

Doppler SignalTrack Software

20 January 2010

Introduction

Doppler Systems has developed the SignalTrack software suite for use with our DDF6001, DDF6002, and MPT direction finders. The SignalTrack software offers the same functionality as our current software, BearingTrack and AutoTrack but adds some important new features. SignalTrack features include:

- Single program can be used for both fixed and mobile operation
- Display of fixed site and mobile site locations and bearings on a single map
- Networking of multiple fixed and mobile sites
- Improved mapping including moving maps using the ESRI ArcGIS engine and Google Earth
- Support for USB receivers (ICOM R1500, R2500) as well as RS232 and CIV receivers
- Automatic calibration to beacon locations
- Ability to save mission profiles
- Synchronize data collection with GPS receiver
- Audio monitoring and recording of remote sites
- AES or DES Encryption of data exchanged with other sites
- Text Messaging between sites (fixed or mobile)
- Supports receiver scanning (ICOM R8500 and AOR AR5000)
- Added support for MGRS coordinate system
- Improved target estimation algorithm
- Improved estimated target display
- Developed on Microsoft's .Net technology
- Setup wizards aide the user in configuring the program
- Supports Doppler DDF6001, DDF6002, and MPT direction finders.

Description

The SignalTrack suite consists of the SignalTrack application, MapFix, WinRDFCmd, AutoDFTest, and the ESRI ArcGIS runtime mapping engine. The application itself is supplied free of charge to be used with any of our direction finders. Use of the program with other direction finders or direction finding system

Product Description

is prohibited. Additionally, use of the ArcGIS mapping engine requires the acquisition of a runtime license from ESRI. This license is available directly from ESRI or we can obtain it for you. The cost of the runtime engine license is approximately \$500.00. The software can be downloaded from our website at www.dopsys.com/signal_track.html. (Due to the large size of the ESRI mapping engine it is available only on CD.)

SignalTrack Uses

SignalTrack can be used with a single direction finder or a network of direction finders; however, its use in a direction finder network is where it shines. Connected to a network of direction finders, SignalTrack will display on a map

- the location of all the direction finder sites
- the lines-of-bearing from each direction finder to the emitter
- an estimated location of the emitter
- a probability ellipse indicating a 95% probability that the emitter is within the ellipse
- the location and heading mobile sites

Figure 1 shows a typical display.

Additionally, SignalTrack controls the frequency of each of the receivers on the network. So when a new frequency is to be monitored, SignalTrack sends commands to all sites to have the receivers change frequency. So an operator using SignalTrack at a remote location can control the entire network of direction finders.

Data collected from the direction finding sites is logged and can be view textually or played back on the screen. If audio is data is streamed it is also recorded and can be played back.

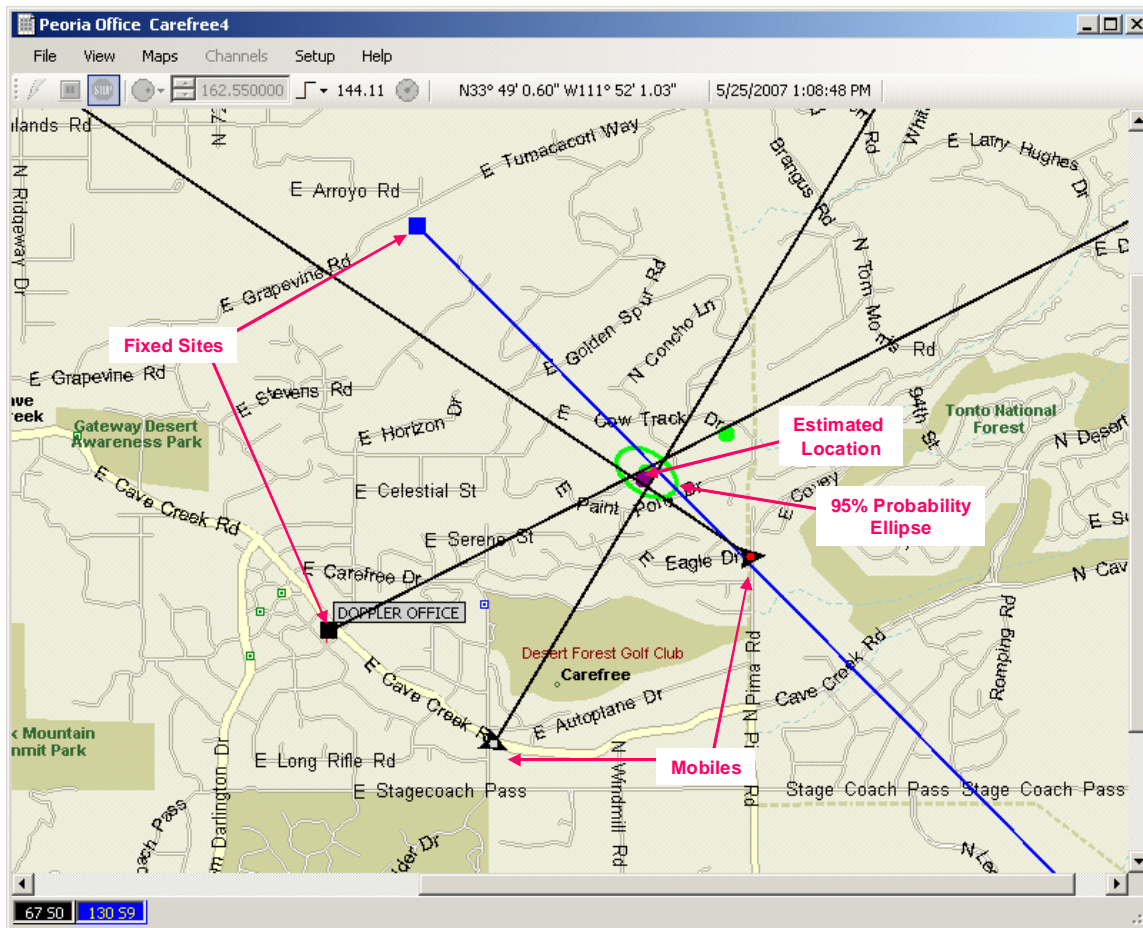


Figure 1: Typical SignalTrack Display with Mobile and Fixed Site Direction Finders

Signal Track Mapping

Maps in SignalTrack display the location of the direction finder sites (fixed and mobile), the lines of bearing from the sites to the RF emitter, and the estimated position of the target. SignalTrack provides three options for mapping; user created maps, ESRI ArcGIS mapping, and Google Earth. As mentioned earlier user created maps are made using MapFix. Any bitmap image file saved as a .bmp, jpg, or .gif file can be used to make a map. For example, the images can be created using a mapping program such as Microsoft MapPoint or Delorme or Google Earth can also be used. User created maps are limited to a fixed area and because they are bitmap based, suffer some image degradation with zooming. However, they are quite inexpensive and versatile.

The ESRI ArcGIS mapping engine provides many features common to modern day mapping engines. ESRI is a leader in GIS software with many city, state, and federal agencies using their products. Upon obtaining a license the user can then load map data from a variety of different sources. Supported file types include: shape files (.shp), raster files (.img, .bmp, .jpg, .png), and ESRI layer files. Additionally, ESRI provides an online database of map data that can be used providing you have an adequate Internet connection. A number of agencies provide mapping data. Maps are built up in layers. For instance you

can have a street layer, a topographical layer, and an image layer. Each layer can be viewed individually. Depending on the layer data you can have extremely detailed maps that allow you to zoom in to resolutions of three meters or less. Also, the mapping data typically covers a wide geographical area so there is no need to make a multiple maps. This is particularly important in mobile applications where the destinations and area to be covered are fluid. The only drawbacks to the ESRI mapping engine are the initial cost of the license and the requirement of a late model computer with at least 2 Gbytes of RAM.

SignalTrack also uses Google Earth as a map display. To use Google Earth you must first create user created map. This can be a very simple map (even a simple grid will do) that allows you to enter sites on the map. Once the sites are entered SignalTrack can launch Google Earth and display the direction finder sites, the lines-of-bearing, and the position estimates. Google Earth provides excellent imagery and street data. The only limitation is that the computer running SignalTrack must be connected to the Internet.

Configuring the SignalTrack Application

Using SignalTrack requires the user to first configure the application and then use the application to collect data. Configuring the program requires selecting the map files to use, selecting frequencies you may want to monitor, setting up the sites, and configuring the network. Fixed and mobile sites have slightly different setup so wizards are provided to assist the user in the configuration. Figure 2 shows the wizard dialogs for a mobile configuration.

After the wizards run, the user must configure any fixed sites that are to be directly controlled by the software. These sites are sites without computers. Configuring these sites entails specifying the location of the site, the means of communication, the display characteristics (color, size, etc.), and the direction finder and receiver addresses.

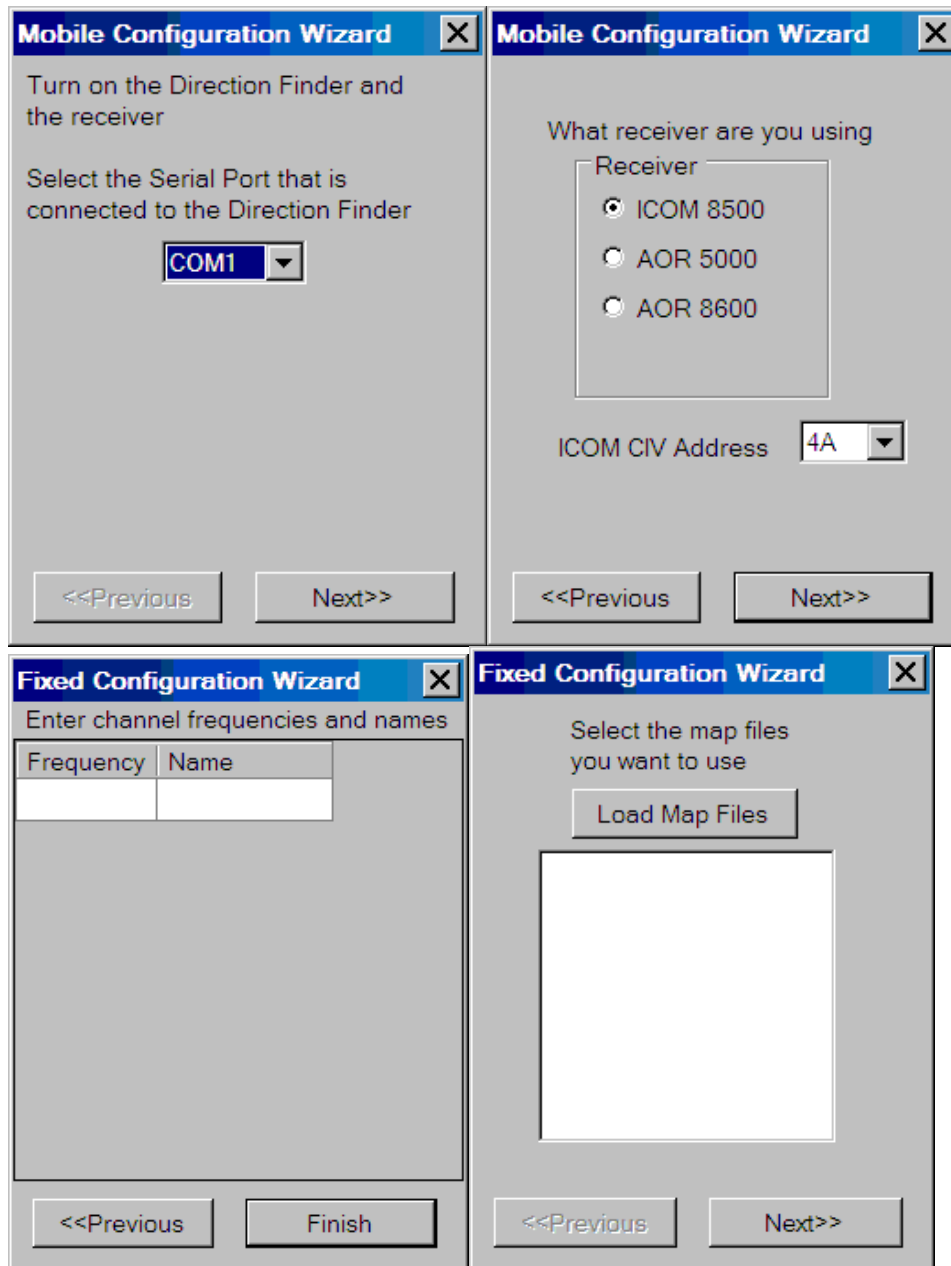


Figure 2 – Mobile Site Configuration Wizard

SignalTrack Networking

Networking direction finders has become an increasingly important requirement of our customers. As a result we have incorporated a number of new networking features in SignalTrack. They include

- Networking of any number of mobile and fixed sites
- Networking of sites with installed computers or with only direction finders
- Streaming audio from remote sites (Ethernet connection)

- Text messaging between sites, fixed and mobile
- Network can include many types of network connections; intranet, Internet, telephone modem, cellular modem, 3G modem, and radio modem.
- Sites support multiple connections, so multiple computers can monitor and control the network.

Figure 3 below illustrates a possible configuration of networked direction finder sites.

Networking Devices

Networking the DDF6001 and DDF6002 direction finders requires external networking devices. For Ethernet connections we recommend either the Digi One SP (www.digi.com) or the Barix Instreamer (www.barix.com). The Digi device acts as a server converting the serial connection to the direction finder into an Internet or intranet connection and it allows multiple TCP/IP or UDP/IP connections. The Barix Instreamer performs a similar function; however, it also is capable of streaming audio from the receiver to a remote location. SignalTrack can receive this audio, play it, and record it for later playback.

For radio modem connections we suggest using the Cal Amp DataRadio Integra TR (www.calamp.com). This device is available in the VHF, UHF, and 900 MHz bands. When using a radio modem SignalTrack synchronizes communications with the radio modems to insure that only one radio at a time is transmitting. Additionally, the bearing data is stored and transmitted at intervals that will allow simultaneous direction finding and networking within the same band.

Cellular communications with mobiles can be accomplished with a 3G modem or a cellular modem. We have used the MultiTech MultiModem with good results.

Complete instructions on using these devices are contained in our product documentation and help files.

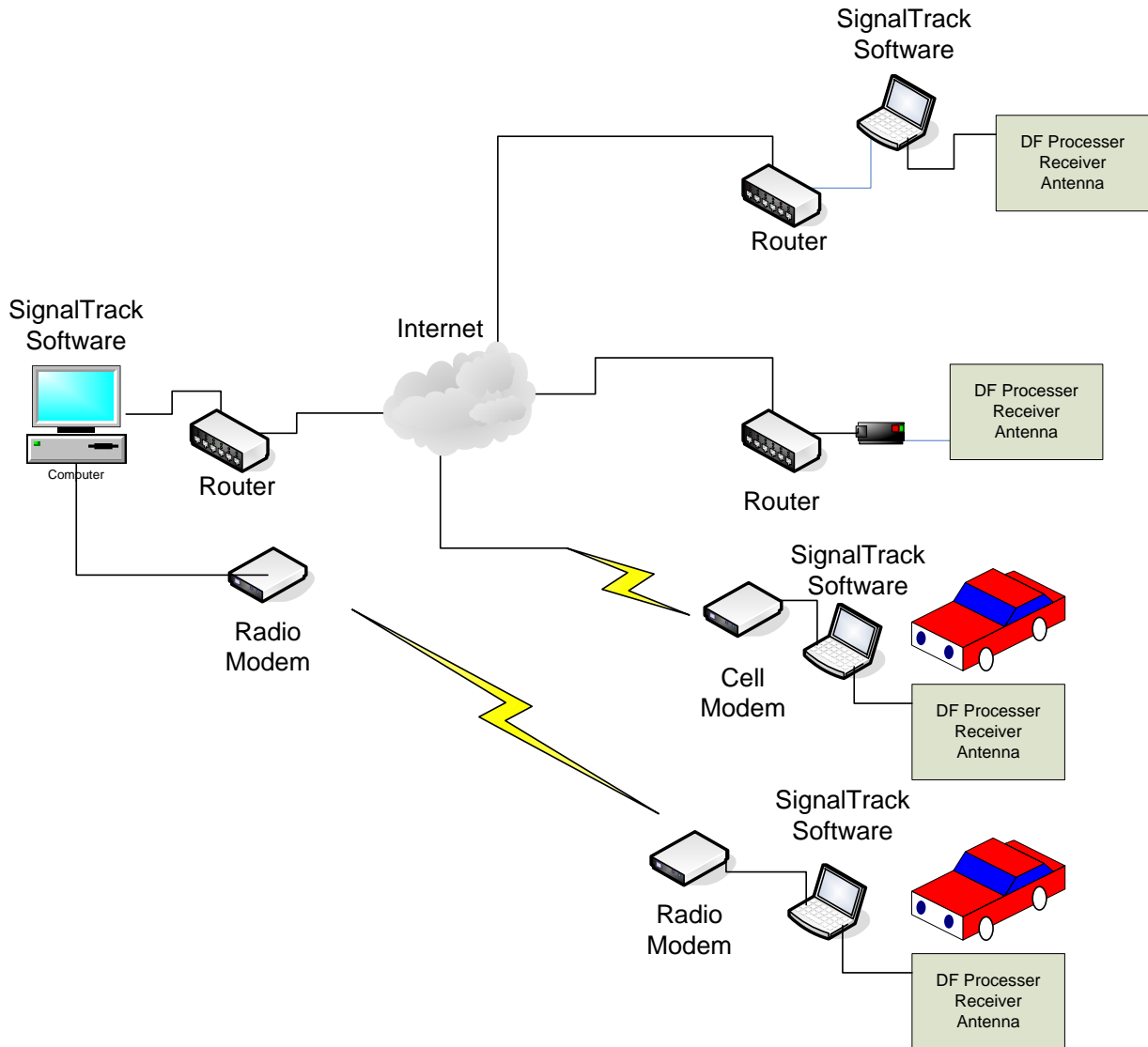


Figure 3: Direction Finding Sites can be networked in a Variety of Ways

SignalTrack Utilities

SignalTrack ships with some utilities for making maps and configuring the direction finder.

MapFix

MapFix is a utility that is used to make maps for use in SignalTrack. Using MapFix nearly any type of image can be used to make a map. MapFix requires an orthonormal (rectangular) map projection. The user selects a map image stored as a bitmap, jpg, or gif and then enters two points of latitude and longitude (or MGRS coordinates) on the map and the map is ready for use in SignalTrack.

WinRDFCmd

WinRDFCmd is a utility program that can be used to configure a DDF6001 direction finder. It is most frequently used to change the CIV address of the direction finder; although it can be used to change a host of settings on the DDF6001 direction finder. It interfaces to the direction finder via the serial port on the computer or via a TCP/IP connection.

AutoDFTest

AutoDFTest is a utility program that can be used to configure a DDF6002 direction finder. It interfaces to the direction finder via a serial connection.

Conclusion

SignalTrack is a very versatile software application monitoring networked direction finders. It has a host of new features that allows an operator to monitor and control the network providing an excellent estimate of the emitter's location and greatly aiding in finding the emitter.