

Programming and Using the Motorola V.3400 Modem for Remote Operation of the DDF6000

A Technical Application Note from Doppler Systems

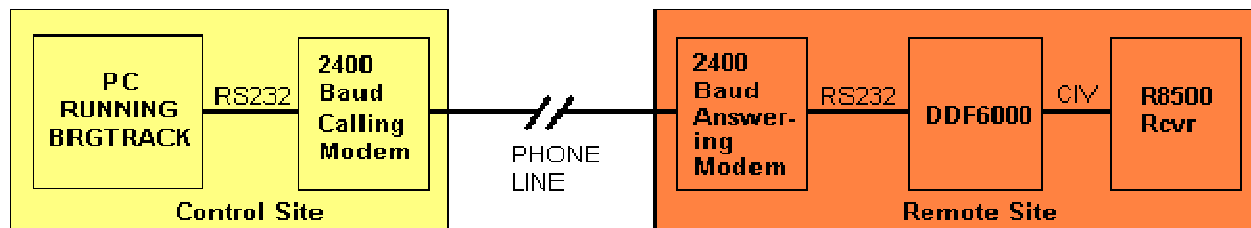
April 11, 1999

1.0 Introduction

Version 3.x of the DDF6000, running version 2.x of the BrgTrack software, allows one or more of these direction finders to be controlled remotely over telephone lines. In the past, radio modems were required for the purpose. To check which firmware version you are using, watch the front panel display of the DDF6000 during power turn-on; to check the software version, use the Help | About BrgTrack menu on the PC. If you are going to need an upgrade, see the Software & Upgrade page on the web site, or seek help from your local distributor or from the factory.

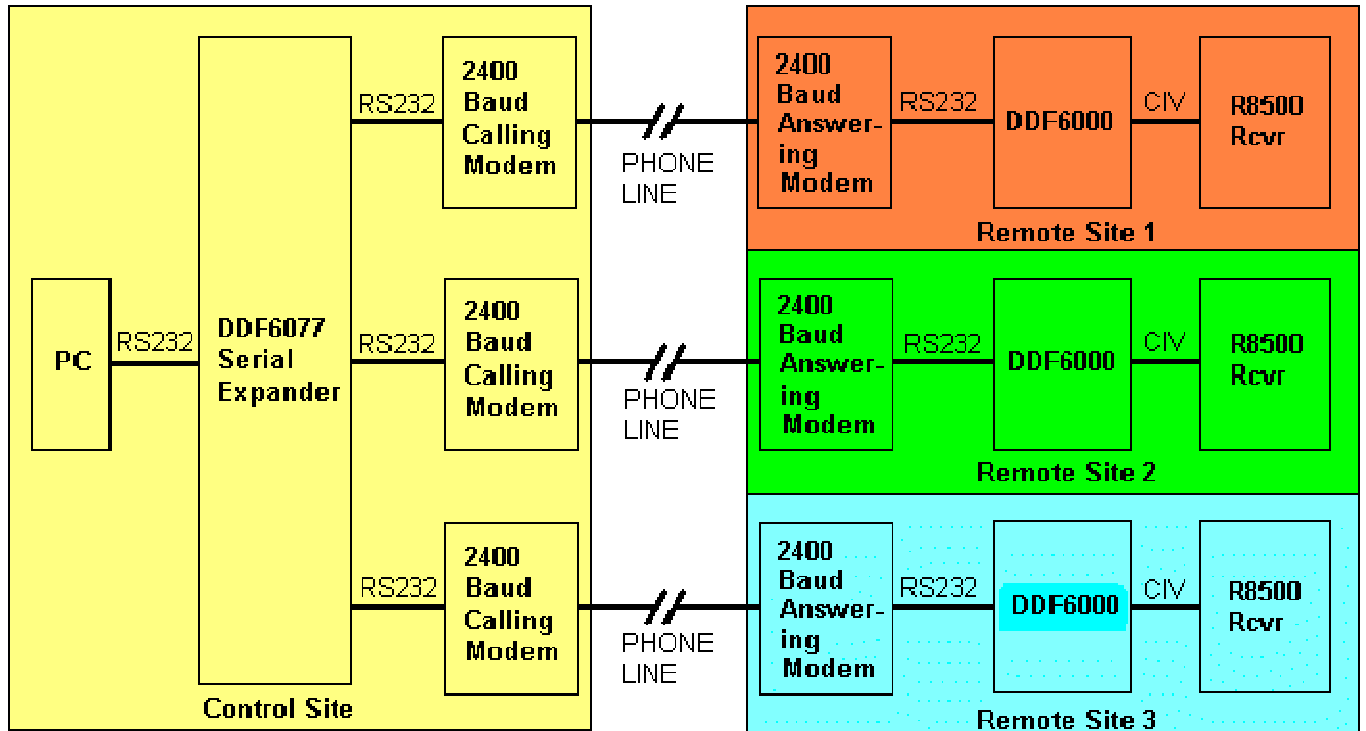
2.0 Configuration

A modem pair is required for each remote site. The "calling" modem is located at the central control point where the PC running BrgTrack is located, and the "answering" modem is located at the remote site. If only one remote site is needed, the PC's COM port will connect to the sending modem using a 3-wire serial cable as shown in Figure 1. If multiple sites are to be connected, the Serial Expander, DDF6077 should be used. See Figure 2. A Serial Expander will interface a single PC COM port with up to three calling modems. If more than three sites are to be connected, multiple Serial Expanders may be used. See Figure 3. (The number of sites that may be connected using N Serial Expanders is equal to $2N + 1$).



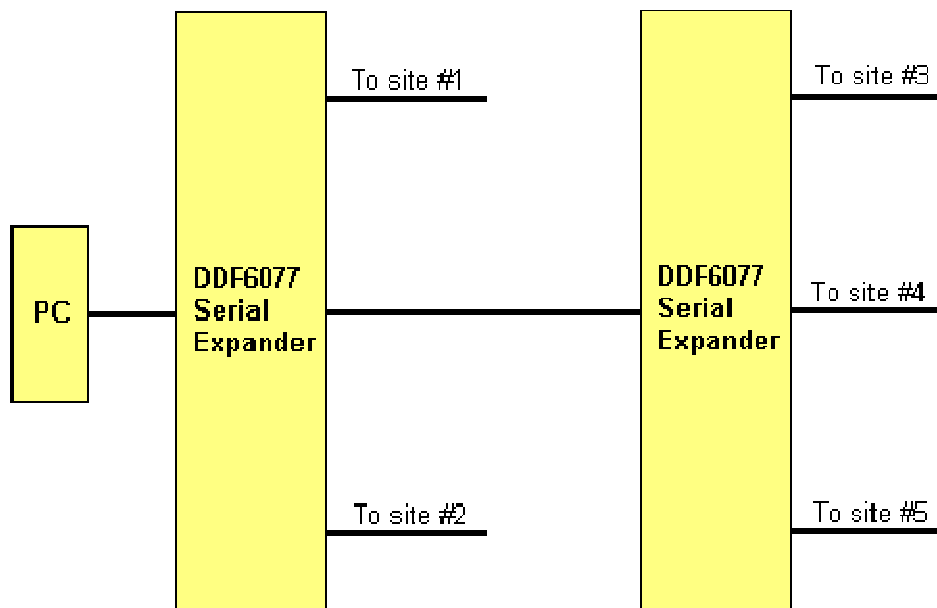
6077-0

Figure 1



6077_1

Figure 2



6077_2

Figure 3

3.0 Motorola V.3400 Modem

This modem is suitable for use as either the calling or answering modem with either leased lines or standard dial up lines. It is an external modem having a liquid crystal display and front panel switches that permit programming, control, dialing, etc. from the panel. It is therefore unnecessary to use AT commands to set up these modems.

Although the setups given below work with the V-3400 modem, there are other modems in the same series which should work very similarly, such as the Motorola V.32E.

4.0 Modem Setup

The modems may be set up from their front panels with only the power connected. The phone lines and/or RS232 cables may be connected or not during programming. Use the YES, NO and TALK/DATA switches to scroll through the menus and make the selections as described in the V.3400 manual. The menu selections listed below work well; however, many of the options could be changed with little or no effect on the operation. For completeness in following the modem menus, all of the selections are listed. Note that the final menu item listed stores these settings for automatic loading after power turnon.

4.1 Calling Modem with Leased Line

CONFIGURATION MENU	SETTINGS
Modem Options	Leased Line / 2 Wire / Mod is V.34 / DCE Max Rate 28800 / DCE Min Rate Disabled / V.34 Rate Thresh High BER / V.34 Asym Rates Enabled / Normal Originate / V.32b Fast Train Enabled / Auto Retrain Enabled / SQ Auto Rate Disabled / Internal Clock / Dial Line Jack RJ11 / Dial TX Level -12 dBm / Lease Line Level -15 dBm / Line Current Dis Short / Auto Dial Backup / Loopback Time 15 Min
Protocol Options	LAPM Prot Enabled / MNP Prot Enabled / Protocol Fallback Enabled / Data Compression Normal / Constant DTE Speed / DTE Flow Control Disabled / DCE Flow Control Disabled / XON-XOFF Pass Thru Disabled / Inactivity Timer Off / Break Option #0 / V.42 Fast Detect Disabled
DTE Options	Ayync Data / DTE Rate 2400 / 8 Bit Char / No Parity / AT Cmd Set Enabled / Ignore DTR / DSR Normal / DCD Normal / CTS Forced High / DTE Fallback Disabled / Options Retained at Disc
Test Options	Bilateral Digital Loop Disabled / DTE Local Test Disabled / DTE Remote Test Disabled / Remote Commanded Enabled / Test Timeout Off
Dial Options	Dial Type Tone / Autodial #1 / Wait for Dial Tone / Wait Delay 2 Sec /

	Pause Delay 2 Sec / Call Timeout 30 Sec / Answer Ring #1 / Autocallback Disabled
Speaker Operation	Volume Control Medium / Speaker On Until Carr Detect
Load/Store Options Set	Load Factory Option? NO / Load User Option Set? NO / Store Present Options? YES - 1 / User Option at Reset 1

4.2 Answering Modem with Leased Line

CONFIGURATION MENU	SETTINGS
Modem Options	Leased Line / 2 Wire / Mod is V.34 / DCE Max Rate 28800 / DCE Min Rate Disabled / V.34 Rate Thresh High BER / V.34 Asym Rates Enabled / Forced Answer / V.32b Fast Train Enabled / Auto Retrain Enabled / SQ Auto Rate Disabled / Internal Clock / Dial Line Jack RJ11 / Dial TX Level -12 dBm / Lease Line Level -15 dBm / Line Current Dis Short / Auto Dial Backup / Loopback Time 15 Min
Protocol Options	LAPM Prot Enabled / MNP Prot Enabled / Protocol Fallback Enabled / Data Compression Normal / Constant DTE Speed / DTE Flow Control Disabled / DCE Flow Control Disabled / XON-XOFF Pass Thru Disabled / Inactivity Timer Off / Break Option #0 / V.42 Fast Detect Disabled
DTE Options	Async Data / DTE Rate 2400 / 8 Bit Char / No Parity / AT Cmd Set Enabled / Ignore DTR / DSR Normal / DCD Normal / CTS Forced High / DTE Fallback Disabled / Options Retained at Disc
Test Options	Bilateral Digital Loop Disabled / DTE Local Test Disabled / DTE Remote Test Disabled / Remote Commanded Enabled / Test Timeout Off
Dial Options	Dial Type Tone / Autodial #1 / Wait for Dial Tone / Wait Delay 2 Sec / Pause Delay 2 Sec / Call Timeout 30 Sec / Answer Ring #1 / Autocallback Disabled
Speaker Operation	Volume Control Medium / Speaker On Until Carr Detect
Load/Store Options Set	Load Factory Option? NO / Load User Option Set? NO / Store Present Options? YES - 1 / User Option at Reset 1

4.3 Calling and Answering Modems with Dialup Line

CONFIGURATION MENU	SETTINGS
Modem Options	Dial Line/ Modulation is Automode / DCE Max Rate 28800 / DCE Min Rate Disabled / V.34 Rate Thresh High BER / V.34 Asym Rates Enabled / V.22 Guard Tone 1800 Hz / V.32b Fast Train Enabled / Auto Retrain Enabled / SQ Auto Rate Disabled / Internal Clock / Dial Line Jack RJ11 / Dial TX Level - 12 dBm / Line Current Dis Short / Long Space Disc Enabled
Protocol Options	LAPM Prot Enabled / MNP Prot Enabled / Protocol Fallback Enabled / Data Compression Normal / Constant DTE Speed / DTE Flow Control Disabled / DCE Flow Control Disabled / XON-XOFF Pass Thru Disabled / Inactivity Timer Off / Break Option #0 / V.42 Fast Detect Disabled
DTE Options	Ayync Data / DTE Rate 2400 / 8 Bit Char / No Parity / Async Controlled Dialer / AT Cmd Set Enabled / Ignore DTR / DSR Normal / DCD Normal / CTS Forced High / DTE Fallback Disabled / Options Retained at Disc
Test Options	Bilateral Digital Loop Disabled / DTE Local Test Disabled / DTE Remote Test Disabled / Remote Commanded Enabled / Test Timeout Off
Dial Options	Dial Type Tone / Autodial #1 / Wait for Dial Tone / Wait Delay 2 Sec / Pause Delay 2 Sec / Call Timeout 30 Sec / Answer Ring #1 / Autocallback Disabled
Speaker Operation	Volume Control Medium / Speaker On Until Carr Detect
Load/Store Options Set	Load Factory Option? NO / Load User Option Set? NO / Store Present Options? YES - 1 / User Option at Reset 1

On the calling modem, you will also need to go to the CHANGE PHONE NUMBER menu and enter the phone number of the answering modem.

5.0 Modem Operation

5.1 Calling Modem to PC Cable

All that is required is a 3 wire shielded cable that connects the calling modem to the COM port on the PC.

Signal	PC DB25 (female) pin	PC DE9 (female) pin	Calling modem DB25 (male) pin
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TXD	2	3	2
RXD	3	2	3
Ground	7	5	7

5.2 Answering Modem to DDF6000 Cable

A 3-wire shielded cable is required that connects the following signals on the answering modem to J1 on the DDF6000.

Signal	Answering modem DB25 (male) pin	DDF6000 J1 (female) pin
TXD	3	3
RXD	2	2
Ground	7	5

5.3 Testing the Modems - Leased Line Configuration

Connect a DDF6000 to an Answering Modem and connect a Calling Modem to the PC. Connect the two modems together with a jumper cable having RJ45 (8-conductor) plugs. Use the jacks marked AUX/LEASED LINE (furthest from the RS232 connectors) on the modems. Turn the modems on. After a few seconds of handshaking the two modems will connect. When this happens, the displays on both modems will say "ON LINE" and the carrier detect CD LED will be lit.

Be sure that a plug is inserted in J4 on the DDF6000 to place it in the CIV mode. Turn on the power to the direction finder with the plug installed. To test the network, you do not need to have a receiver or direction finder antenna connected. You can place the direction finder in a "self test" mode by selecting (from the front panel) Sweep = 0, Cal = ON, Sig = 9). The DF should display a bearing. When you finish these tests, you can turn off the self test mode using the same command sequence.

Execute BrgTrack on the PC. Check that the proper COM port has been selected (Setup | Serial Port), then check that the DF address matches that of the DDF6000 connected. (The default value is 1). Select Setup | Site, Enable one site, select Modify, and set the DF-id to the address of the DDF6000. If a CIV receiver is connected to the DDF6000, check that its address also matches that shown in the RX-id field. Select Locate on Map and be sure that the site location is shown somewhere on the screen. If a CIV receiver is not connected to the DF, be sure that no channels are enabled (Setup | Channels | Disable).

Now place BrgTrack in the RUN mode. The RD and TD lights on both modems should blink and the BrgTrack screen should display a bearing.

To verify that the system will restart after a power failure, turn the DDF6000 Off. BrgTrack will display an error message. Turn the DDF6000 back ON then click on "Yes" to restart BrgTrack's polling sequence.

Turn off the power on the answering modem. BrgTrack will again display an error message and after brief interval, the CD light on the calling modem will go off. Turn the power back on and wait until the calling modem light returns to on. This may take several seconds. Now click the "Yes" button to restart BrgTrack.

Turn off the power on the calling modem, turn it back "on", and wait for the CD light to indicate that the modems have re-established communication. Restart BrgTrack using the "Yes" button.

If you will be connecting to multiple sites, repeat the above tests using the next modem pair.

5.4 Testing the Modems - Dialup Line Configuration

Connect a DDF6000 to an Answering Modem and connect a Calling Modem to the PC. Connect each of the modems to a different telephone line using a jumper cable having RJ11 (2 or 4 conductor) plugs. Use the jacks marked DIAL LINE (closest to the RS232 connectors) on the modems.

Turn the modems on. From the front panel of the sending modem, press the NO switch to select the menu Dial Stored Number. Select the number of the answering modem and press YES to initiate the dialup process. After a few seconds of handshaking the two modems will connect. When this happens, the displays on both modems will say "ON LINE" and the carrier detect CD LED will be lit.

Be sure that a plug is inserted in J4 on the DDF6000 to place it in the CIV mode. Turn on the power to the direction finder with the plug installed. To test the network, you do not need to have a receiver or direction finder antenna connected. You can place the direction finder in a "self test" mode by selecting (from the front panel) Sweep = 0, Cal = ON, Sig = 9). The DF should display a bearing. When you finish these tests, you can turn off the self test mode using the same command sequence.

Execute BrgTrack on the PC. Check that the proper COM port has been selected (Setup | Serial Port), then check that the DF address matches that of the DDF6000 connected. (The default value is 1). Select Setup | Site, Enable one site, select Modify, and set the DF-id to the address of the DDF6000. If a CIV receiver is connected to the DDF6000, check that its address also matches that shown in the RX-id field. Select Locate on Map and be sure that the site location is shown somewhere on the screen. If a CIV receiver is not connected to the DF, be sure that no channels are enabled (Setup | Channels | Disable).

Now place BrgTrack in the RUN mode. The RD and TD lights on both modems should blink and the BrgTrack screen should display a bearing.

To verify that the system will restart after a power failure, turn the DDF6000 Off. BrgTrack will display an error message. Turn the DDF6000 back ON then click on "Yes" to restart BrgTrack's polling sequence.

Turn off the power on the answering modem. BrgTrack will again display an error message and after brief interval, the CD light on the calling modem will go off. Turn the power back on and redial the answering modem from the calling modem front panel. After the modems connect, click the "Yes" button to restart BrgTrack.

Turn off the power on the calling modem, turn it back on, and again redial the answering modem. After the modems connect, restart BrgTrack using the "Yes" button.

If you will be connecting to multiple sites, repeat the above tests using the next modem pair.

5.5 ICOM R8500 Setup Note

Be sure that the CIV Transceive Mode is turned OFF when using this receiver. See page 32 of the IC-R8500 Instruction Manual for the procedure for changing the CIV Address and the CIV Transceive Mode.

5.6 Testing Multiple Modem Connections

Before testing multiple modems and DF's you need to set the addresses of each DDF6000 to a unique value using the RDFCMD program provided with the direction finders. Connect a DDF6000 to the PC serial port (using a minimum 3-wire cable), execute RDFCMD, select the proper COM port, select DF serial port J1, select CIV protocol, enter the current CIV address (1 unless you have already changed it), and enter anything for the receiver CIV address.

Enter command 0 (Bearing Data Rqst) and verify that the a response message is received. To change the CIV address, enter command 4 from the Main menu to reach the RDF Address Menu, enter the new CIV address, then hit the ESC key twice to exit the program.

If you will be using CIV receivers at each site, you need to also set unique addresses on these. Refer to the ICOM receiver manual for instructions on setting the CIV addresses.

Connect the female connector on the serial data expander to the PC using the cable provided with it (the 3 conductor shielded DE9 male to DE9 female), and connect the calling modems to the male connectors on the serial data expander.

With BrgTrack in its off mode, setup the CIV addresses for the direction finders and receivers at each site to match those connected to the network.

Turn all the direction finders and modems on and wait until all the modems are communicating properly as indicated by stable CD indications on the calling modems. Now click on Run in BrgTrack. You should see bearings displayed at each site (assuming that all direction finders are still in the self test mode).

6.0 Timing

The following timing diagrams are provided as an aid in case you experience difficulty with communications after setting up the modems. Figure 4 shows the timing obtained using the Motorola V.3400 modem on a leased or dial up line. Figure 5 illustrates the timing that results when a direct (local) connection is made between the PC and the DDF6000.

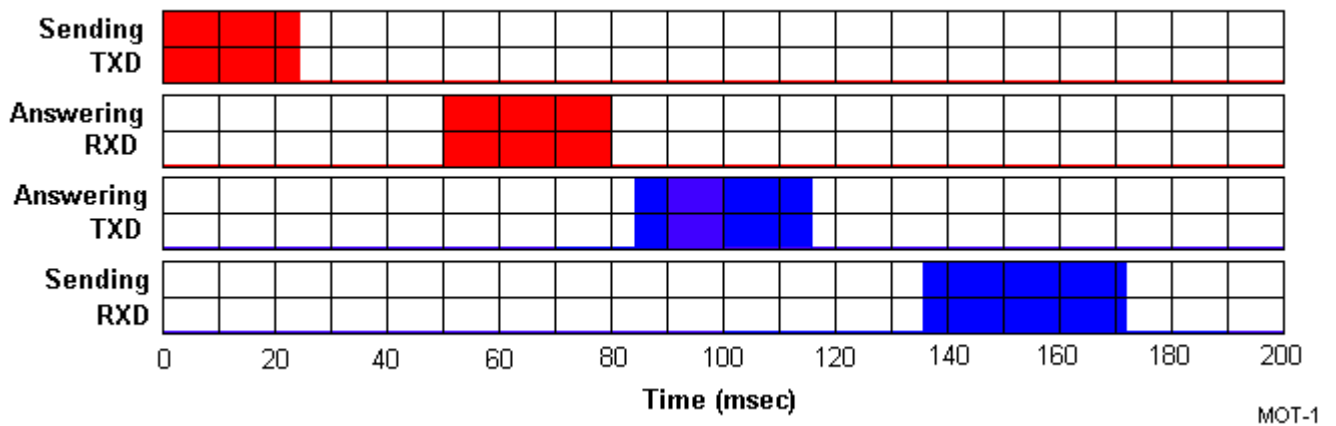


Figure 4

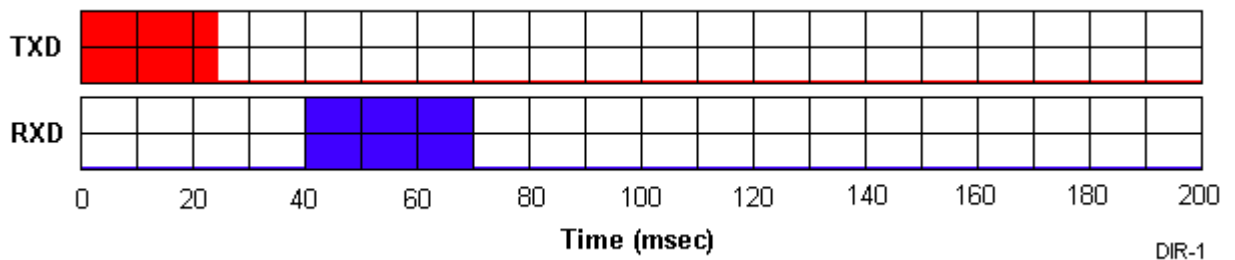


Figure 5

7.0 Final Installation

When all of the modems, direction finders, receivers, serial data expanders and the PC are operating reliably in the same area, you are ready to locate the answering modems, direction finders and receivers to the remote sites and connect them to the actual telephone lines. Be

sure to note the CIV addresses of the direction finders and the receivers so that they are installed at the correct site locations. Also, be sure not to mix up the calling and answering modems. Remember to switch off the self test mode on the direction finders.