

A Simple Homing Direction Finder Using a DDF7001 and an Android Device

A Technical Application Note from Doppler Systems

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1.0 Introduction

Many mobile direction finding applications simply require a bearing to the RF emitter measured relative to the vehicle. For this type of application a laptop running our MPT user interface software is a bit inconvenient. For this reason Doppler has developed an Android application that can be used wirelessly in a vehicle to provide bearing and signal strength readings to the operator. It also can be used to change a subset of the direction finder settings.

2.0 Hardware Configuration

To use the Android application you must establish a wireless network within your vehicle. In this application note we will use the TP Link TL-WR703N wireless router; however, any wireless router will work. The TP Link router operates off of 5 volts supplied by the DDF7001 and connects directly to the DDF7001 RJ-45 connector. A block diagram of the hardware setup is shown below along with a photograph of a typical setup.

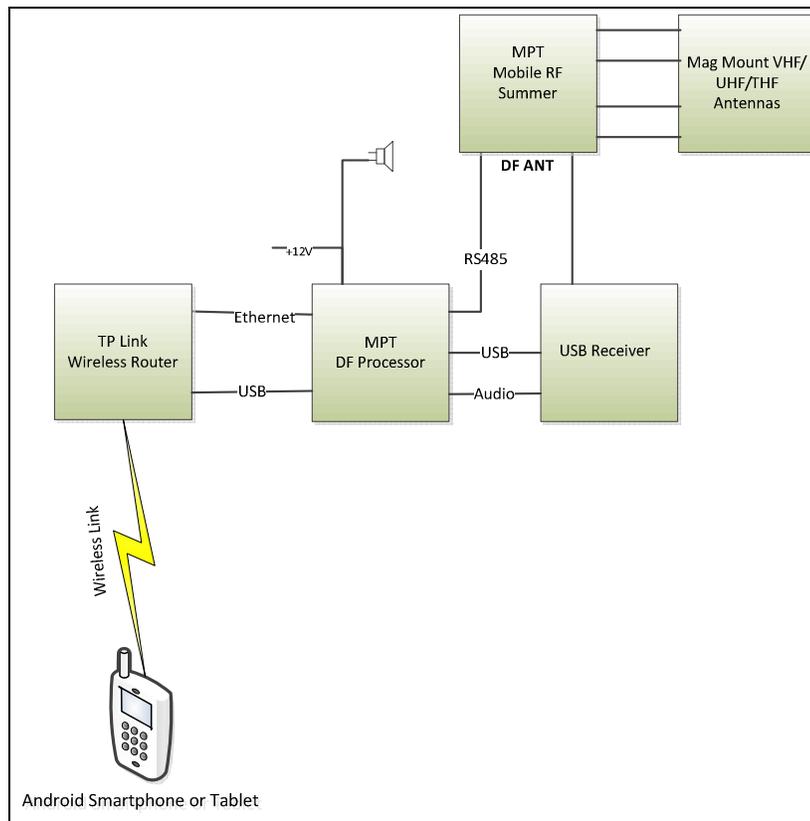


Figure 1: Block Diagram of Hardware Setup

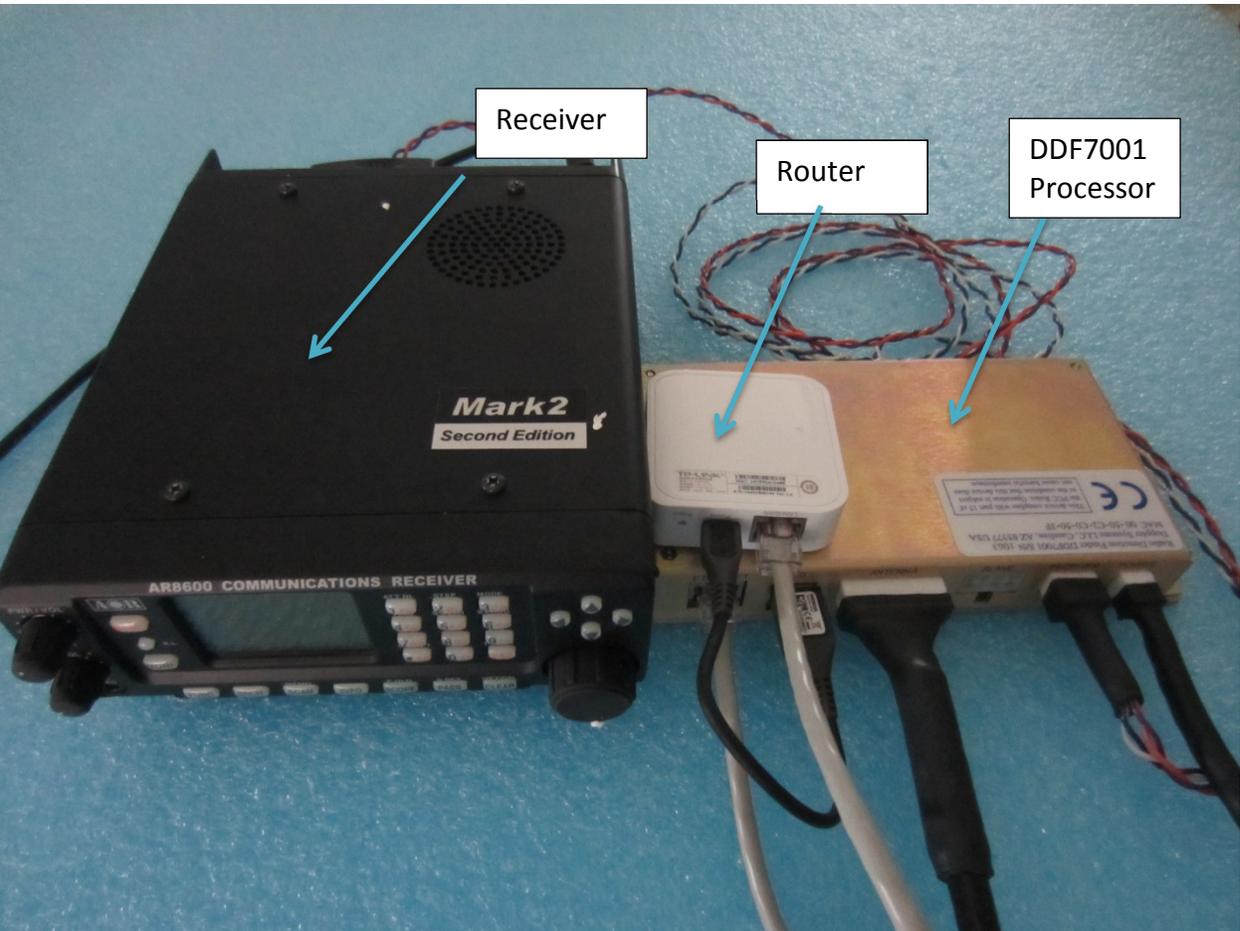


Figure 2: Typical Hardware Setup for Wireless Control

3.0 Configuring the Processor

With this hardware complement the DDF7001 must have a static IP address. The static IP address selected must be within the IP address range of your router and should be outside of the DHCP assignment range. For the TP Link router the IP address range is 192.168.0.1 to 192.168.0.253 and the DHCP assignment range is 192.168.0.100 to 192.168.0.199.

Setting a static IP address is best accomplished using the web browser interface. After configuring your computer's IP interface as described in chapter 3, pages 6 – 15 of the [MPT Software Users Guide](#), connect a crossover cable from a personal computer to the DDF7001 processor and power the processor. Launch a web browser (Internet Explorer, FireFox, etc.) and type 10.0.0.100 in the address text box. Hit Enter and the following screen will be displayed



Doppler Systems, LLC

Radio Direction Finding Systems

- ◇ [Back to top](#)
- ◇ [IP Settings](#)
- ◇ [Direction Finder](#)
- ◇ [Bearings](#)
- ◇ [Calibrate](#)
- ◇ [Receiver](#)
- ◇ [Serial Ports](#)
- ◇ [Radio Modem](#)
- ◇ [Change Password](#)



Select the feature you would like to configure from the table on the left

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Figure 3: Web Browser Start up Screen

Next, click on the IP Settings item on the left of the screen. The software will ask for a password. If you haven't changed it, the default user name is doppler and the password is admin. After you've entered the password the following page will be displayed.

? **Set/Edit IP Address**

Name	type	IP address	subnet mask	gateway	IP port	disable DHCP
et1	Ethernet	10.0.0.100	255.0.0.0	10.0.0.1	2101	<input type="checkbox"/>

Figure 4: Default IP Parameters

Change the IP address, the subnet mask, and the gateway to match your router. Check the disable DHCP checkbox and press the SET IP ADDRESS button. The settings below were settings for the TP Link router.

 **Set/Edit IP Address**

Name	type	IP address	subnet mask	gateway	IP port	disable DHCP
et1	Ethernet	192.168.0.99	255.255.255.0	192.168.0.254	2101	<input checked="" type="checkbox"/>

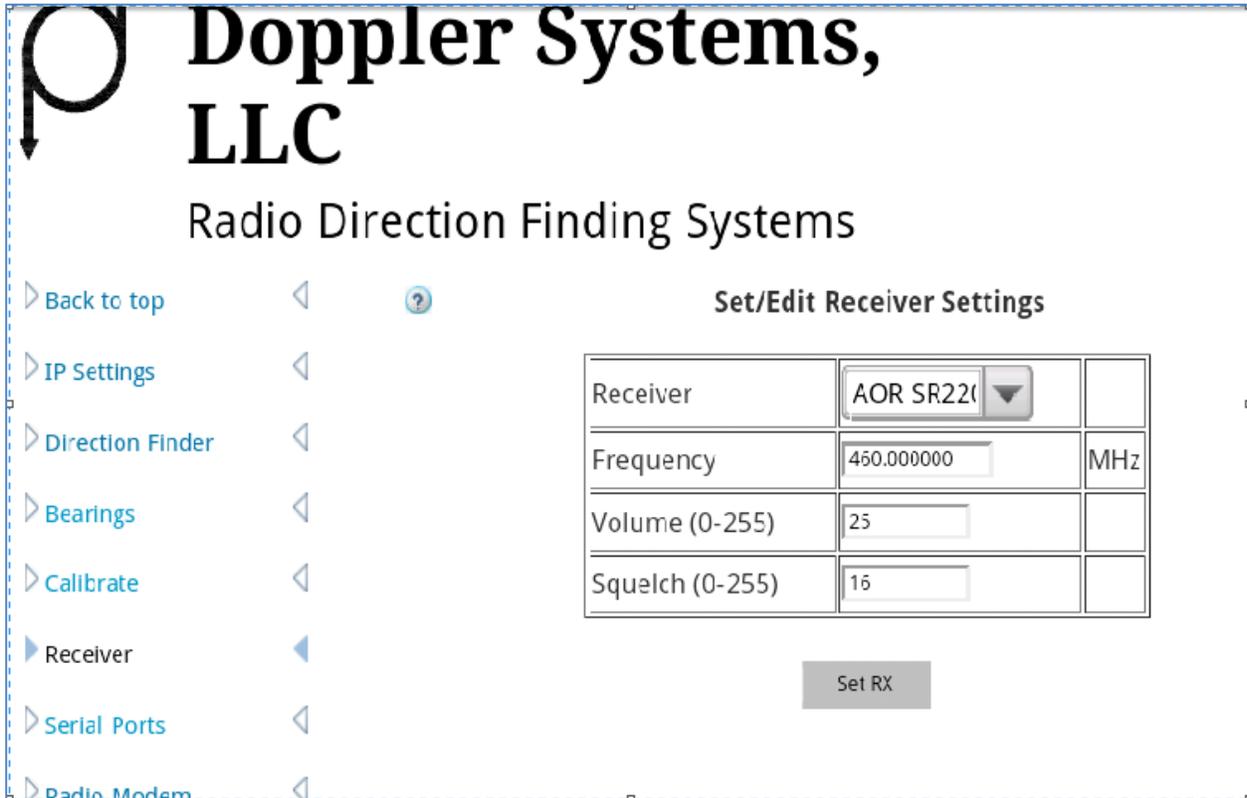
Figure 5: IP Parameters for TP Link Router

At this point the PC will lose connection with the processor.

4.0 Setting up the Android Device

When connected to the internet, use your Android device to install Doppler DDF7000 User Interface from the Google Play store. Then set your Android device to connect to the wireless router that is connected to the DDF7001.

If you are using DDF7001 supported receiver, use the web browser on your Android device to select the receiver you are using. Use the IP address that you set in the above section. The receiver page is shown below. Select the receiver from the drop down menu and press **Set RX**.



The screenshot shows the web interface for Doppler Systems, LLC. The header includes the company logo and name, followed by the tagline "Radio Direction Finding Systems". A navigation menu on the left lists various settings: Back to top, IP Settings, Direction Finder, Bearings, Calibrate, Receiver (highlighted), Serial Ports, and Radio Modem. The main content area is titled "Set/Edit Receiver Settings" and contains a table with the following fields:

Receiver	AOR SR22(
Frequency	460.000000	MHz
Volume (0-255)	25	
Squelch (0-255)	16	

Below the table is a "Set RX" button.

Figure 6: Setting the Receiver Using a Web Browser

Launch the app and a screen similar to the one below will be displayed.

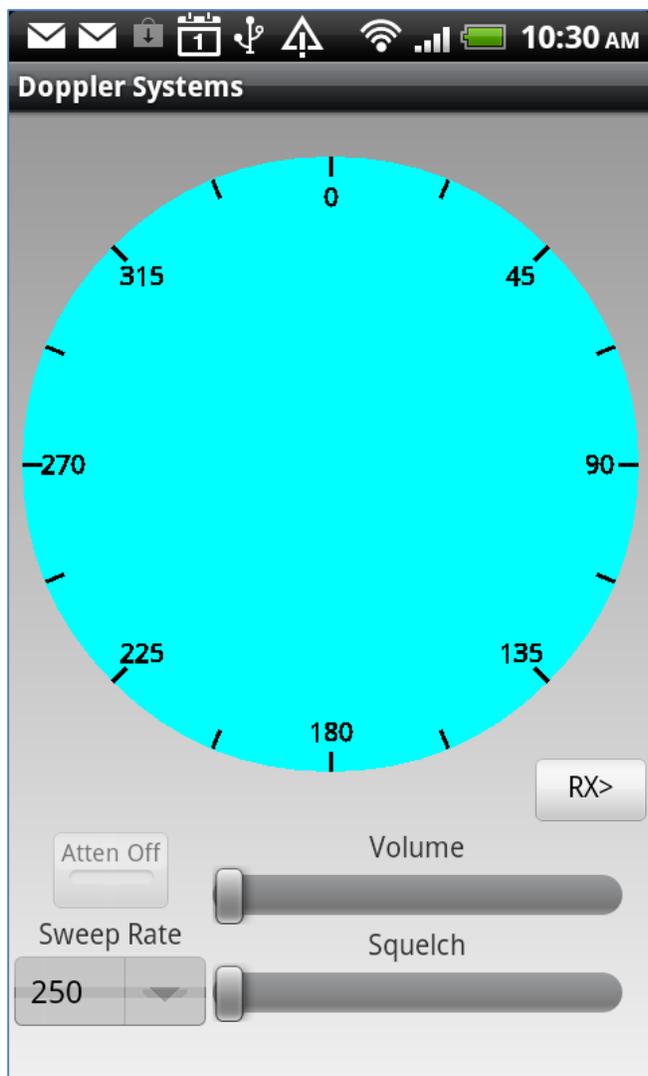


Figure 7: Screen at Startup

Press the menu key and select IP Address from the menu. Enter the IP address in the dialog box as shown below and press Ok.

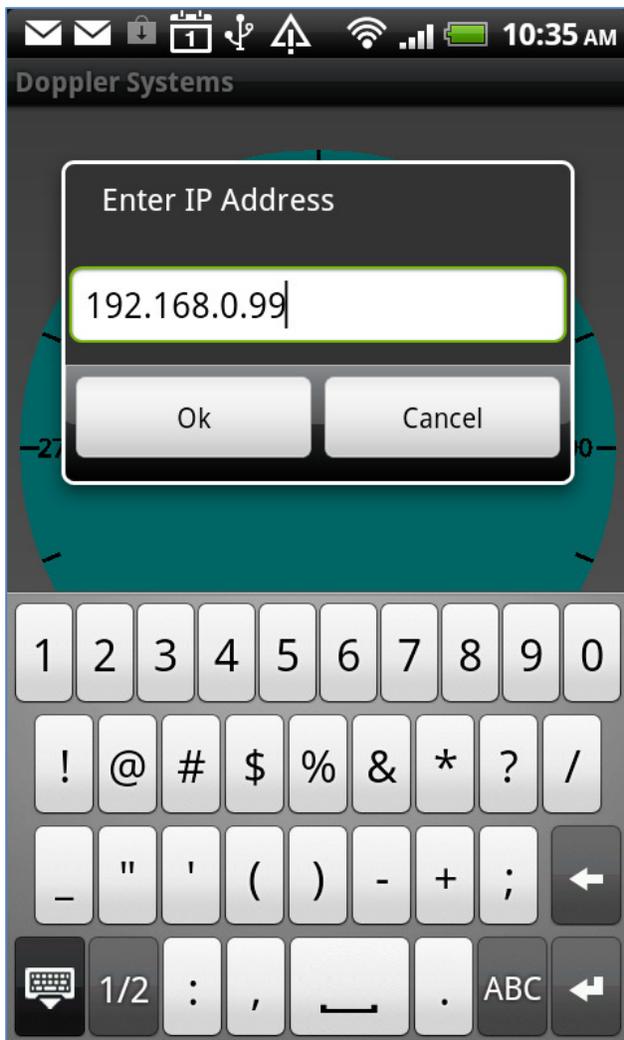


Figure 8: Enter the IP Address

The screen below will be shown. A connection is indicated by the controls being enabled

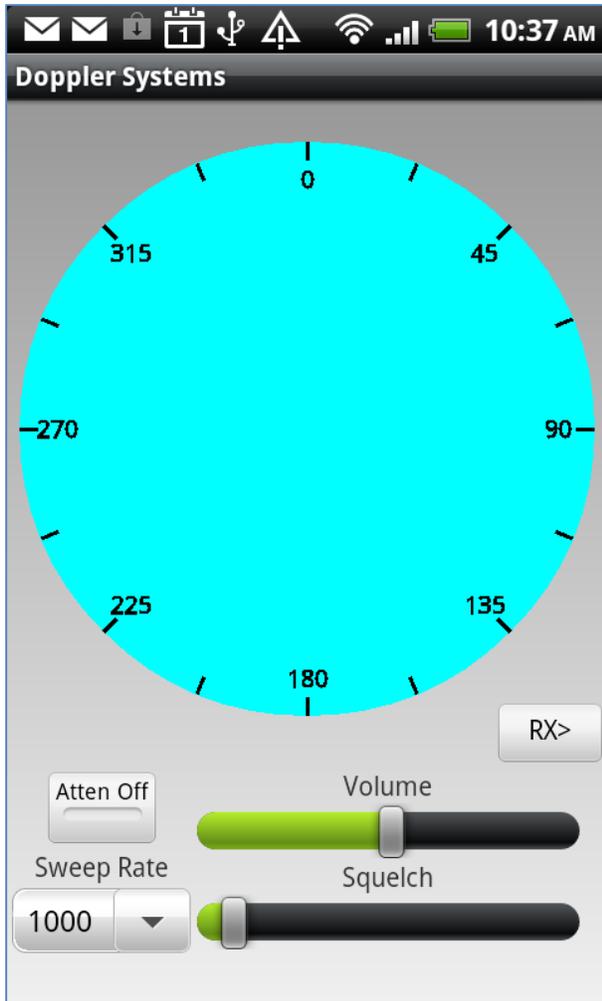


Figure 9: Enabled Controls Indicate Connection

If you are using one of the receivers supported by the DDF7001 then you can set the volume squelch, and frequency. Tune it by pressing the RX button and setting the frequency as shown below.

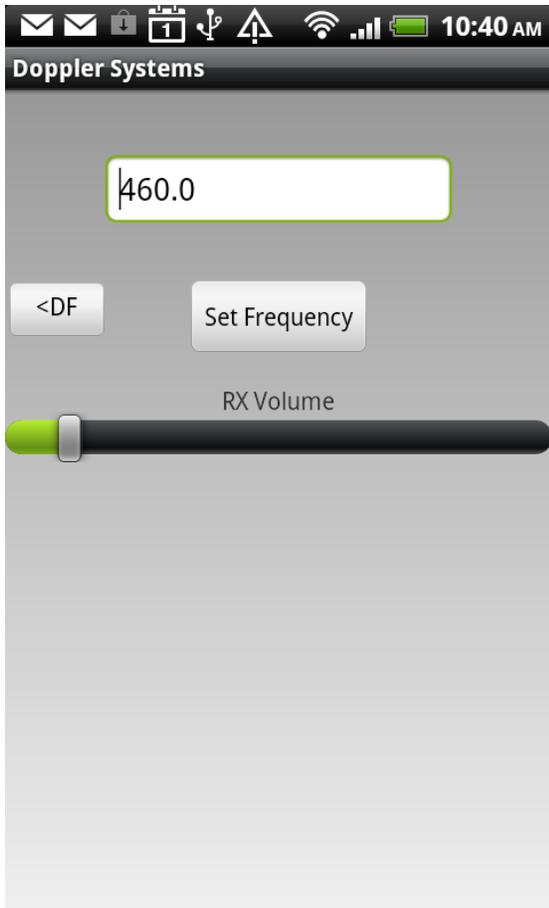


Figure 10: Tune the Receiver

At this point the system is ready to operate.

5.0 Operation

To check your installation, first tune the receiver to a frequency where there is no signal. Adjust the receiver squelch to quiet the receiver. Next tune the receiver to a frequency that has a continuous signal (e.g. weather station). You should see a bearing being displayed similar to below. If you do not see a bearing line and are not hearing audio from the direction finder try increasing the receiver volume until a bearing line is displayed. Next drive the vehicle in a circle and watch the display. If the system is installed properly the bearing display will rotate as you drive in a circle.

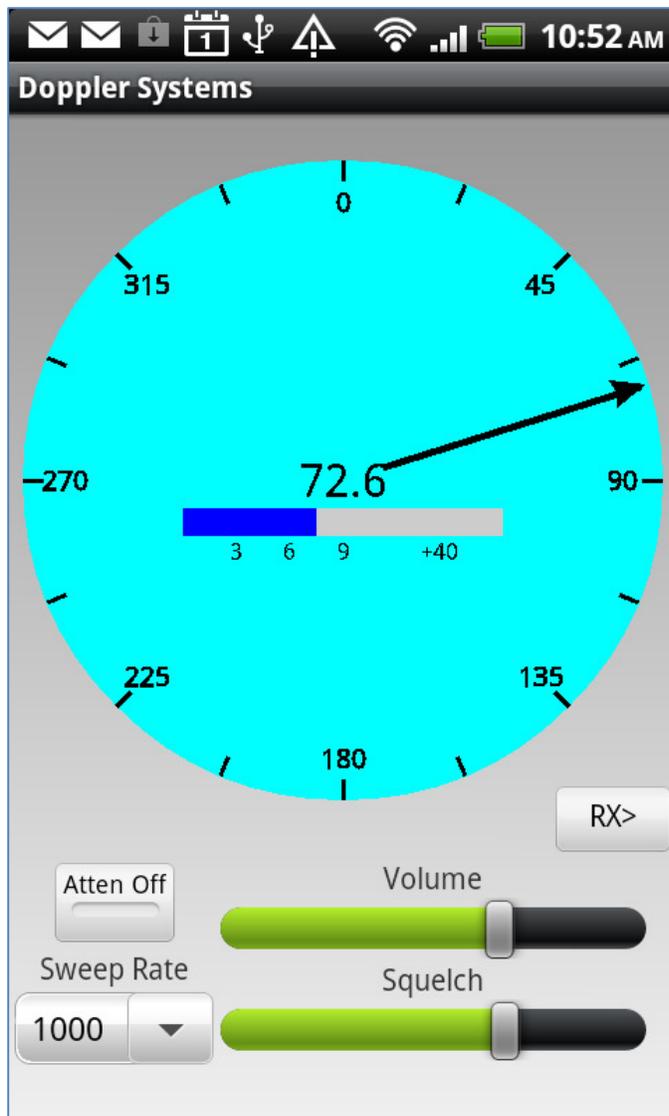


Figure 11: Typical Bearing Display

If you are using one of the DDF7001 supported receivers you do not have to calibrate the direction finder.

If you are using an unsupported receiver then you will need to calibrate the direction finder. Point the vehicle at a signal source. Tune in the signal source and note the measured bearing. Press the menu button and select Cal. Enter 0 as the calibration angle and press OK. The bearing angle should now read close to 0.

Note: *Doppler Systems recommends that a person other than the vehicle driver uses the Android application to perform the direction finding.*