0dB to 50dB, and the number of stations picked up will be shown. Afterwards, you will see a message similar to the following but with your configuration set. The gain receiving the highest number of stations will be chosen. This is not always +50dB.

You will then see a resume of your configuration

```
######################### Summary #########################
Station Name is             : Your Station Name
Station APRS Server is       : aprs.glidernet.org:14580
Station Latitude is          : Your Station Latitude
Station Longitude is          : Your Station Longitude
Station Altitude AMSL  [M] is  : Your station altitude
Station Altitude GEOID [M] is  : Your Station GEOID
Station SDR PPM is            : Your Station Flarm Offset
Station SDR Gain is           : Your Station Flarm Antenna
Station SDR Freq Centre is    : Your Station Centre Frequency
######################### Summary #########################
```

Starting Services

The station will now log into the Open Glider Network (OGN) and the ATOM GRID servers, and you will get

(21:54:20) FILESYS : Mount RO
pi@ognpaw:~/rtlsdr-ogn $

If you do not get this message after about 20 minutes, check that the connection to the router is secure and that you have access to the internet.

The configuration is now done, and the PilotAware servers will send a message to connect your station to the secure ATOM Grid. This has to be authenticated manually to ensure that you are a genuine site so it may take some time as the email address is not manned 24/7. Any issues, contact ogn@pilotaware.com.

To return to the home page type the IP address into the command line with no extension. (make sure that an extension has not been cached if it appears, delete it) This extension may be :4200, so delete it to get back to the local login home page.

Testing the Installation

Your station will next appear on the Open Glider Network App, the URL of which is shown here. This may take up to 20 minutes to appear.

https://ognrange.glidernet.org/#,max,lastweek,52.12902_6.85676,,#000000ff:#000000ff,circles;

It will also show in the list of sites available here

https://www.dropbox.com/s/0n5emkw4nm85sw1/ogn-r.txt?dl=0

It may take some time to register but not longer than 20 minutes.

Check PilotAware transmission to and from the ATOM-GRID Ground Station.

To check that the ATOM GRID ground station is working, power up a PilotAware unit outside so that it picks up enough satellite stations in the immediate location. Ensure that you have configured the PilotAware Unit to show ground stations. This is done on the Rosetta configure page.

Once the Rosetta has booted up;

1. The number of ground stations in view will be shown in the top right hand of the Rosetta RADAR Screen. This will normally be 1.
2. The ground station will be shown as an ICON in the centre of the RADAR screen. (You must have selected show ground stations on your PilotAware Rosetta to see this).
3. The OGN-R station will appear in the list in the Rosetta Traffic Page

4. The PilotAware with its ICAO number, Altitude and Distance will be recorded on the ATOM GRID Virtual RADAR Screen. The diagram below shows MLAT-TEST, but it will show whatever the flight ID of your PilotAware unit has been set to.
5. The ATOM table shown below is similar to what you will see on the ATOM GRID Home Page.

| Home | Metar | Radar | Login |

Version 20200128 : Date 2020-02-13 09:08:13 (71ms) : Station PWWilmcot
P3I(data)=23 MLAT=Connected Internet=Connected

ICAO	Reg	Type	Age	Amb(RND/ACT)	GS(KN)	Dist(KM)	Alt(FT)	Uplink
F1267D	MLAT-TEST	-P--1	-	-	0	0.0	209(G)	-
3C661A	D-AIPZ	---Al	-	-	265	16.6	6700(Q)	-
3C66B8	D-AIUX	---Al	-	-	294	34.1	11650(Q)	-
406F9A	G-PRPE	---Al	-	-	245	43.4	11550(Q)	-
A6869C	N52AG	---Ar	-	-	9	45.6	750(Q)	-
AC9837	N910RW	---Ar	-	-	163	65.7	5600(Q)	-
43C8DE	ZM504	---Ar	-	-	74	89.5	1925(Q)	-
3C5433	D-AEAS	---Ar	-	-	207	99.5	6350(Q)	-
4CA9BB	-	---Ar	-	-	239	99.7	10725(Q)	-

At the top of the page is the menu to access the other pages.

METAR shows the data for airfields limited to 150Kms away.

RADAR accesses the ATOM Virtual RADAR Page.

Login takes you to the software shell to configure the software and run diagnostic programs.

The following data is shown below the Menu.

Version 20230128. New versions will be downloaded automatically via the Internet.

Date and Time.   Current Date and Time, including server response time.

Station.   The Station name. In this example, it is PWWilmcot.

P3I Data.   The number of PilotAware packets received today.

MLAT.   'Connected' means receiving MLAT data.

Internet.   'Connected' means connected to the internet.

Line 1 of the matrix shows the test PilotAware unit being received by the ground station showing that it is receiving data from PilotAware units. Designated as a PilotAware (P) being picked up locally (l). The altitude shown is the height above sea level and it is GPS (G) derived data.

Home Matrix Key

Home	Metar	Radar	Login

```
Version 20230624 : Date 2023-08-30 14:27:05 (30ms) : Station PWWilmcot, EM=0, SG=1
QNH 1008mb (EGBB), 34 mins ago, 28 km away
P3I[UP=606816/0.33% DN=140810/0.03% DC=95.75%] Internet=Connected
```

ICAO	Reg	Type	Ltcy	Age	Amb(RND/ACT)	GS(KN)	Dist(KM)	QNE	GNSS	Info
404E16	G-MPAA	-PM-r	4	9	0.01/0.00 NM	2	0.1	*300*	150	V=20230610 R=1/0 E=0
DDA77D	G-CFWT	O---r	0	1	–	29	11.2	*2025*	1875	–
405C46	G-EWAD	--M-r	5	5	0.30/0.11 NM	78	14.1	1800	*1650*	–
DDEAFE	G-KKSX	O---r	0	5	–	61	15.3	*2125*	1975	–
405EAD	G-DFBM	O---l	0	0	–	51	17.0	*3450*	3313	–
407CE4	G-DRTK	---Al	0	0	–	160	18.3	2300	*2150*	–
49D09E	OK-TVH	---Ar	0	0	–	185	18.7	5075	*4925*	–
402563	G-WAVE	--M-r	5	6	0.30/0.17 NM	104	26.0	2975	*2825*	–
D001CA	ZSGER	O---r	0	8	–	62	26.3	*1625*	1475	–
407506	G-JMBS	--M-r	4	6	0.30/0.25 NM	148	26.3	2200	*2050*	–
896483	A6-EUY	---Al	0	0	–	291	26.7	8500	*8350*	–
401B9D	G-COVZ	--M-r	5	6	0.30/0.15 NM	92	26.8	2600	*2450*	–
407E92	G-DMBC	O-M-l	5	0	–	34	28.0	2750	*2600*	–
D00CA4	D00CA4	O---r	0	1	–	84	28.1	*3525*	3375	–
3D9AC9	D-GEWF	---Al	0	0	–	194	28.6	10000	*9850*	–
DDE3F8	G-DDXB	O---r	0	10	–	46	31.4	*1600*	1450	–
06A0C2	A7-BDD	---Al	0	0	–	185	31.7	2925	*2775*	–

Key to Matrix columns

Column 1 ICAO

This is the unique ICAO transmitted from the aircraft detected

Column 2 Reg

This is the registration transmitted from the aircraft detected

Column 3 Type

This is the type of transmission detected allocated to 4 types

O---- represents a Flarm detection

-P--- represents a PilotAware detection

--M-- represents a Mode-S detection (M for Multilateration)

---A- represents an ADSB transmission from a Transponder ADSB (DF17)

---a- represents an ADSB transmission from a CAP1391 transceiver ADSB (DF18)

----l shows that the target has been received locally by this ATOM station

----r shows that the target has been relayed from the PilotAware servers as it is within the capture area.

† Note that relayed data will be used if it is newer than directly detected data. This helps with airframe obscuration.

Often there will be multiple entries, such as OPMa-l. This means the aircraft transmits multiple EC signals with the same ICAO correctly installed on each device.

Often, an aircraft will transmit two EC devices with different ICAO codes that are incorrectly installed. This usually happens with gliders that have not installed their ICAO code into their Flarm device, which will transmit its default serial number beginning with DD.

Column 4 Ltcy.

This is the time taken from an aircraft interrogation being detected by multiple stations and the MLAT fix being available for broadcast.

Column 5 Age

This is the time in seconds since the last refresh of the MLAT position. If this is greater than 15 seconds, then the position is removed.

Column 6 AMB (RND/ACT)

This is the positional Ambiguity of Multilaterated detections. RND is the NACP level, and ACT is the calculated error in NM.

Column 7 GS (KN)

This is the ground speed of the target aircraft

Column 8 Dist (KM)

This is the distance of the target aircraft from the ATOM station position.

Column 9 QNE

This is the barometric altitude being transmitted by the target aircraft in steps of 25ft.

Column 10 GNSS

This is the GPS altitude being transmitted by the target aircraft

Column 11 Info

This row shows which aircraft is triggering the information broadcast, and Column 11 shows what is being broadcast. Used mainly for MLAT aircraft nearby.

Other engineering information will also be shown, which is of little concern to the casual user.

More Information

If you require More Information please contact

ATOM@pilotaware.com