



Application Note #5440

Upgrading Firmware Over the Air

October 30, 2006

Purpose

This application note is intended to guide the user through a successful firmware upgrade over the air.

Pre-requisites

The following is a table showing the minimum level of firmware required to complete RF upgrades:

Family of Radio	Firmware compatibility (and above)
FGR	2.13
I-Series	3.13
IM-Series	3.36e
LRS-Series	9.33
HT-Series	2.59
IO-Series	2.54

- Note: All radios in the network MUST be at the above firmware version or higher. If ANY radio does not meet this criteria every site in the network will have to be visited and power cycled!!!**



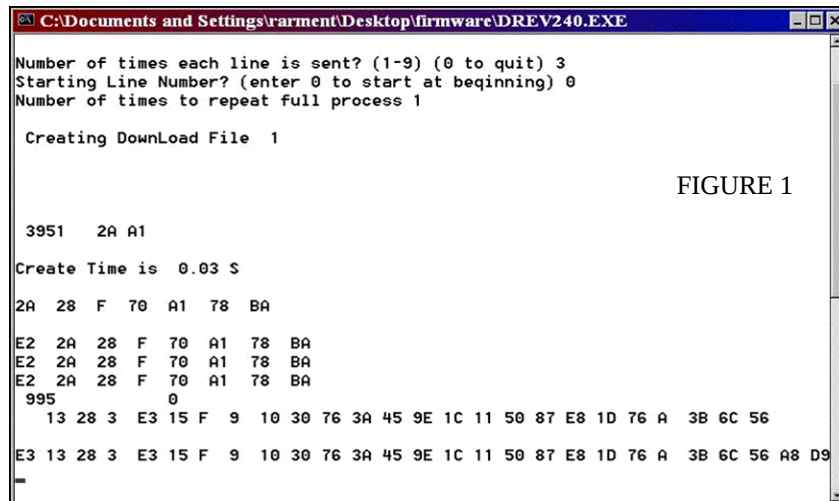
- The RF Firmware upgrade option will function in both Point-to-Point and MultiPoint networks.
- The RF Firmware upgrade will NOT transmit through a DGR repeater.
- All DGR radios in the network MUST have the Retry Odds option set to “non-0” (1-9).
- The Master Radio MUST have the Diagnostic setting, in the MultiPoint Parameters menu, set to “0”.
- In order to successfully accomplish an RF firmware upgrade, a Diagnostics cable is required.

Basic Execution of an RF Firmware Upgrade

1. From the Master Radio location, use a Diagnostics cable to attach the Freewave radio to a serial port on the computer.
2. Start the firmware upgrade executable (e.g. DREV254.exe) by double clicking the .EXE or by using the Run function.
3. The program automatically defaults to COM1. The COM port may be changed by selecting menu option ‘3’ “Set Com Port for Terminal Emulation and Download. “Enter the number of the COM port to be used, hit “Enter”, then set the baud rate to ‘19200’ and hit “Enter”.
4. Confirm setup of Master radio
 - A) Select option ‘2’ “Radio Setup”
 - B) Press “Shift ‘U’” (Capitol U) to put the radio into Setup and bring up the Main menu.
 - C) On the Main menu, check the revision of the firmware to confirm if an upgrade is needed for the Master radio.
 - D) Select option ‘5’ “Multipoint parameters”.
 - E) Confirm option ‘B’ “Diagnostics” is set to 0.
 - F) Note the value at which option ‘1’ “Master Packet Repeat” is set.
 - G) Press ESC several times to exit the Configuration menu.
 - H) Press ‘Q’ to quit and return to the upload menu.

Basic Execution of an RF Firmware Upgrade (continued)

5. Select option '4' "UpLoad Firmware Over RF."
6. Verify that the computer is connected to the master radio via a Diagnostics cable and press 'y' when prompted, then press "Enter".
7. Enter the number of times to repeat each line, generally '3'. Refer to **Specifics of Operation** for explanation of this option.
8. Enter the 'Starting Line Number'. The initial value MUST be '0'. However, this will vary when doing repeater retries, refer to **Specifics of Operation** for explanation of this option.
9. Enter the 'Number of times to repeat the full process'. Refer to **Specifics of Operation** for explanation of this option.



```

C:\Documents and Settings\varment\Desktop\firmware\DREV240.EXE
Number of times each line is sent? (1-9) (0 to quit) 3
Starting Line Number? (enter 0 to start at beginning) 0
Number of times to repeat full process 1

Creating DownLoad File 1

3951 2A A1
Create Time is 0.03 S
2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
995
13 28 3 E3 15 F 9 10 30 76 3A 45 9E 1C 11 50 87 E8 1D 76 A 3B 6C 56
E3 13 28 3 E3 15 F 9 10 30 76 3A 45 9E 1C 11 50 87 E8 1D 76 A 3B 6C 56 A8 D9

```

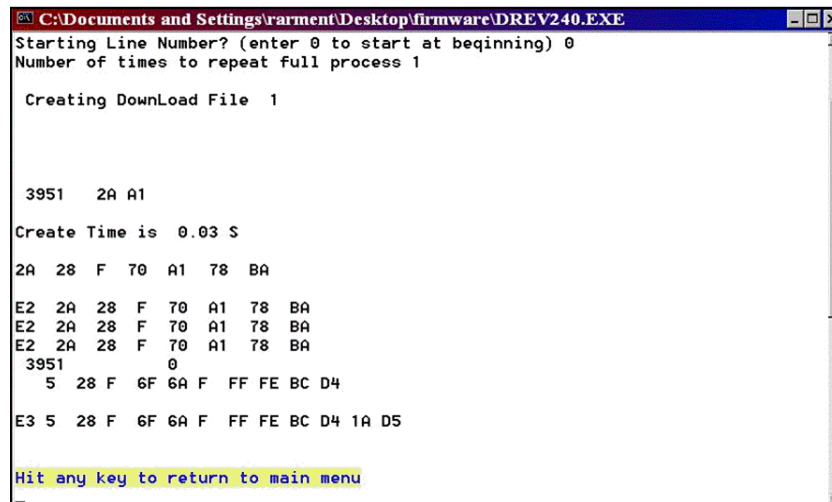
FIGURE 1

Figure 1 shows the screen in process of an upload.

The line following the duplicate lines is the counter. This number represents the progress of the upload.

Basic Execution of an RF Firmware Upgrade (continued)

- Wait for the upload to complete. When finished, the screen should look similar to Figure 2. The example shown took approximately 10 minutes to complete. This time will increase as the “line repeats” or “full process repeats” are increased.



```
C:\Documents and Settings\rrament\Desktop\firmware\DREV240.EXE
Starting Line Number? (enter 0 to start at beginning) 0
Number of times to repeat full process 1

Creating DownLoad File 1

3951 2A A1
Create Time is 0.03 S
2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
E2 2A 28 F 70 A1 78 BA
3951 0
5 28 F 6F 6A F FF FE BC D4
E3 5 28 F 6F 6A F FF FE BC D4 1A D5

Hit any key to return to main menu
```

- Repeat steps 6-10 once for each series repeater in the network (if upload software does not include “Number of times to repeat full process” option).
- Upgrade the firmware on the Master radio, if necessary, using option 1 from the Main menu, “Upload Firmware Through Direct Connection”.



Specifics of Operation

The Master radio firmware will not be upgraded by way of an RF upgrade. This is done using the standard upgrade procedure. (Option 1)

Once a radio starts to receive an RF firmware upgrade it compares the broadcasting firmware revision number to the one it currently has. If the broadcasting revision matches the firmware in a radio, the radio ignores the rest of the transmission (Repeaters will repeat the data), but if the broadcasting firmware revision is different (either newer OR older) the radio will process the firmware upgrade.

As mentioned previously and as depicted in Figure 1, the second question the user responds to is: "Number of times each line is sent?"

This option is variable from 1 to 9 and is subject to user definition. A standard network with high signal levels and low noise levels would require a setting of 3, while less efficient or reliable radio links will require settings up to 9. In order to calculate the number to be used for this setting:

- 1) Reference the Master Packet Repeat setting from the master radios multipoint settings menu.
- 2) Add 1 to this number.

Also mentioned previously and depicted in Figure 1, the "Starting Line Number?" option is always set to '0' the first time the firmware upgrade is run. This will take all directly connected Slave and Repeater radios through the firmware upgrade process. After the last line is sent, the repeater stops transferring the upgrade, leaving any radios beyond with only a partial upgrade. They do, however, retain all the code that was properly transferred to that point and will save that information in their own buffer. At this time it will be necessary to perform the upgrade process again. It is advisable to start at a higher line number. Freewave suggests starting at line 3000. This process MUST be repeated once for each inline Repeater that the network contains unless the "Number of Times to Repeat the Full Process" option was set to something greater than 1.

Specifics of Operation (continued)

A Slave radio located on the far side of a Repeater will receive all firmware upgrade lines up to the point that the Repeater stops transmitting the new firmware. The Slave radio will store this new firmware in the buffer and will wait for the retransmission of the remaining lines. This is also why retransmissions may start at a higher line number than the original upgrade.

If a firmware upgrade is started, but not successful, the radios will hold the received firmware code lines in its buffer until the power is cycled on that radio or the firmware is retransmitted successfully.