Doppler UI

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1. Disclaimer

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Doppler Systems radio direction finding equipment and software are designed to help locate the source of interfering, emergency or unauthorized transmissions, or others coming from marker and rescue beacons, etc., and is not intended to be used as a navigation aid. In particular it is not to be used for aircraft or marine navigation.

Doppler Systems does not warrant that the Software will meet your requirements or that operation of the Software will be uninterrupted or that the Software will be error-free.

2. Introduction

Doppler UI is an intuitive software interface designed for Doppler Systems' radio direction finders. It connects to Doppler Radio Direction Finders over an IP network, enabling individual monitoring, control, and configuration.

The software displays the line-of-bearing of incoming radio frequency signals and supports both fixed and mobile direction finders. When paired with a mobile system, Doppler UI is especially effective at locating the source of radio transmissions.

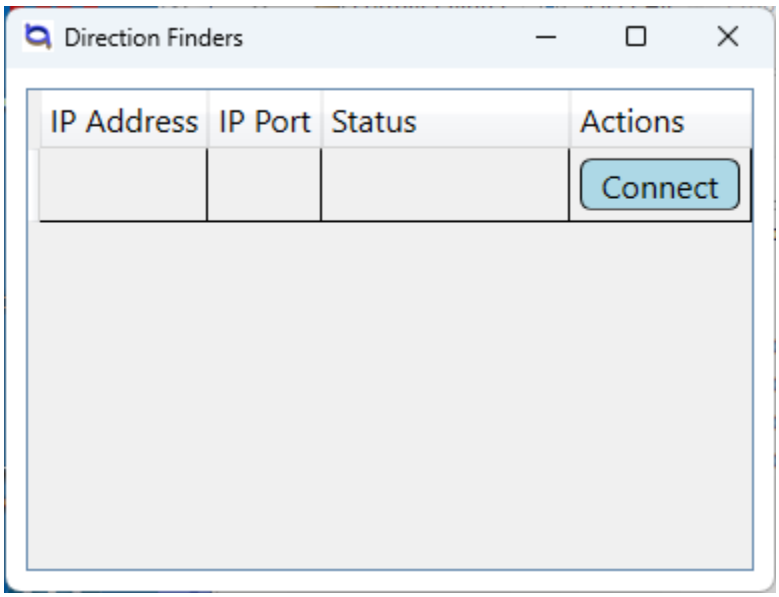
The software is capable of configuring a Doppler radio direction finder. All user configurable parameters are available via Doppler UI.

3. Installation

Doppler UI is available from the software downloads page of our website. After downloading it simply run the installer and answer the questions in the prompts. Once installed a shortcut will be shown on your desktop.

4. Getting Started

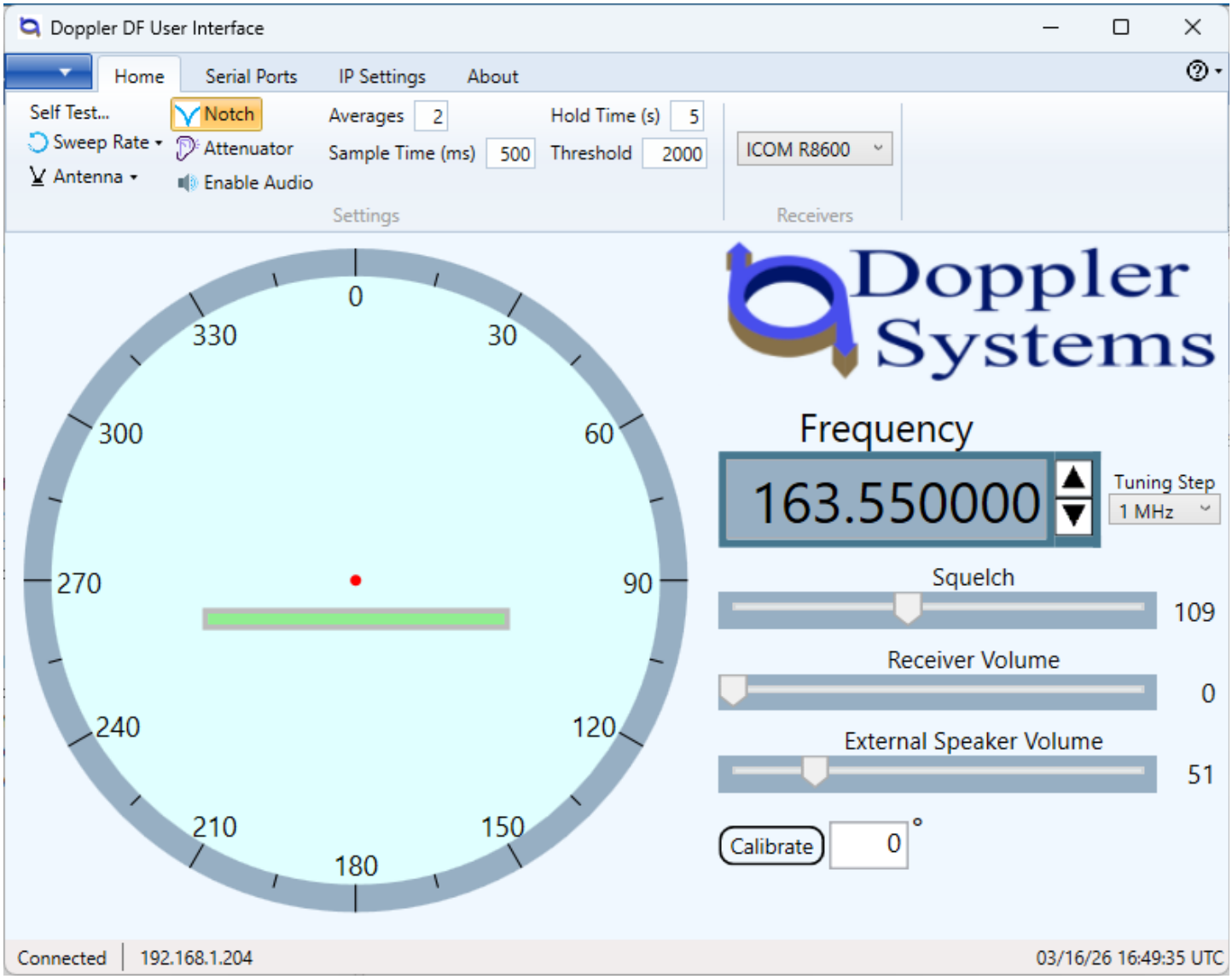
Double click on the desktop shortcut or launch Doppler UI from the start menu. After starting the software the following dialog will be displayed



If a direction finder is powered on and connected to the same local area network (LAN) as the computer the IP address and IP Port fields will automatically be filled in and a connection will be established with the direction finder.

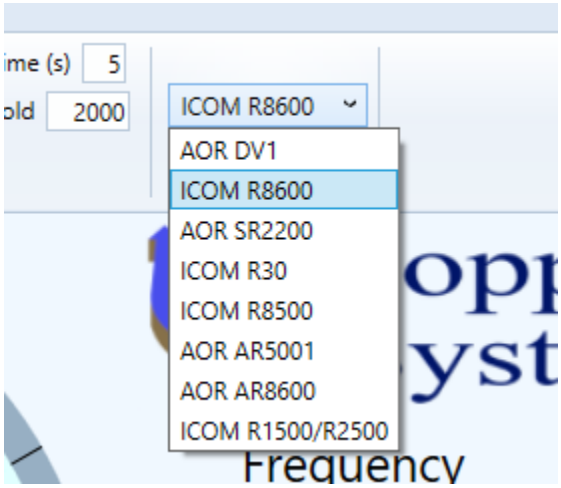
If the direction finder is not on the same LAN as the computer, simply enter the IP address and the IP Port (default is 2101) and press the Enter key. Doppler UI will attempt to connect to the direction finder.

If the connection is made the dialog shown above will be minimized. It can be displayed by selecting it from the task bar at the bottom of the screen. After the dialog is minimized the main screen for the direction finder will be displayed



4.1. Setting the Receiver

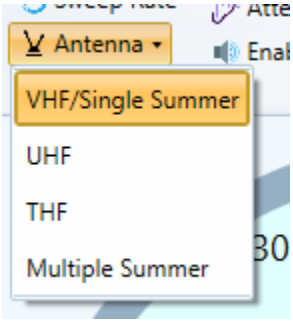
After making a connection you must set the receiver to the receiver you are use with the direction finder. To select the receiver go the Home->Receivers group and select the receiver you are using as shown below



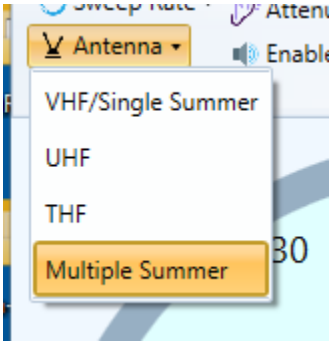
If you are using a receiver not on this list you will need to manually adjust the receiver volume, squelch, and frequency.

4.2. Setting the Antenna

Most mobile direction finders use single summers and the antennas are changed when changing bands. The antenna setting for this configuration is as shown below.



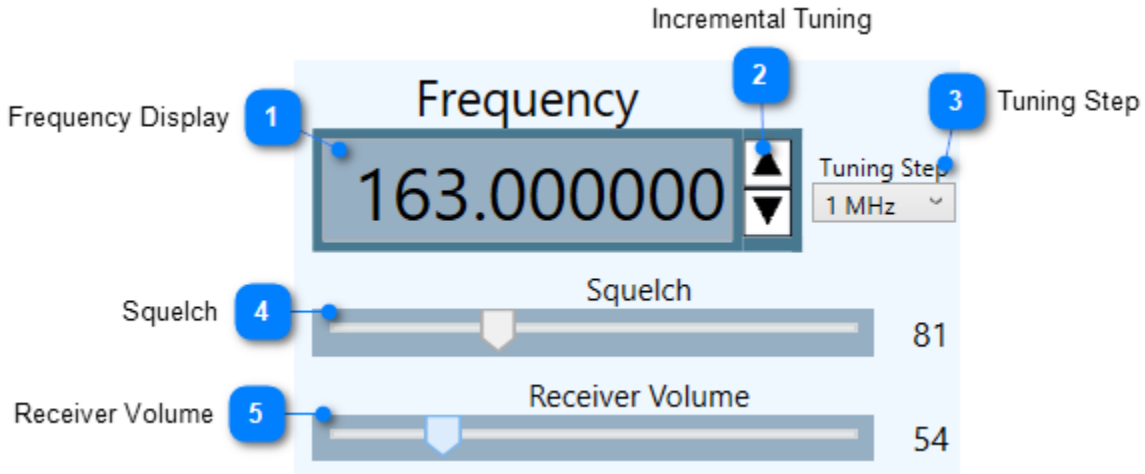
In some mobile direction finders, three summing units are used with three sets of antennas. If this is the configuration you are using set the antenna as shown below.



If you are using the direction finder in a fixed site configuration, you will need to set the antenna to the antenna band you are using, VHF (115 - 250 MHz), UHF (250-500 MHz), or THF (500 - 1000 MHz).

4.3. Receiver Settings

To set the frequency use the frequency control on the right side of the main screen.



1 Frequency Display

The frequency display shows the frequency the receiver is tuned to. The receiver may be tuned by selecting the frequency displayed and typing a new frequency followed by the Enter or Tab key.

2 Incremental Tuning

Pressing the up arrow or down arrow will incrementally tune the receiver by the selected tuning step. The up arrow or right arrow and down arrow or left arrow keys will also incrementally tune the receiver

3 Tuning Step

The Tuning Step drop down sets the incremental tuning step.

4 Squelch

This control sets the receiver squelch. When selected the squelch may be increased or decreased by sliding the the control or by using the up arrow or right arrow and the down arrow or left arrow.

5 Receiver Volume

The receiver volume sets the volume of the external speaker output for the receiver. For all receivers except the AOR DV1 and the ICOM R8600 you must adjust the volume to provide audio input to the direction finder. To accomplish this, tune the receiver to a known frequency that is transmitting then adjust the volume until a bearing is received. For the ICOM R8600 and the AOR DV1, leave the volume set to 0 unless you want to hear the receiver audio through the receiver speaker.

4.4. Displaying a Bearing

The compass rose display in the main window displays the direction of the signal (line-of-bearing) from the direction finder location to the source of the signal. Tune the receiver to the frequency of the signal and the compass rose will display the bearing.

1 Line of Bearing

The direction of the bearing from the direction finder location to the signal source

2 Signal Strength

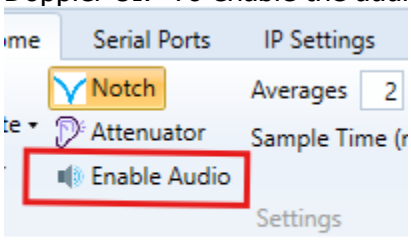
The signal strength of the received signal

3 Bearing Received Time (UTC)

The time the last displayed bearing was received in Universal Coordinated Time.

4.5. Playing Audio

There are two ways to hear the audio from the direction finder. The first way is to enable the audio using Doppler UI. To enable the audio, press the Enable Audio in the Settings group on the Home tab.



The audio received by the direction finder will be streamed to the computer and play through the computer's default audio device, typically the computer speakers.

The other way to listen to the audio is to connect a speaker to the audio output of the direction finder (see the MPT User's Manual). The volume of the audio can be adjusted using the External Speaker Volume control

4.6. Calibration

If you are using any of the listed receivers and are using the direction finder as a mobile, there is no need to calibrate the direction finder. Simply set the receiver and each receiver has a default set of calibration constants that provides the best accuracy available.

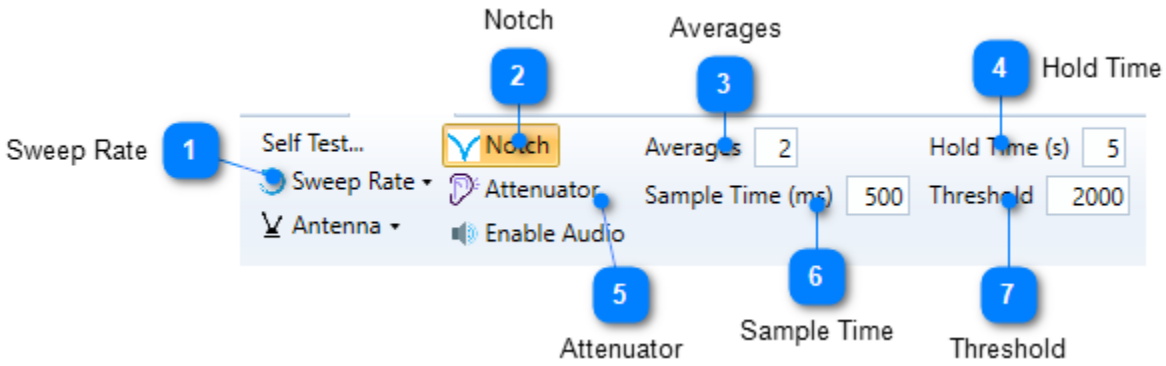
If you are using the direction finder in a fixed site configuration, or if you are using a different receiver from the ones listed, then you must calibrate the direction finder. To calibrate the direction finder, locate a continuously transmitting RF source. This can be a weather station, a repeater, etc. For fixed site direction finder, calculate the bearing angle between the location of the direction finder the the RF source and enter that angle into the text box next to the Calibrate button.

Tune the receiver to the frequency of the RF source and press the Calibrate button. After a short time the calibration will complete and the compass rose will display the bearing.

For mobile configurations, the same technique as the fixed site can be used, but typically it is easier to position the vehicle so that the front of it is pointed at the RF source and then set the angle to 0 and press the calibrate button.

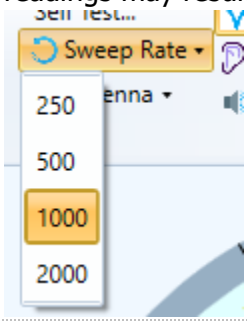
5. Settings

Doppler UI can adjust any of the settings in the direction finder. For most applications, the default settings will give the user the best results, but under some conditions it may be necessary to make changes.



1 Sweep Rate

The Doppler radio direction finder has four sweep rate settings; 250, 500, **1000**, and 2000. The sweep rate is the rotational rate of the antenna in Hz. For most signals the default sweep rate of 1000 Hz works well; however, if the signal has a large 1000 Hz component in its audio, erroneous bearing readings may result. Changing the sweep rate will fix this issue.

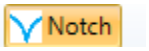


2 Notch

The simulated rotation of the antenna adds a tone in the audio at the sweep rate. When listening to the audio, this tone is annoying and long term exposure can cause hearing loss. A notch filter is provided to remove the tone from both the computer audio as well as the audio driving the external speaker.

As a trouble shooting aid, you can disable the notch filter. When disabled you will hear a tone at the frequency of the sweep rate when receiving a signal. Presence of this tone indicates the antenna is sweeping.

We recommend that the user not listen to the audio for long periods of time with the notch filter off.

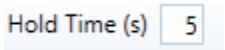


3 Averages

The Doppler Systems radio direction finders provide increased accuracy by sweeping the antenna first in the clockwise direction for the sample time and then in the counter clockwise direction for the sample time second. This technique removes some bearing errors due to asymmetry in the IF of the receiver and it also removes errors due to slight frequency offsets. When the averages is set to 2, the CW and CCW readings are averaged. When the averages are set to 1 the CW and CCW readings will be displayed. This setting can be used to determine if the calibration is close. When direction finding on a strong signal the CW and CCW and the receiver is on frequency the CW and CCW readings should be less than 30 degrees apart. If they are more than that recalibration may be required.
On noisy signals, setting the averages to a higher number will filter out some of the noise and provide a more stable bearing reading. Only use higher average settings if the RF source is not moving relative to the direction finder.

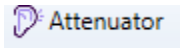
4 Hold Time

The hold time is the time the direction finder will hold a bearing after the signal ceases.



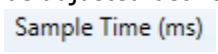
5 Attenuator

If you are operating mobile are are very close to the RF source, the preamplifiers in the summing unit can be overloaded. This rarely happens; however, if it does the user can press the Attenuator button which will disable the preamplifiers reducing the sensitivity of the direction finder by about 30 dB.



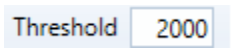
6 Sample Time

The sample time is the time between bearing reading outputs. The default setting is 500 milliseconds but can be adjusted between 200 and 1500 ms.



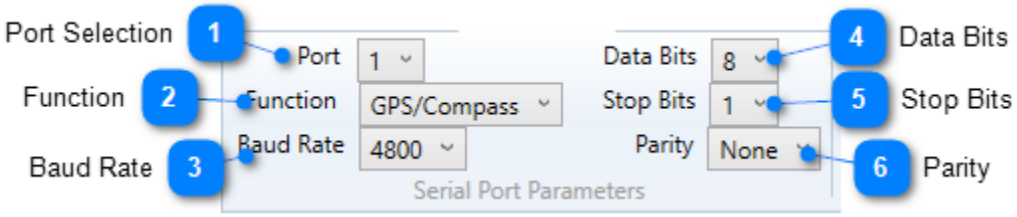
7 Threshold

When direction finding on weak signals Doppler Systems uses a proprietary method to determine if a signal is present. The method estimates the relative bearing stability and compares it to a threshold. Increasing the threshold increases the sensitivity of the direction finder but also increases the probability of a false alarm. If the threshold is set at 9999 and the squelch is open, large variations in bearings will be noted when no signal is present. Typically a setting of 1000 to 2000 is best, but if the user is trying to find a weak signal a setting of 4000 is recommended.



6. Serial Ports

The Doppler Systems' radio direction finder hosts serial ports for connection to GPS devices, compasses, serially controlled receivers, and the Doppler Systems' self test generator. The serial port tab on the ribbon control is used to configure the serial ports to support these devices.

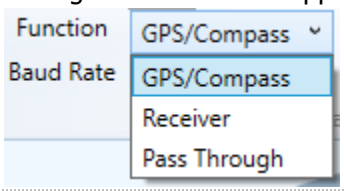


1 Port Selection

Use this drop down to select the port for which you want to change the settings. There will be between one and four ports depending on the USB-to-serial adapter being used.

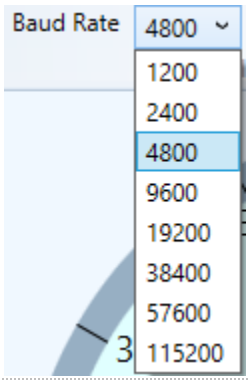
2 Function

Set the function for the device you are using. The GPS/Compass setting is used for devices that send GPGGA, GPVTG, and GPRMC messages. The Receiver setting is used to communicate with serial receivers, such as the ICOM R8500 and the AOR AR8600. These are old receivers and are not typically used. The Pass Through setting is used for the Doppler Self Test generator.



3 Baud Rate

Set the baud rate to match the device's baud rate setting



4 Data Bits

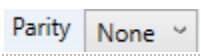
Set the data bits to 7 or 8 depending on the device.

5 Stop Bits

Set the stop bits to 1, 1.5, or two depending on the device.

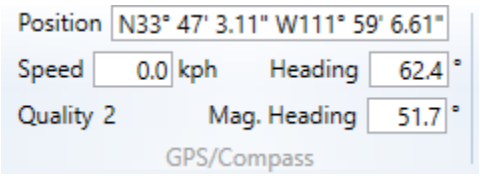
6 Parity

Set the parity to None, Odd, or Even depending on the device



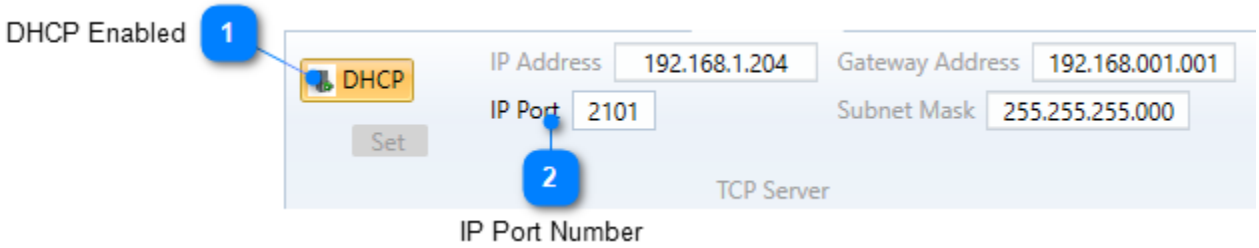
6.1. GPS/Compass Display

If the GPS is connected and communicating with the direction finder the GPS/Compass display will be shown on the Serial Ports tab as shown below. This provides the user an indication of that the GPS is functioning properly.



7. IP Settings

The radio direction finder can be configured to obtain its IP address via DHCP or the IP address can be set to a static value. The IP Settings tab allows the user to change set the IP address to a static value and it also allows the user to change the IP Port used by the direction finder.

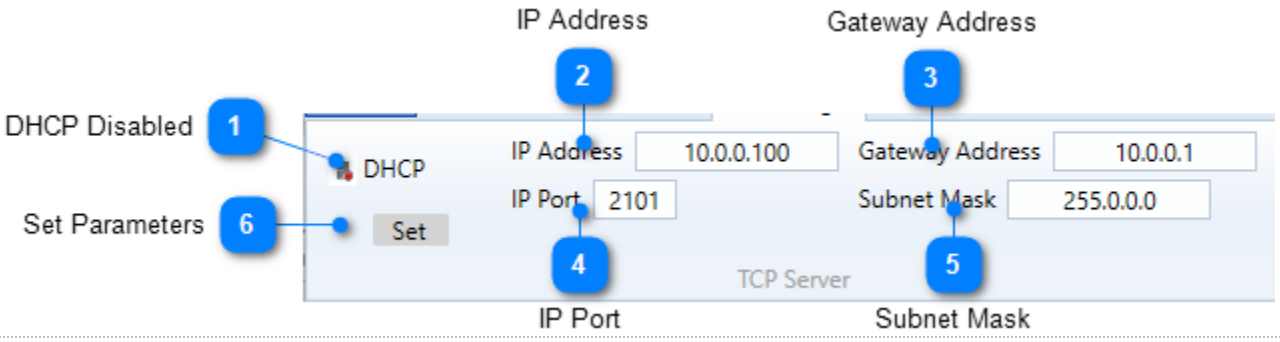


1 DHCP Enabled

When DHCP is enabled, the DHCP button is highlighted and the parameters obtained by DHCP will be displayed. Only the IP Port can be changed. To disable DHCP, press the button.

2 IP Port Number

When DHCP is enabled, the IP Port number can be changed by typing in the desired IP Port number and pressing Tab, Enter, or by clicking on another text box. When the port number is changed a dialog will be displayed allowing the user to proceed or cancel. Proceeding will cause the IP Port number to change and the processor will then be reset. This will cause the DF window to close and the Direction Finders list window to be displayed. The direction finder may disappear from the window briefly and then reappear and connect (this happens only if the computer is on the same LAN as the direction finder.)



1 DHCP Disabled

When the DHCP is disabled, the DHCP button is not highlighted. Press the button to enable DHCP

2 IP Address

The desired static IP address

3 Gateway Address

The desired gateway address

4 IP Port

The desired IP Port

5 Subnet Mask

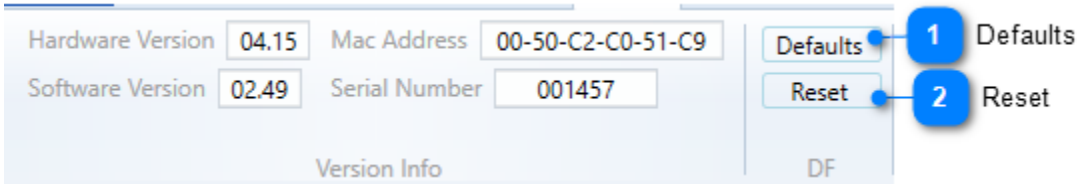
The desired subnet mask

6 Set Parameters

After the IP parameters have been changed press the set button to upload them to the processor. The user will be notified that the parameters will be changed and the processor will reset. During reset the DF User Interface window will be closed and the Direction Finder list will be displayed. The direction finder may disappear from the window briefly and then reappear and connect (this happens only if the computer is on the same LAN as the direction finder.)

8. About

The About tab provides information about the processor and allows the user to set the processor to its default configuration or reset it.



1 Defaults

Press the Defaults button to set the direction finder parameters to their default values. After setting the defaults, you will need to

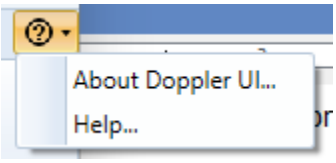
- Set the receiver for the receiver you are using
- Configure the serial ports
- Set the Antenna to the antenna you are using

2 Reset

Press the reset button to cause the direction finder to reset. During the reset time, connection to the direction finder will be interrupted. If the computer and the direction finder are on the same LAN the connection we be reestablished after the reset. If this is not the case wait about 60 seconds and then attempt to reestablish the connection.

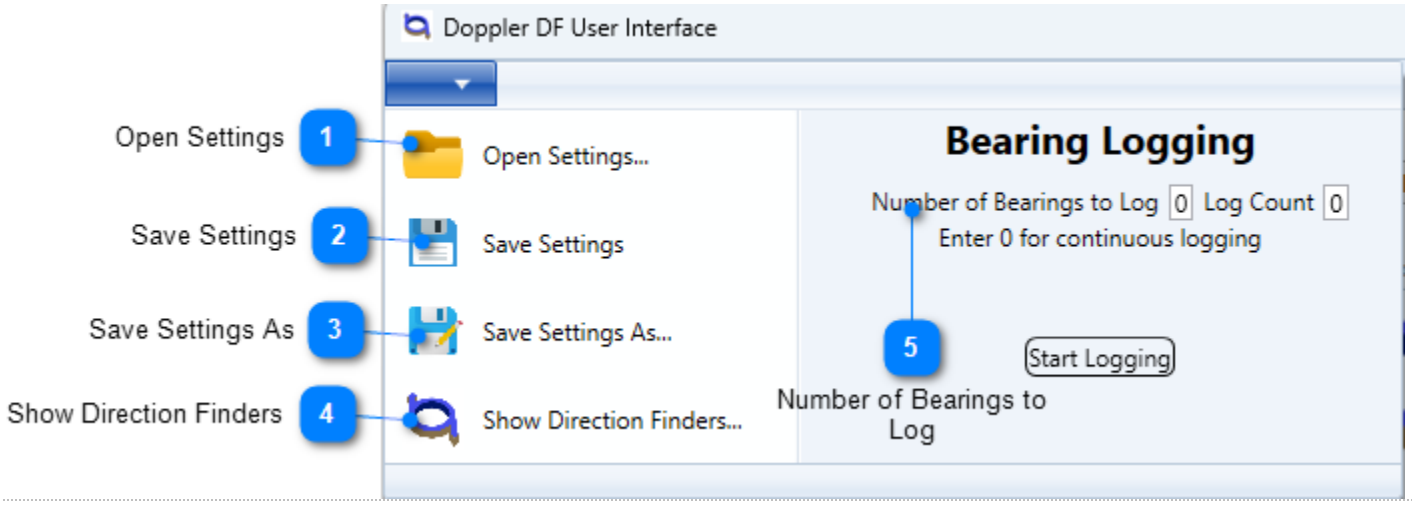
9. Getting Help

The menu at the right of the Window will allow you to access the Help facility.



10. Application Menu

The application menu on the left side of the screen allows the user to save settings and restore them. It also is used to start and stop logging of bearing data.



1 Open Settings

Opens a previously saved settings file

2 Save Settings

Saves the current settings

3 Save Settings As

Save the settings in a different file

4 Show Direction Finders

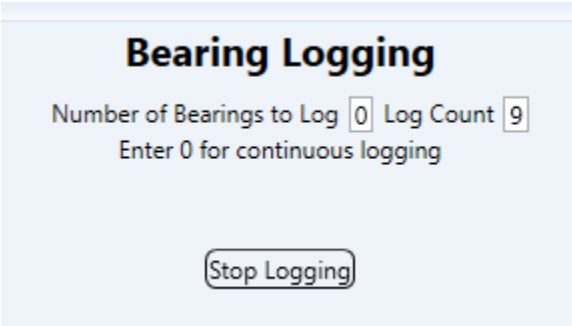
Show the direction finders that are in use or select to add a direction finder.

5 Number of Bearings to Log

Enter the number of bearings to log. I zero is entered logging will be continuous.

10.1. Logging

Bearings received by Doppler UI can be logged and saved to a file. To start logging enter the number of bearings you want to log and press Start Logging. If you enter 0, the program will log bearings until you tell it to stop. The figure below shows the Stop Logging button.



Once logging is complete the file is saved in the folder C:\Users**UserName**\Documents\Doppler Systems\Doppler UI\Logs. The file name will in the form yyyyMMdd-hhmmss.csv where

- yyyy is the year
- MM is the month

- dd is the day
- hh is the hour
- mm is the minute
- ss is the second

The file is in csv format. Below is an example of the file format

Date	Time	Frequency	Bearing	RSSI	Latitude	Longitude	Heading
3/20/2026	01:17:23.5	162.55	20.3	66	33.78421	-111.985	182.4
3/20/2026	01:17:24.0	162.55	20.7	66	33.78421	-111.985	182.4
3/20/2026	01:17:24.5	162.55	21.1	66	33.78421	-111.985	182.4
3/20/2026	01:17:25.0	162.55	21.4	66	33.78421	-111.985	182.4
3/20/2026	01:17:25.5	162.55	20.8	66	33.78421	-111.985	182.4
3/20/2026	01:17:26.0	162.55	20.8	66	33.78421	-111.985	182.4
3/20/2026	01:17:26.5	162.55	20.9	66	33.78421	-111.985	182.4
3/20/2026	01:17:27.0	162.55	20.9	65	33.78421	-111.985	182.4
3/20/2026	01:17:27.5	162.55	20.6	66	33.78421	-111.985	182.4
3/20/2026	01:17:28.0	162.55	20.1	66	33.78421	-111.985	182.4
3/20/2026	01:17:28.5	162.55	19.6	66	33.78421	-111.985	182.4
3/20/2026	01:17:29.0	162.55	19.9	66	33.78421	-111.985	182.4
3/20/2026	01:17:29.5	162.55	19.9	66	33.78421	-111.985	182.4
3/20/2026	01:17:30.0	162.55	19.3	65	33.78421	-111.985	182.4

11. Troubleshooting

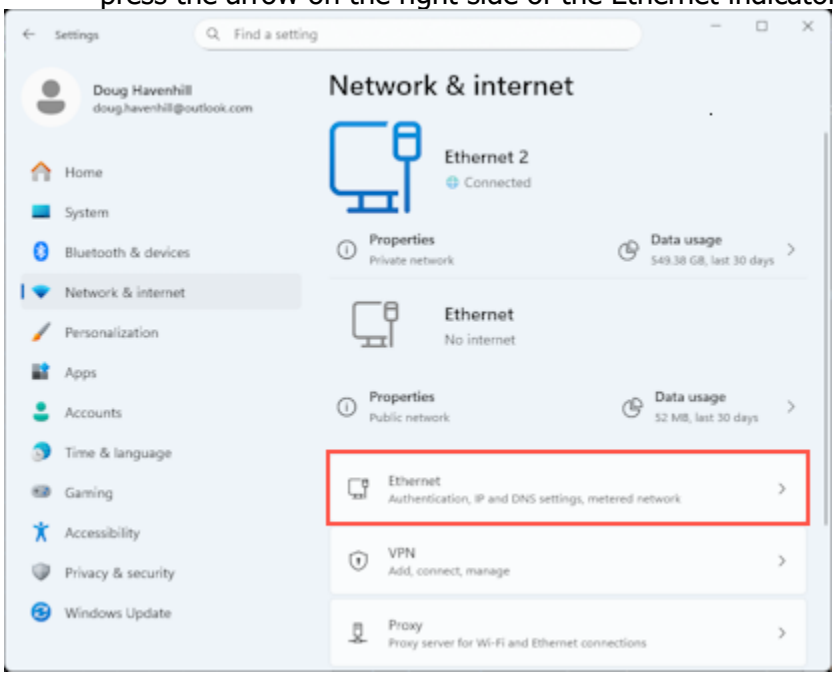
11.1. Cannot Connect

If you are unable to connect to the direction finder there are a few things that you can try to enable the connection.

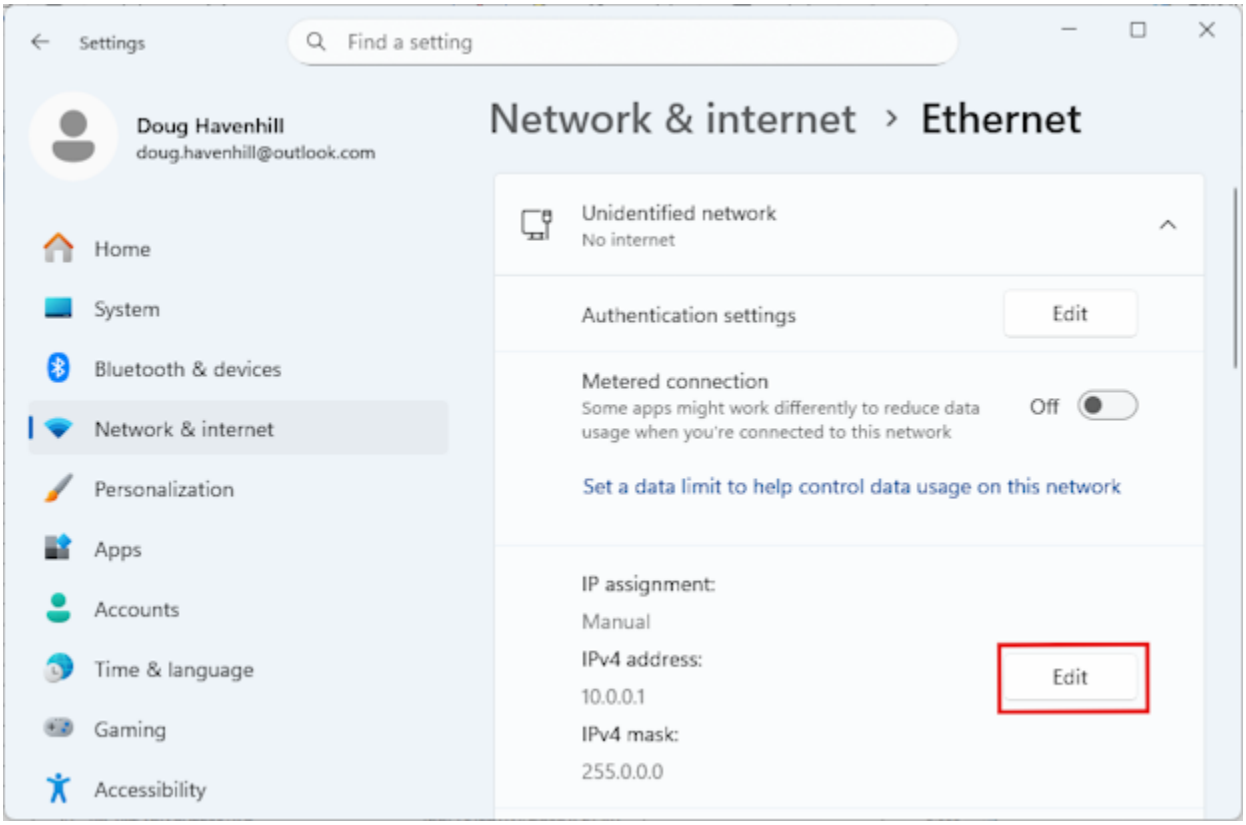
Configure your Network Connection

If you are connected directly from your computer to the direction finder then you must configure your Ethernet connection so that you can connect to the direction finder address (default is 10.0.0.100). Follow the instructions shown below to configure your network connection.

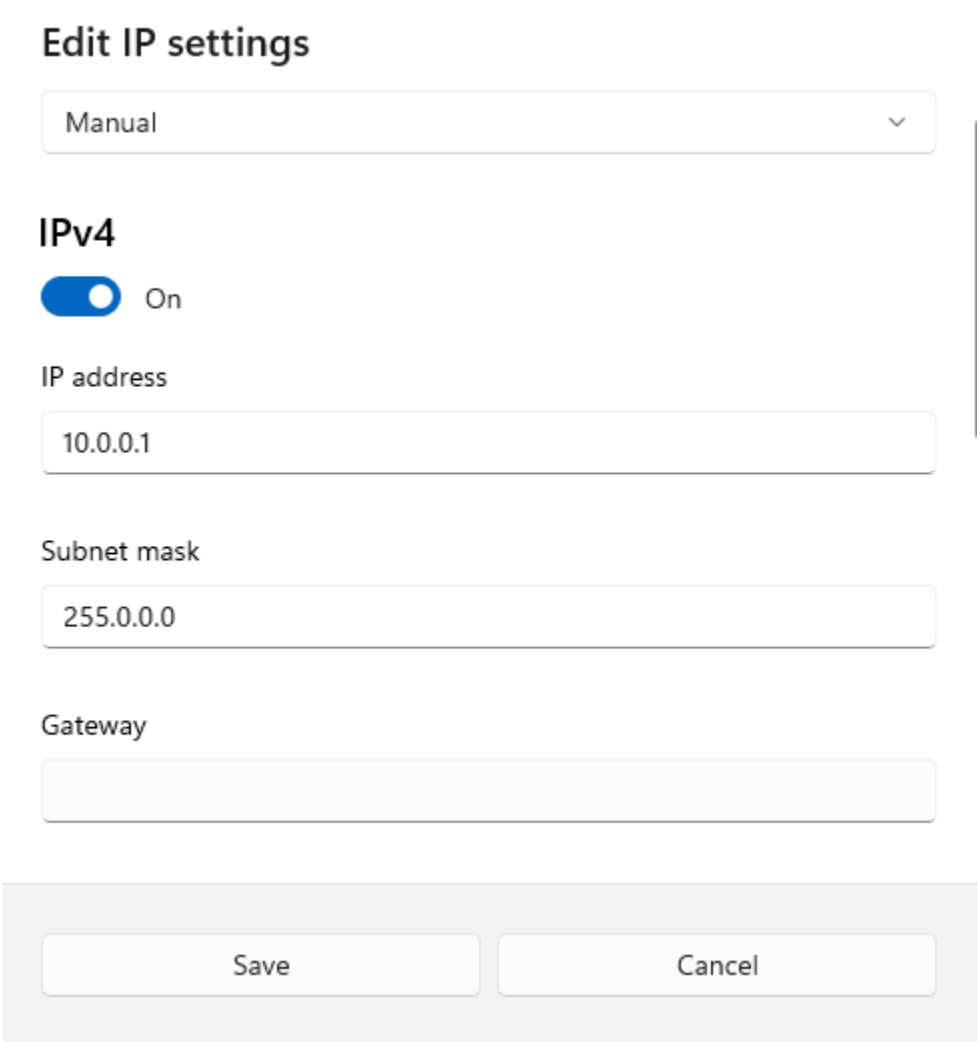
1. Type Settings into the Start menu and select Network & internet on the left side of the window and press the arrow on the right side of the Ethernet indicator



2. Press the Edit button shown below



3. Change the settings to match what is shown below and press Save



Direction Finder was configured with a static IP but IP address has been forgotten

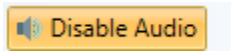
If the direction finder was configured in the past with a static IP connection and the user has forgotten the IP address it will be necessary to return the direction finder to its default state. To reset the direction finder to the default IP address

1. Power down the direction finder.
2. Disconnect everything except the power cable
3. Connect a USB keyboard to one of the USB ports
4. Power the direction finder and wait 60 seconds
5. Type "dopplermpt" (no quotes) followed by the enter key.
6. Power down the direction finder.
7. Disconnect the USB keyboard and reconnect all the cables
8. Power up the direction finder.

After completing this process, the direction finder will have DHCP enabled if it is not able to obtain a DHCP address it will default to an IP address of 10.0.0.100.

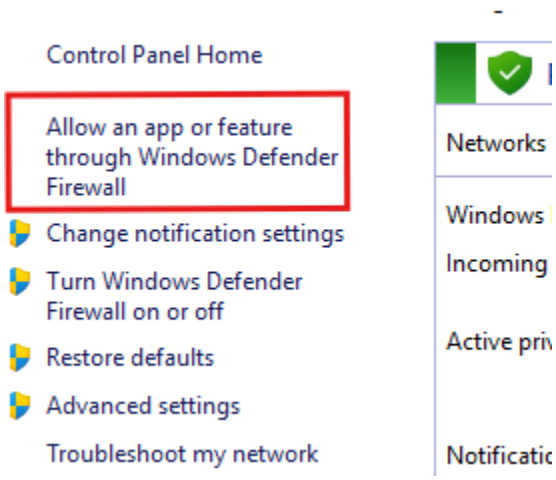
11.2. Cannot Hear Audio

If you are unable to hear the audio try the following

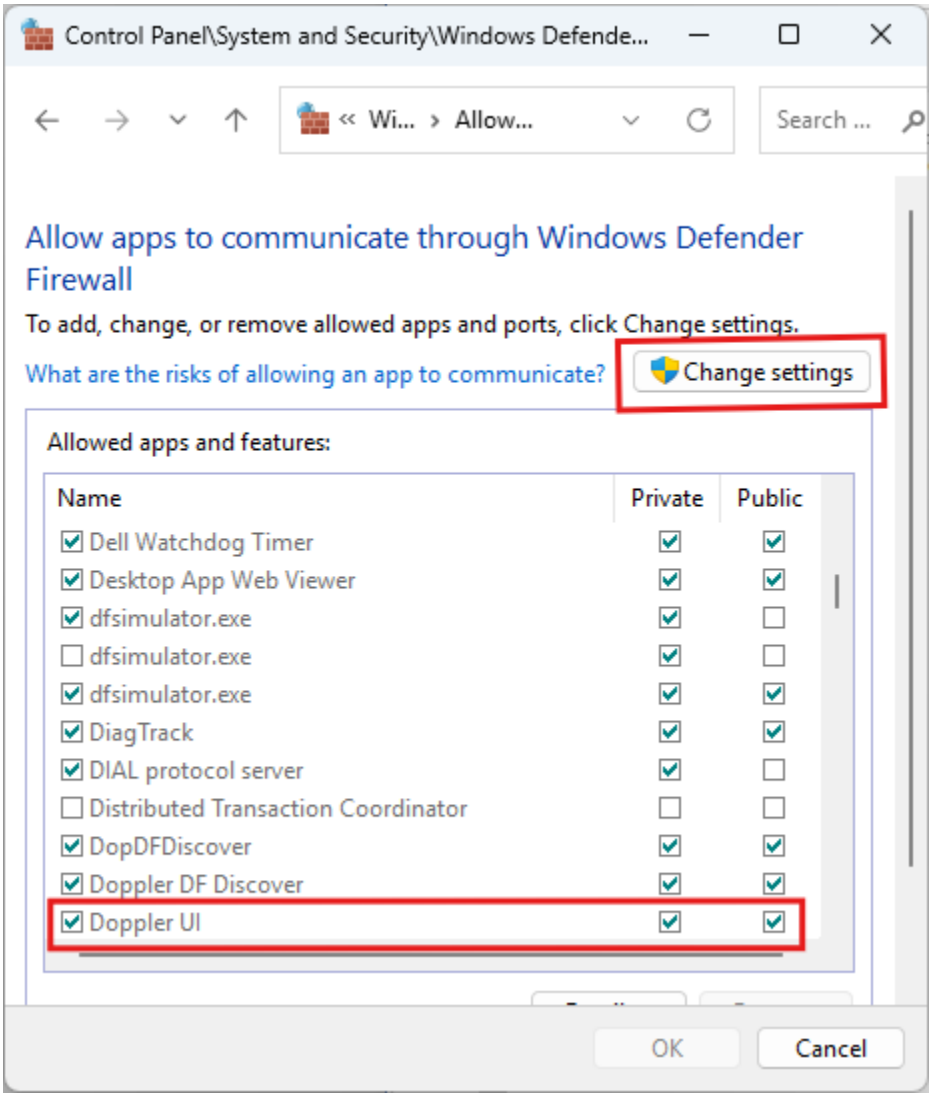
1. **Increase the volume of your default audio playback device**
2. **Make sure the Enable Audio button is pressed** 

3. **Configure the firewall.** In order for the direction finder to stream audio, the computer's firewall must be configured to allow the Doppler UI to stream the audio on the selected UDP port. The Doppler UI installation software will typically configure the firewall automatically but occasionally due to insufficient user privileges during installation, manual configuration is required. To configure the firewall do the following

- Go to Control Panel->System and Security->Windows Defender Firewall and click on the text shown below



- Click on Change Settings and scroll down the application list until you find Doppler UI. Make sure the Private and Public check boxes are checked.



- If you made any changes press OK

4. **Set the audio port.** If you are connected to more than one direction finder, each direction finder must have a unique audio port in order to stream audio from each device. To change the audio streaming port.

- Disable audio streaming on all the connected direction finders
- On the IP Settings tab assign a unique IP Audio Server IP port. To assign the port, type in a port number and press Enter.
- Once you have assigned unique port numbers to each direction finder, re-enable the audio on the direction finders.

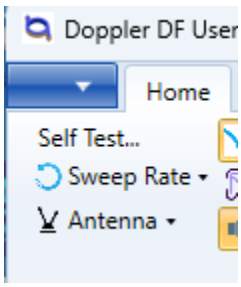
12. Self Test

Self Test is used to test the Doppler radio direction finding antenna. There are two ways to use the self test feature. One way is to use an over the air signal and the other way is by using Doppler's Self Test Generator that is supplied as an option many of our direction finders.

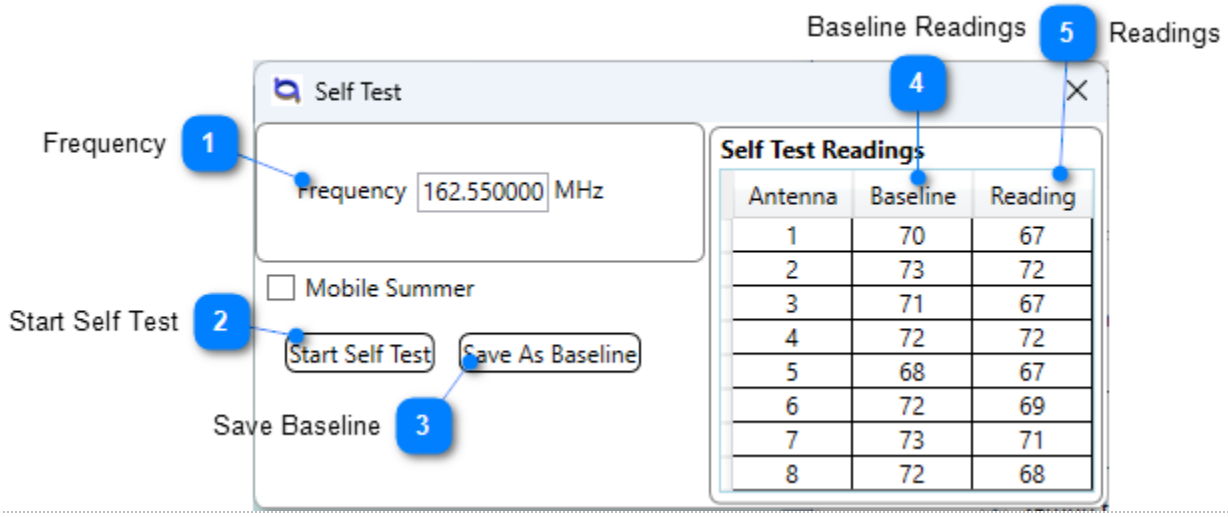
12.1. Over the Air

Over-the-Air Self Test

Performing an over-the-air self test requires a transmitter that is transmitting during the entire duration of the test (~30 seconds). Click on Self Test in the Home tab.



The following dialog will be shown



1 Frequency

The frequency to be used for self test

2 Start Self Test

When Start Self Test is pressed, the direction finder will tune the receiver to the set frequency and then measure the signal strength on each of the antennas.

3 Save Baseline

Save As Baseline allows the user to save the readings to compare to the next test to determine if any significant changes have occurred.

4 Baseline Readings

The baseline readings are previously stored readings. If the same signal source is used and the direction finder is in the same location the baseline readings can be compared with the readings to determine if there are significant changes

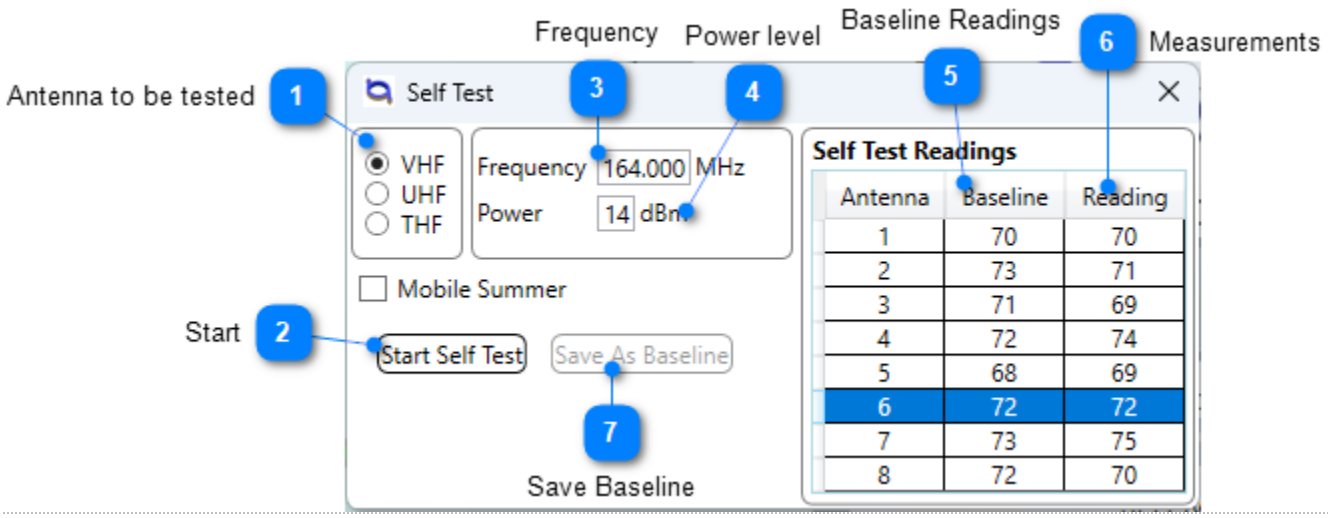
5 Readings

The measured signal strength at each antenna

Press the Start Self Test button end the test will begin. A progress bar will indicate testing is in progress. When the test completes, the signal strength of each antenna will be displayed in the Reading column. If this is the first time the test has be completed the user can press the Save As Baseline button and the readings will be saved to be used for future comparison.

12.2. Self Test Generator

The Doppler Self Test Generator is supplied with many of our radio direction finders. It supplies a stable and repeatable signal on a set frequency that can be used to test the direction finding antenna. When the self test generator is installed, pressing the Self Test button on the home tab will display the following dialog



1 Antenna to be tested

Click on which antenna to test. If testing the mobile antenna click on mobile and use the VHF setting

2 Start

Press this button to start the test

3 Frequency

The is the frequency to be used to run the test. The frequency range is limited by the self test generator.

4 Power level

Power level of the self test generator. If the measured readings are above 200, then reduce the power until the readings are less then 200

5 Baseline Readings

The baseline readings are previously stored readings. If the same signal source is used and the direction finder is in the same location the baseline readings can be compared with the readings to determine if there are significant changes

6 Measurements

The measured signal strength at each antenna

7 Save Baseline

Save As Baseline allows the user to save the readings to compare to the next test to determine if any significant changes have occurred.

Click on Start Self Test and the self test well commence. A progress bar will be shown until the test completes and the measured readings will be shown. If this is the first test the user may save the readings by pressing the Save Baseline button. This allows the user to compare measured readings of future tests with the current test.