Product Identification and Compatibility of Obsolete Models

A Technical Application Note from Doppler Systems

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Introduction

Since 1981 Doppler Systems has introduced 10 different series of radio direction finding systems. Many of these, while no longer made, are still in use and we get frequent questions regarding the compatibility of the various RF summers sold with these models with newer models. This application note can be used to identify the various models of DF processors, displays and RF summers and which cables can be used to connect them.

The earliest models contained the display, processor and RF summer in one enclosure. This works well at VHF (125-175 MHz), but not so well at UHF (350-500MHz) and not at all at THF (700-1000 MHz) frequencies. Those frequencies require a separate RF summer that is located near or built into the antenna. The control signals that pass between the processor and the RF summer were originally analog (one per antenna element), but later models used what is called 2-phase control which provides more accurate antenna summation (and more accurate bearings). The very latest model (Series 7000) uses a digital control between the processor and RF summer then 2-phase control within the summer. Because of this difference, some of the RF summers/antennas are **not compatible** with some of the processors. The discussion of the various series below identifies which models are or are not compatible and how to identify them.

The other difference that will be noted is the connectors used on the antennas, such as the magnetic mount quarter wave whips used in mobile DFs. On the first DFs, these used RCA style plugs, but these were soon replaced by BNC connectors and later with TNC connectors. TNC are the most reliable and secure of the three and are used today on our current DFs.

Series History

The following figure show when various discontinued direction finders were manufactured. The current Series 7000 direction finders were introduced in 2011.

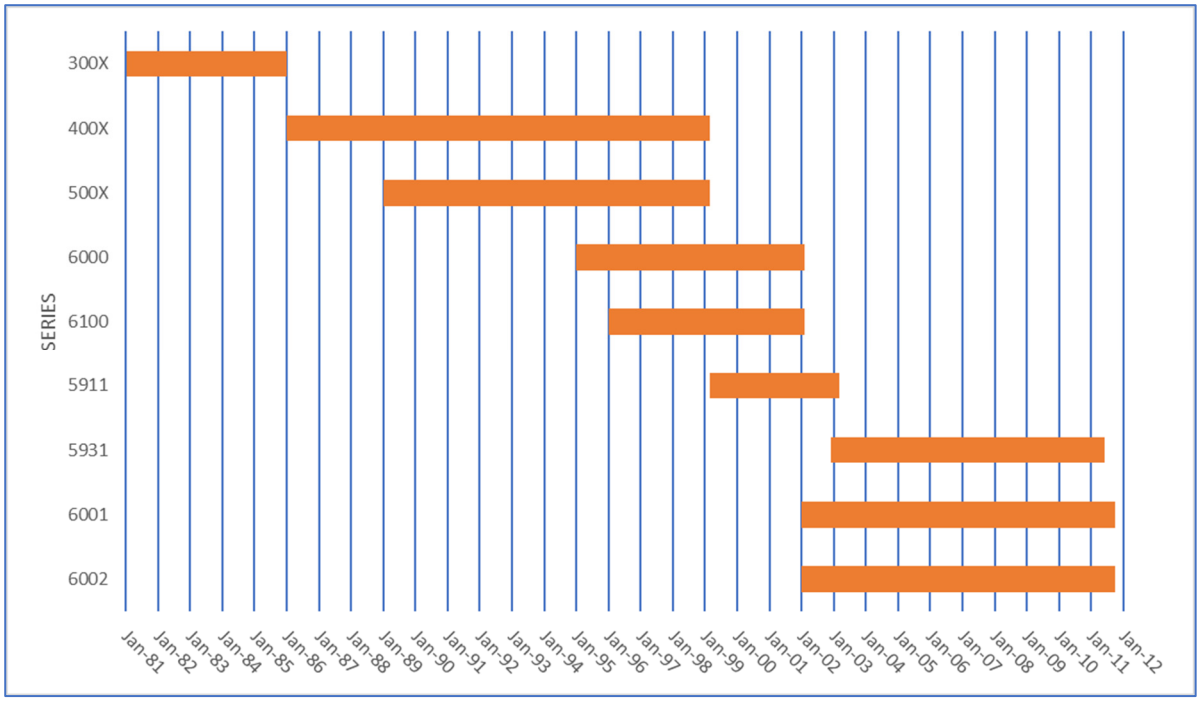

Figure 1 Timeline of Discontinued Doppler Systems Direction Finders

Series 300X

The DDF300X had a self-contained RF summer which worked only in the VHF high band (125-175 MHz). RCA phono jacks were used for the antenna inputs and summer output. This series is not compatible with any of the later models. DDF3001 did not have a digital bearing display, and DDF3003 had an AFSK output for recording bearing data.

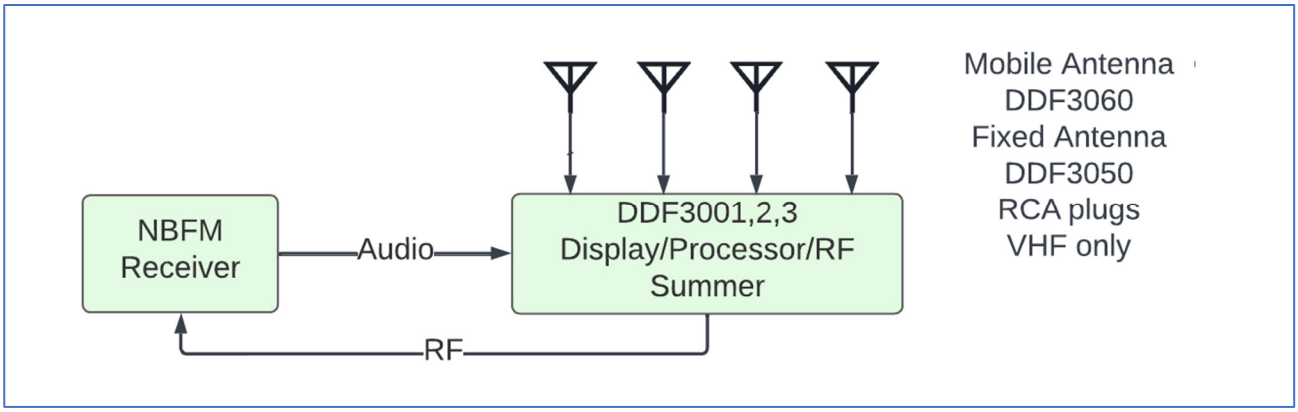

Figure 2 Series 300X Block Diagram

Figure 3 DDF3003 Display/Processor/RF Summer

Figure 4 DDF3060 Antenna

Series 400X

The DDF400X also had a self-contained RF summer which worked effectively from about 50 to 480 MHz. BNC connectors were used for the antenna inputs and summer output. The DDF4003 had a serial interface fixed at 300 baud while the 4004 had a speech synthesizer to articulate the bearing. The four antenna cables used on the fixed site had to be carefully matched which limited their length to about 50 feet.

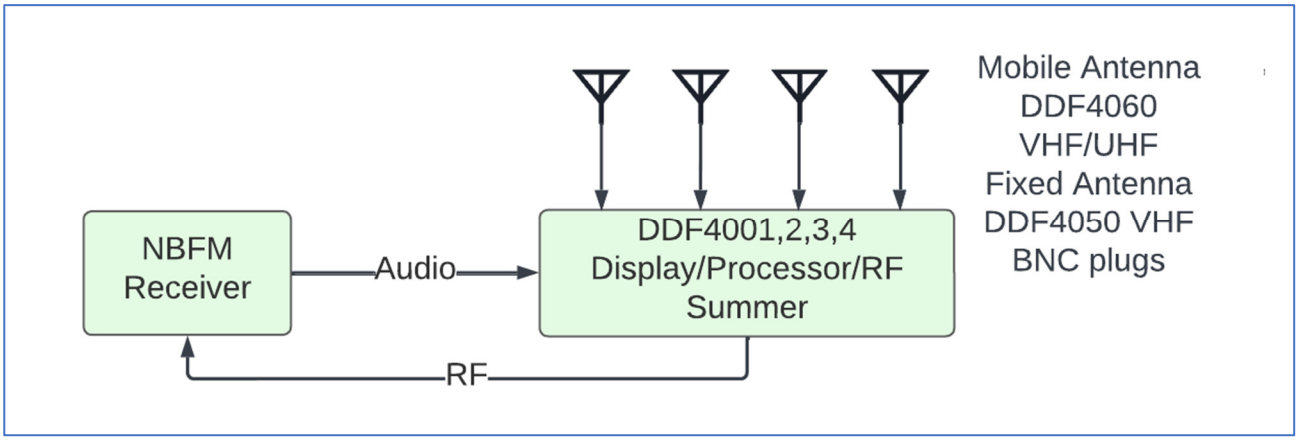

Figure 5 Series 400X Block Diagram

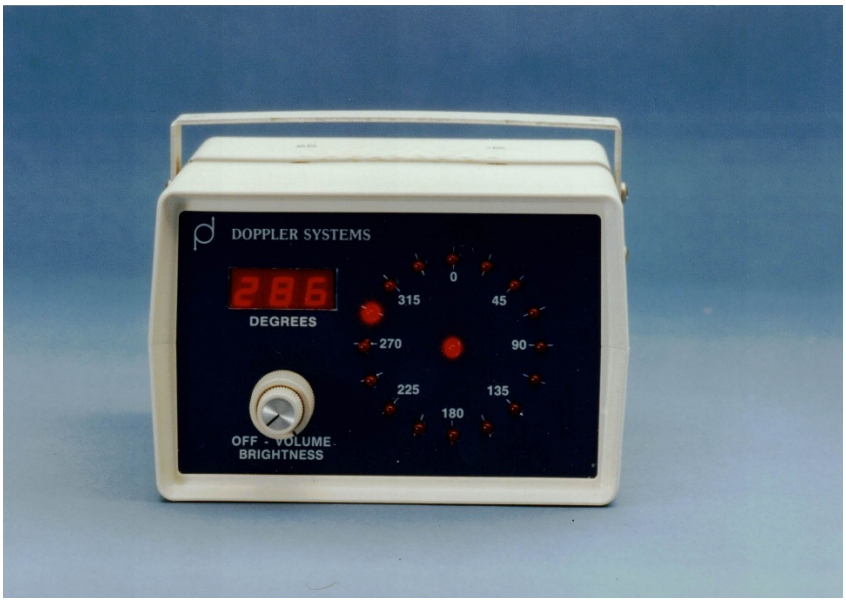

Figure 6 DDF4004 DF Processor

Series 500X

The DDF500X used an external RF summer model DDF5060 which operated up to 1000 MHz. Like the 400X series, the 5003 had a serial interface fixed at 300 baud and the 5004 had a speech synthesizer.

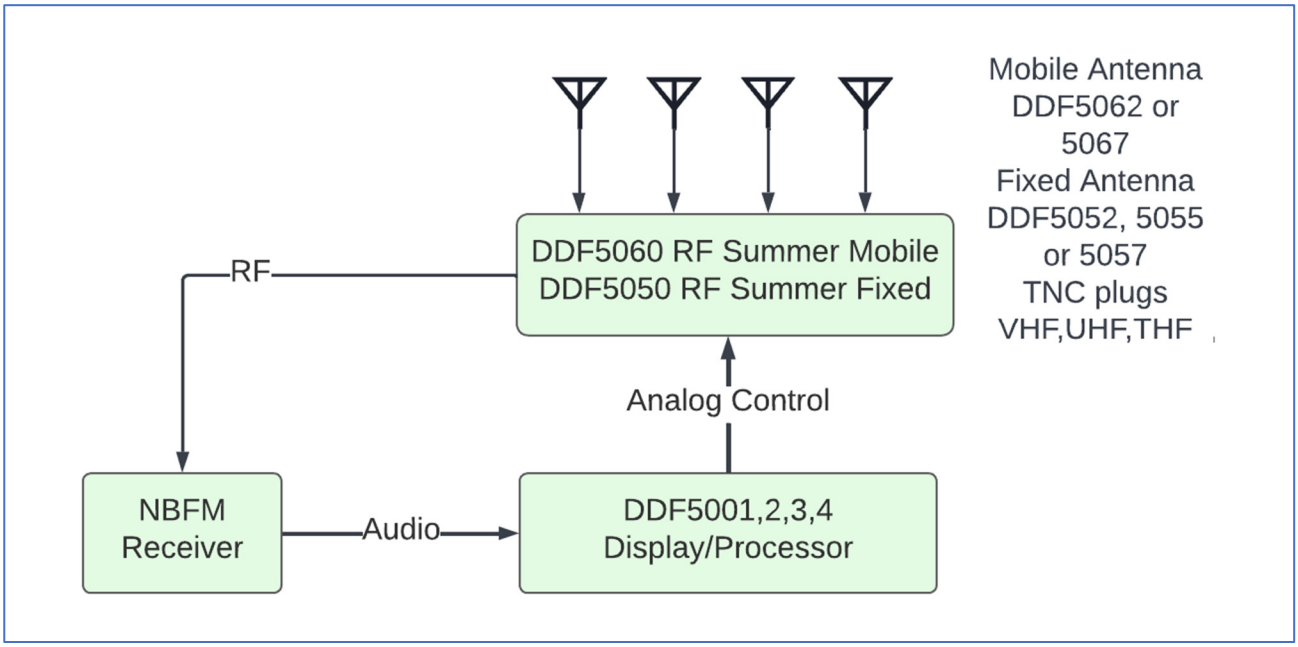

Figure 7 Series 500X Block Diagram

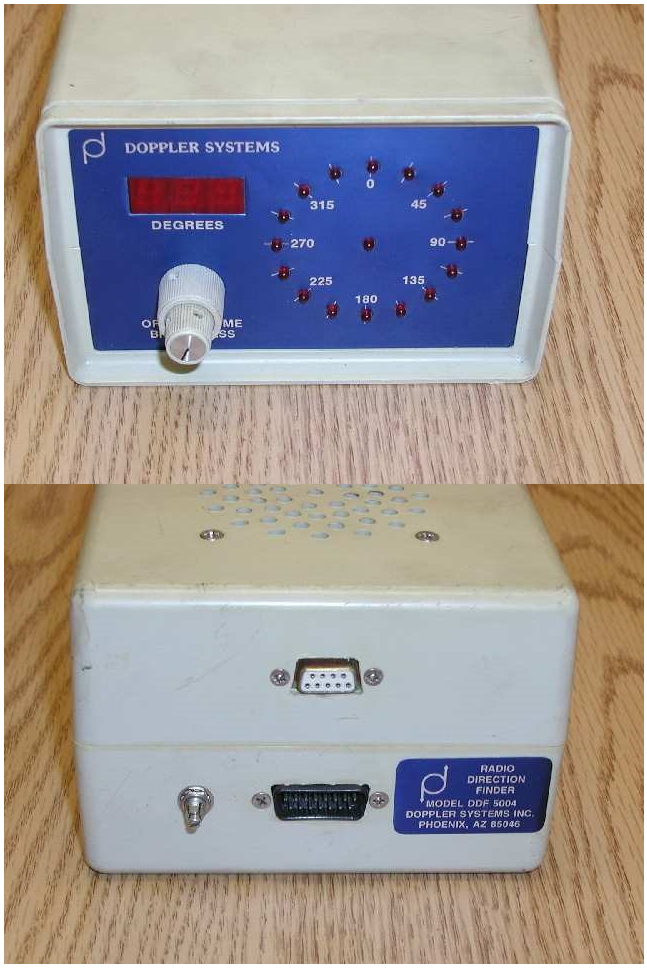

Figure 7 Photo of Series 500X DF. Model DDF5004 Shown.

Figure 8 DDF5050 RF Summer and DDF5052 Antenna

Power and audio connections to the series 400X and 500X were made through the 15 pin Dsub connector on the rear panels.
Both series use the same cable connections shown in the following diagram.

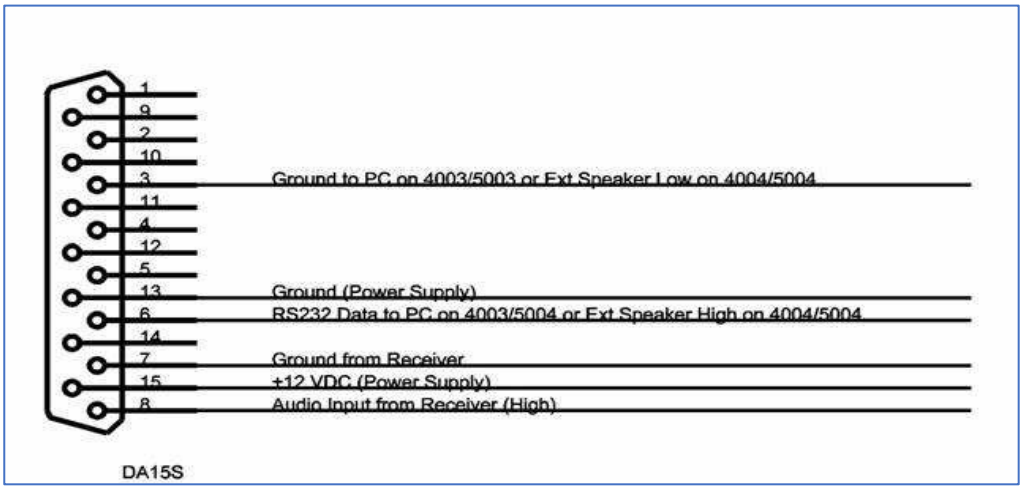

Figure 9 Power/Signal Cable Used on Series 400X and 500X

The RF summer used with the series 500X was model DDF5060. Prior to 1996, this summer was made with the control cable and coax terminated directly on the electronics; from 1996 on, connectors were used on the side of the housing.

Figure 10 Photo of DDF5060 Summers

The latter DDF5060 summers (with the connectors) were also used with the Series 5911 and 6100 DFs (see below). The same RF summer is used on all three series, but the control cables are different. For the Series 500X, a 6-conductor shielded cable, DDF6143A, was used.

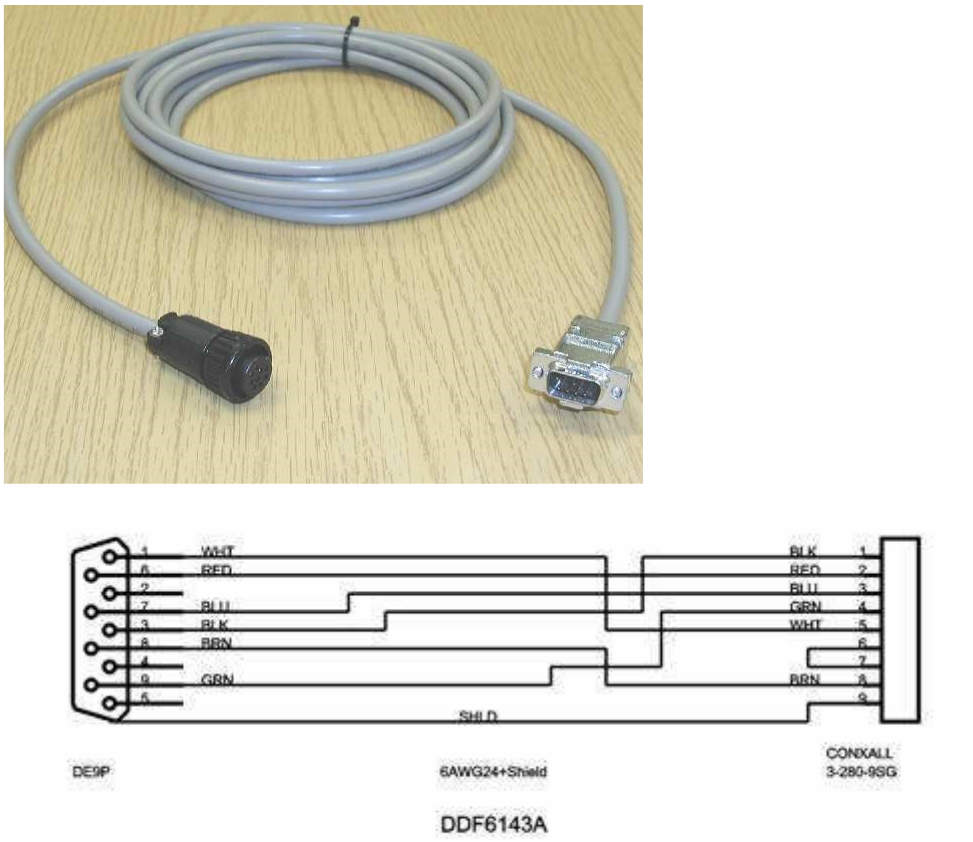

Figure 11 Control Cable Used on Series 500X DFs

Series 5911

The DDF5911 processor was a mobile unit that used the DDF5960 RF summer and DDF5921 remote display. It looks very similar to the later series model DDF5931. The RF summer used with the 5911 was the same as that used with the series 500X (above) but with a different cable. The DDF5911 is most easily identified by the 15-pin female Dsub connector used for the RF summer. Do not attempt to use the DDF5911 with the DDF5980 RF summer used in the Series 5931 which has a 9-pin circular female connector on its side in place of the 9-pin male connector used on the DDF5060 and DDF5960 summers. The DDF5980 summer is also larger (5-inch square) compared to the DDF5060 and DDF5960 which were 4 inches square.

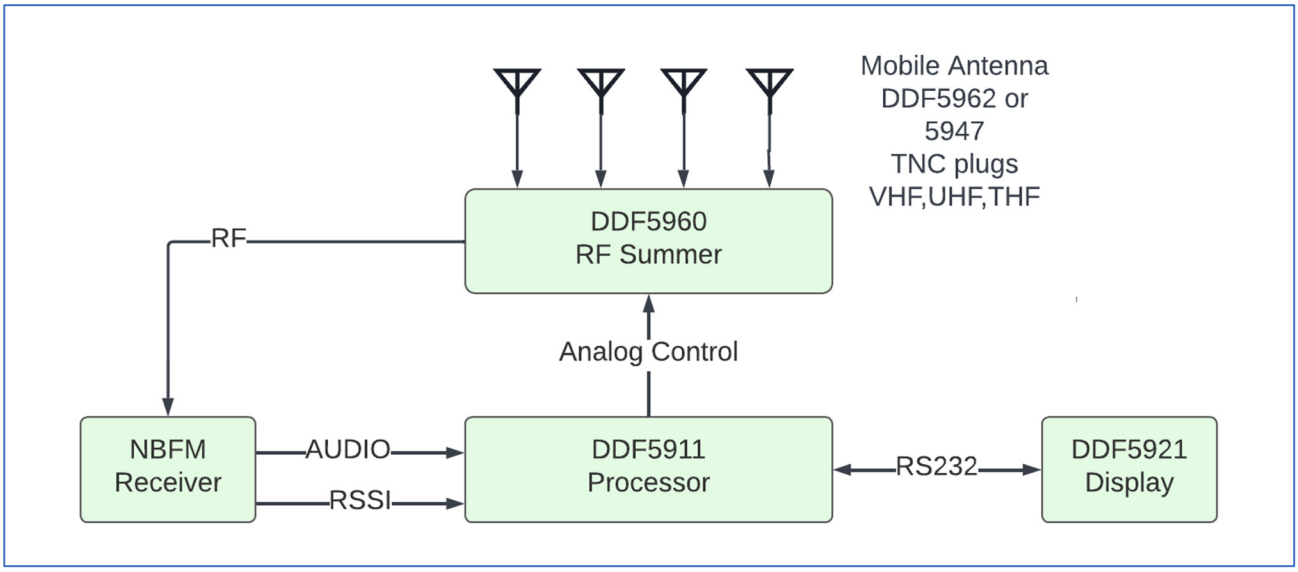

*Figure 12 Series 5911 B**lock Diagram***

Figure 13 Photo of DDF5911 Processor

Figure 14 DDF5921 Remote Display

The cable used to connect the DDF5911 to the RF summer was an 8-conductor shielded cable, DDF6119B, shown below. The DDF5911 cannot be used with the fixed site 8 element antennas used with the models DDF6000.

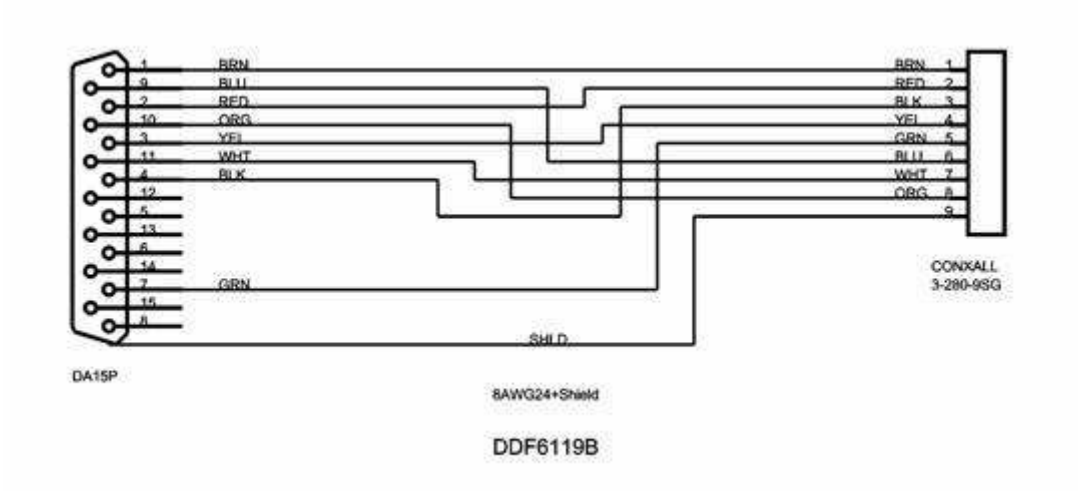

Figure 15 Control Cable Used in Series 5911

Series 6000

This is a fixed site model that found widespread use by the US Coast Guard. A block diagram of the system is shown below.

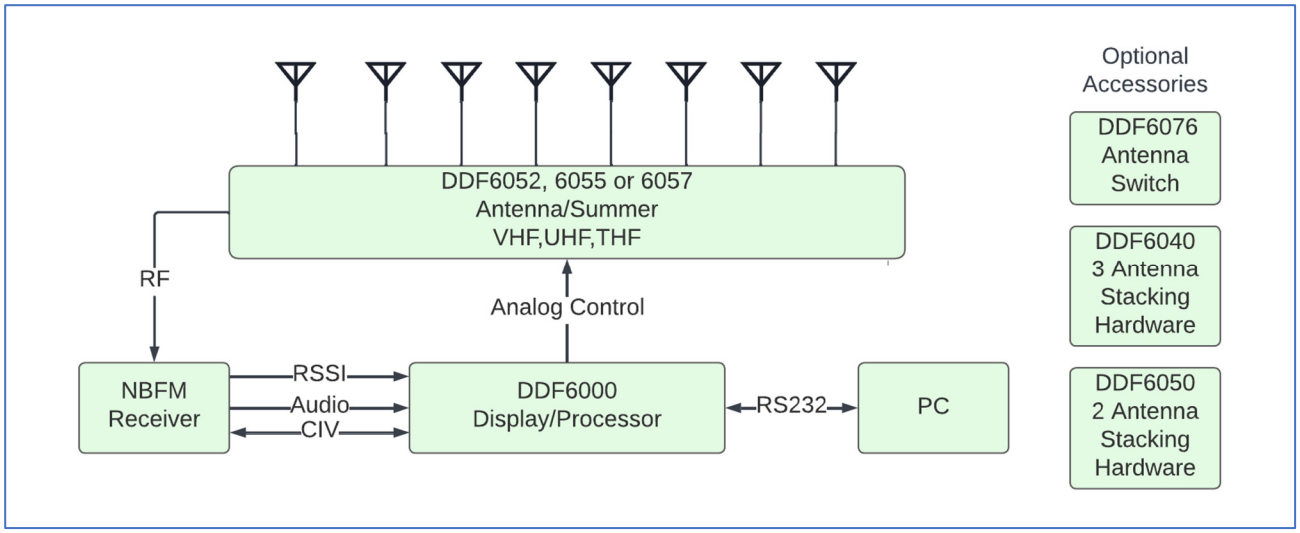

Figure 16 Series 6000 Block Diagram

The system can be used without a PC, but the real utility came from the use of a software program called BearingTrack that displayed lines of bearing on a map from one or more DF locations. When multiple antennas were used, they were stacked using the DDF6040 or DDF6050 hardware, and separate control and RF lines were required to each antenna. The DDF6076 could be used to manually or remotely switch between bands (antennas).

In outward appearance the Series 6000 is nearly identical to the later Series 6001, described below. Although Series 6000 and Series 6001 sites may be interconnected, the RF summing circuitry used is different and the antennas and processors are not interchangeable. To avoid any problems, the gender of the control cables used was different; the DDF6000 used a 15 pin female and the DDF6001 used a 15 pin male connector.

Figure 17 Photo of DDF6000 DF Processor

Figure 18 DDF6052, 6055, 6057 Stacked Antennas

Series 6100

This is a mobile version of the system that contains additional RS232 ports to allow for connection to a GPS and Compass. The unit can be used in the conventional homing mode or with GPS and laptop connected, it can run the program AutoTrack which allow consecutive bearings to be saved to a map for triangulation.

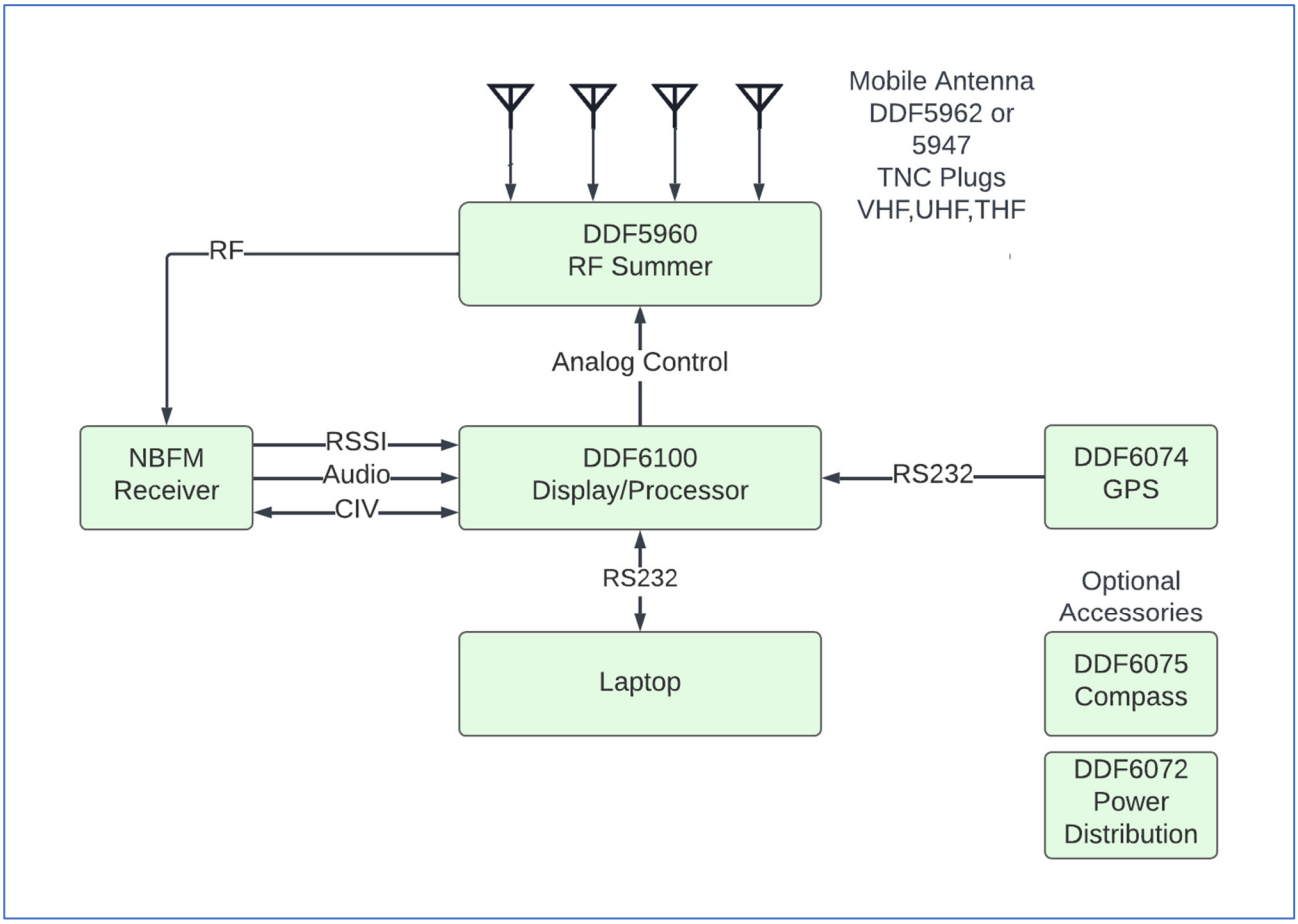

Figure 19 Series 6100 Block Diagram

Note that the same RF summer DDF5960 used in the Series 5911 is also used in the Series 6100.

Figure 20 DDF6100 DF Processor

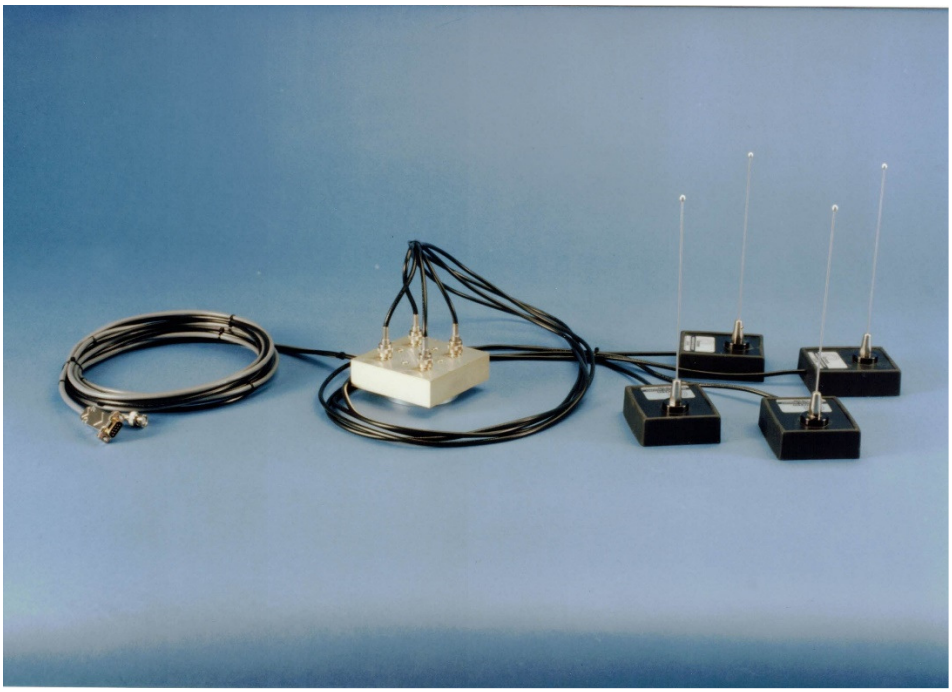

Figure 21 DDF5960 RF Summer with DDF5962 Mobile Antenna Cut for UHF

In outward appearance the Series 6100 is nearly identical to the later Series 6002, described below. However, the RF summing circuitry used in these designs is different and the RF summers and processors are not interchangeable. To avoid any problems, the gender of the control cables used was different; the DDF6100 used a 15-pin female and the DDF6002 used a 15-pin male connector.

Series 6001

This series replaced the Series 6000 for fixed site direction finding. It utilized a newly designed RF summer in the antenna which provided improved accuracy. The control signals that are used between the DDF6001 processor and the antenna are called “2-phase” in the following diagram to distinguish them from the “analog” control signals used in the previous systems. The control cable is wired differently and has opposite gender connectors to avoid an improper mismatch between series.

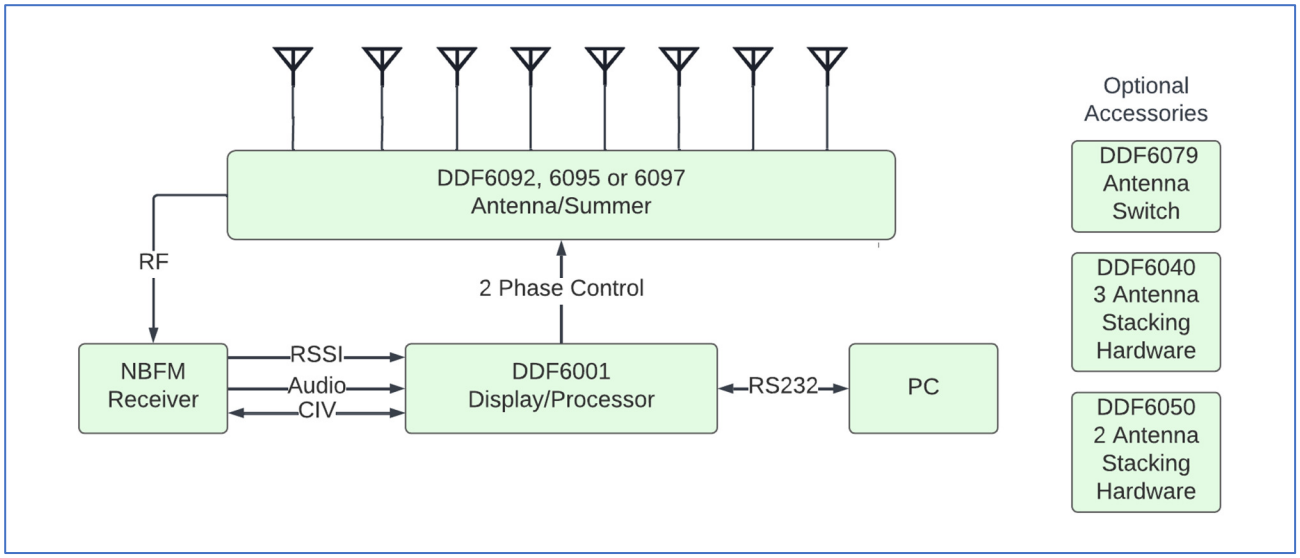

Figure 22 Series 6001 Block Diagram

The antennas are different models than in the Series 6000, but they can be stacked and switched in the same way. This system can also be networked using SignalTrack with other Series 6001 sites or with Series 6000 sites. It can also be used stand alone with no PC connection.

Figure 23 DDF6001 DF Processor

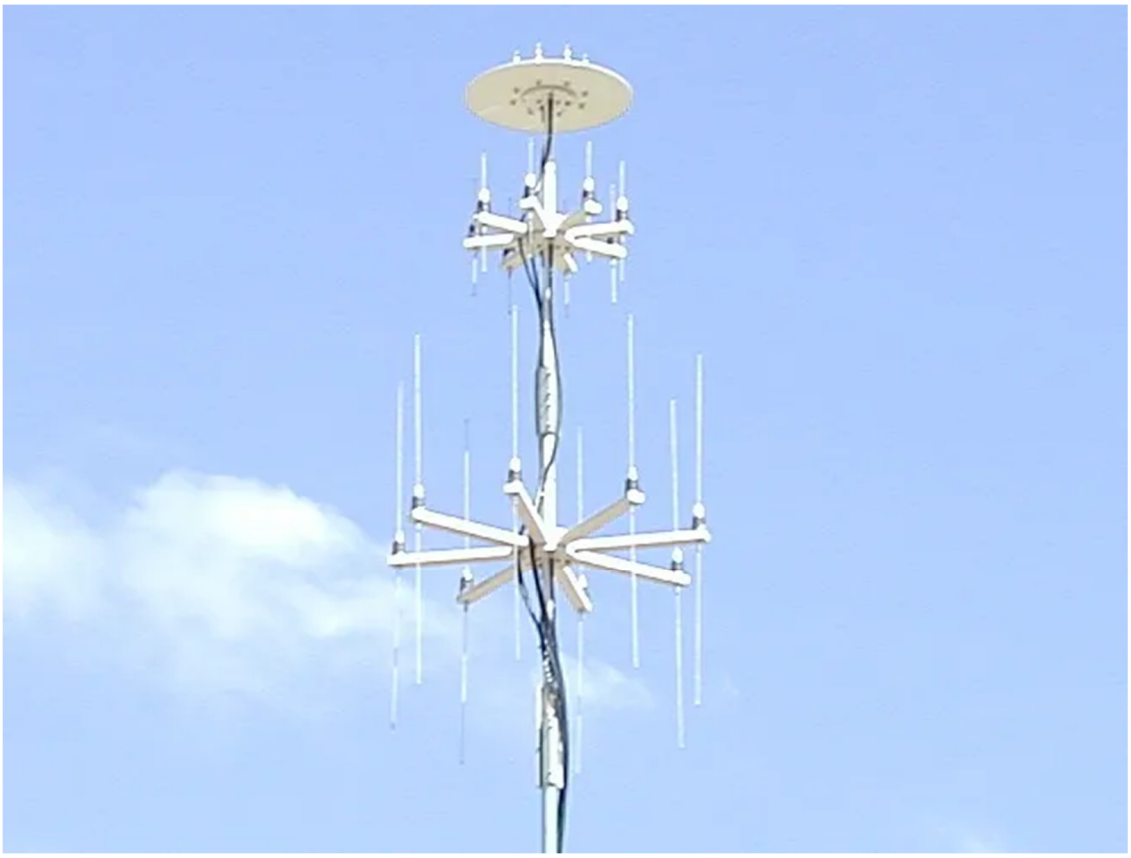

Figure 24 DDF6092, DDF6095, DDF6097 Stacked Antennas

Figure 25 DDF6079 Antenna Switch

Series 6002

This is the successor to the Series 6100 mobile system. It uses a new RF summer, the DDF5980. As with the fixed sites, the cable is different (it uses different gender connectors) to avoid mixing the old and new style summers and processors.

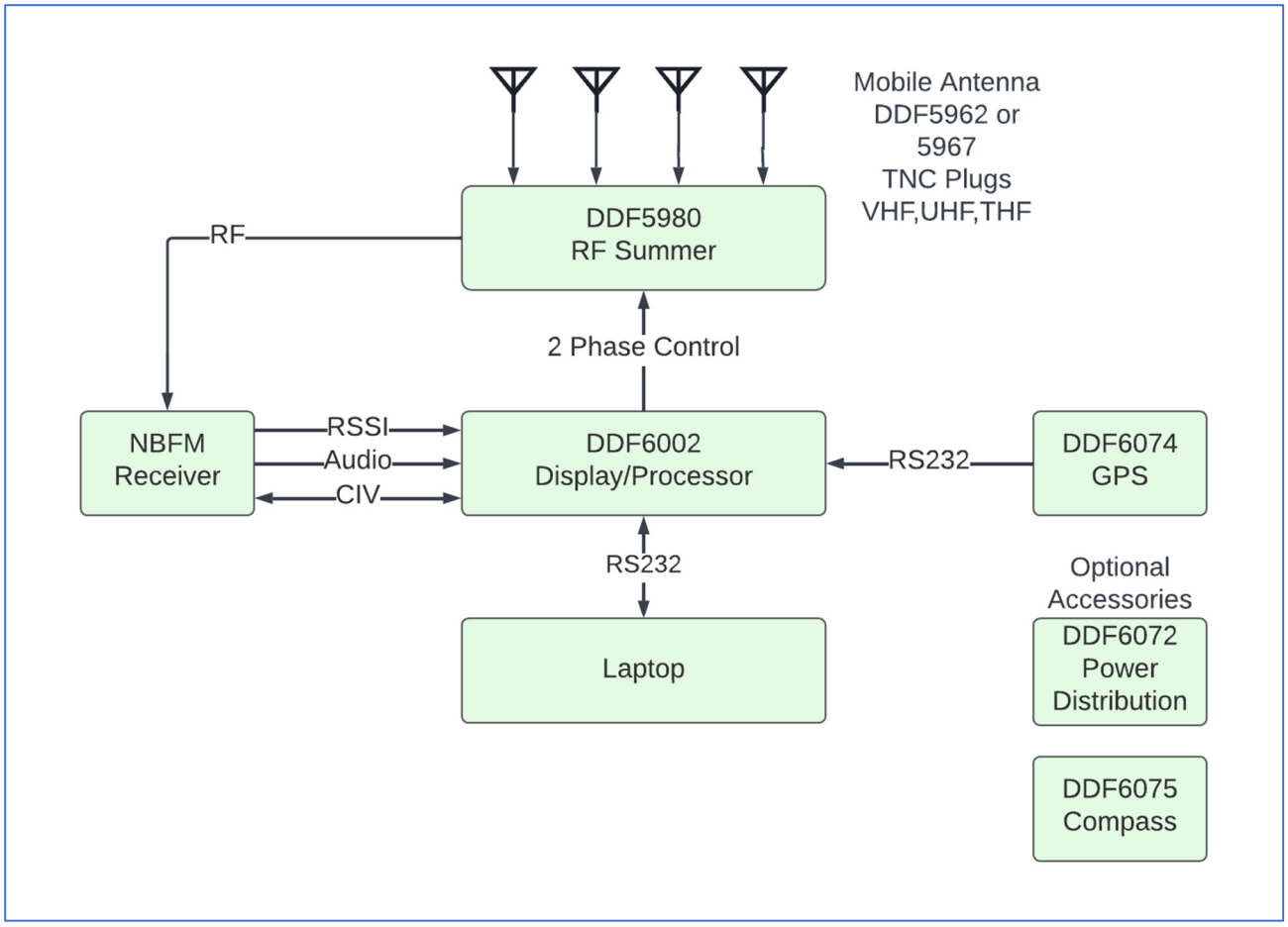

Figure 26 Series 6002 Block Diagram

The spacing between the TNC connectors on the DDF5980 RF summer is 4 inches instead of the 3 inches used on the DDF5960 summer. This improves the accuracy at the lower end of the THF band (700-1000 MHz), but it requires a different model THF antenna, the DDF5967. Other features are the same as on the Series 6100. It can be used without a GPS or laptop as a traditional homing system, or with these added, it can run SignalTrack to save and plot lines of bearing on a map display.

Figure 27 DDF6002 Display Processor

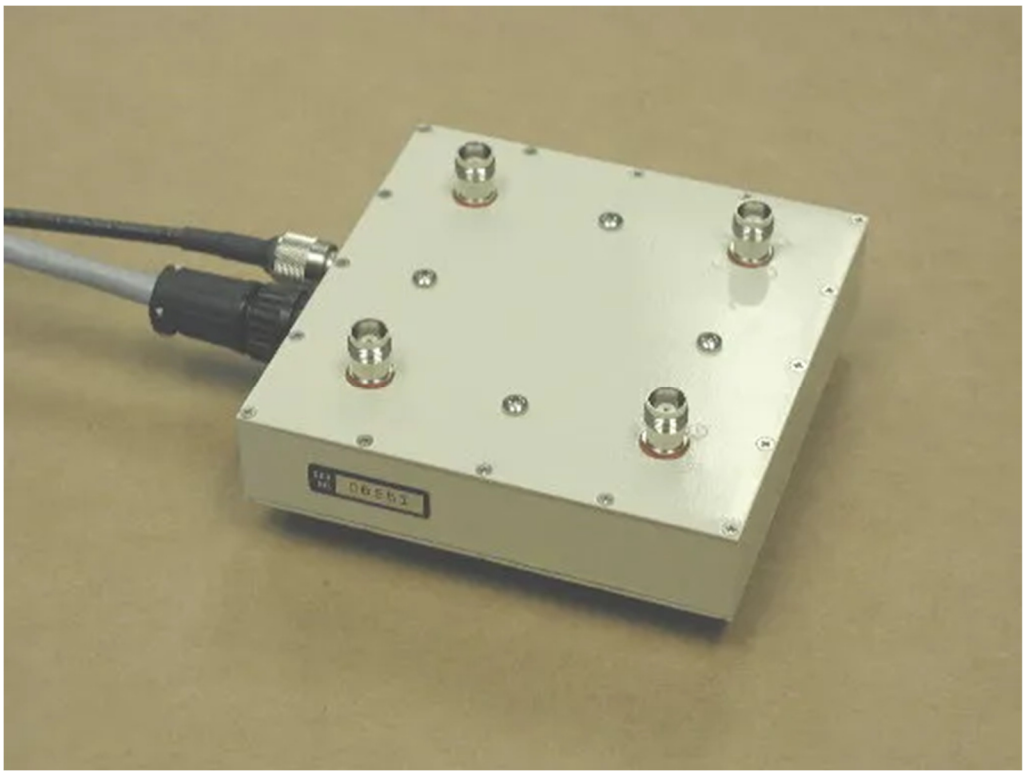
Figure 28 DDF5980 RF Summer

Figure 29 DDF6072 Power Distribution Unit

Figure 30 DDF6074 GPS

Figure 31 DDF6075 Compass

Series 5931

This is a homing only system with the same remote display used on the Series 5911. The summer is the newer DDF5980 model with 2-phase control. As with the Series 6002, the spacing between the TNC connectors on the DDF5980 RF summer is 4 inches instead of the 3 inches used on the DDF5960 summer. The control cable is marked “2-phase” to distinguish it from the “analog” control cable used in the Series 5911.

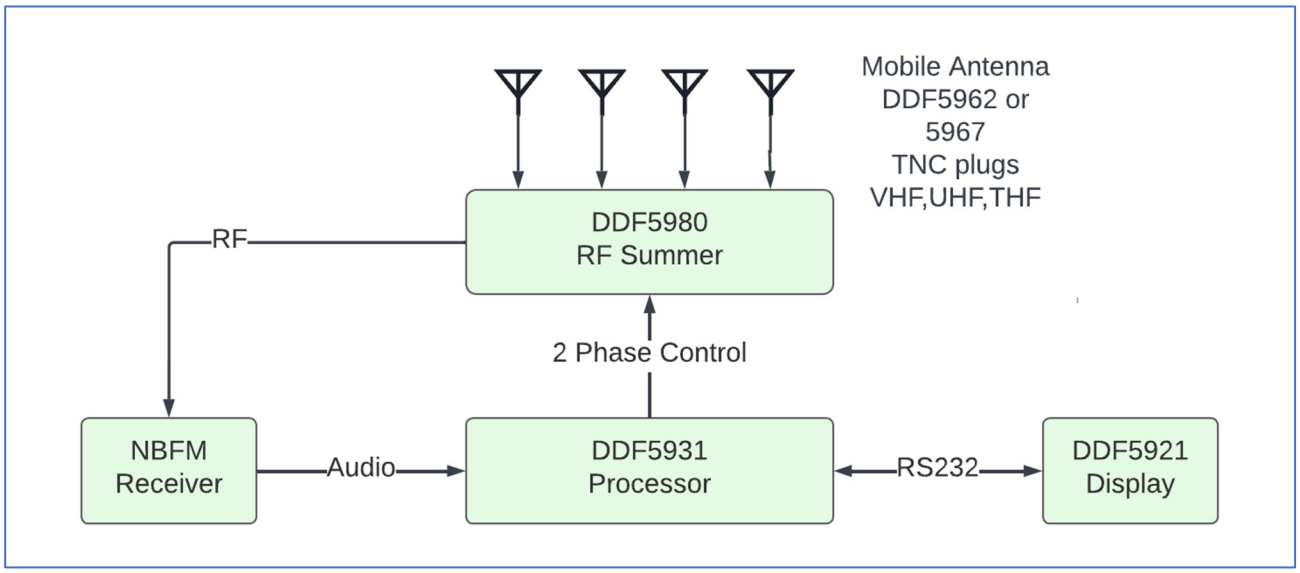

Figure 32 Series 5931 Block Diagram

Figure 33 DDF5931 DF Processor

Note the male 15 pin connector used on the DDF5931 which distinguishes it from the DDF5911 which used a female 15 pin connector for the control cable.