FreeWave Radio Basic Configuration

Overview

Swift Navigation distributes FreeWave 900 MHz or 2.4 GHz radios for use during evaluation of our GNSS receivers. Those radios need to be properly configured before using them in a system. This article describes configuration steps for RTK base and RTK rover radios.

Radios can be configured using a simple serial terminal program or FreeWave Tool Suite. This article uses terminal program. For details about Tool Suite go to FreeWave site.

900 MHz and 2.4 GHz radio programming is identical. In examples below 900 MHz radios are used.

Terminal Program

At Swift we recommend **CoolTerm** as a free terminal program. It can be downloaded from here and is available for **Windows** and **OSX**. For **Linux**, we use **GtkTerm** which can be installed on Ubuntu via apt.

```
sudo apt-get install gtkterm
```

Other terminal programs can also be used.

Radio Hardware Setup

For configuration, radios should be connected to your computer via the RS-232 port using a straight RS-232 cable. If there is no RS-232 port on your computer, use a USB to RS-232 adapter. Freewave radios require a 6 to 30 V DC power supply. Use the wall power adapter included with the radios, or a 12 V battery, to power radio during configuration.
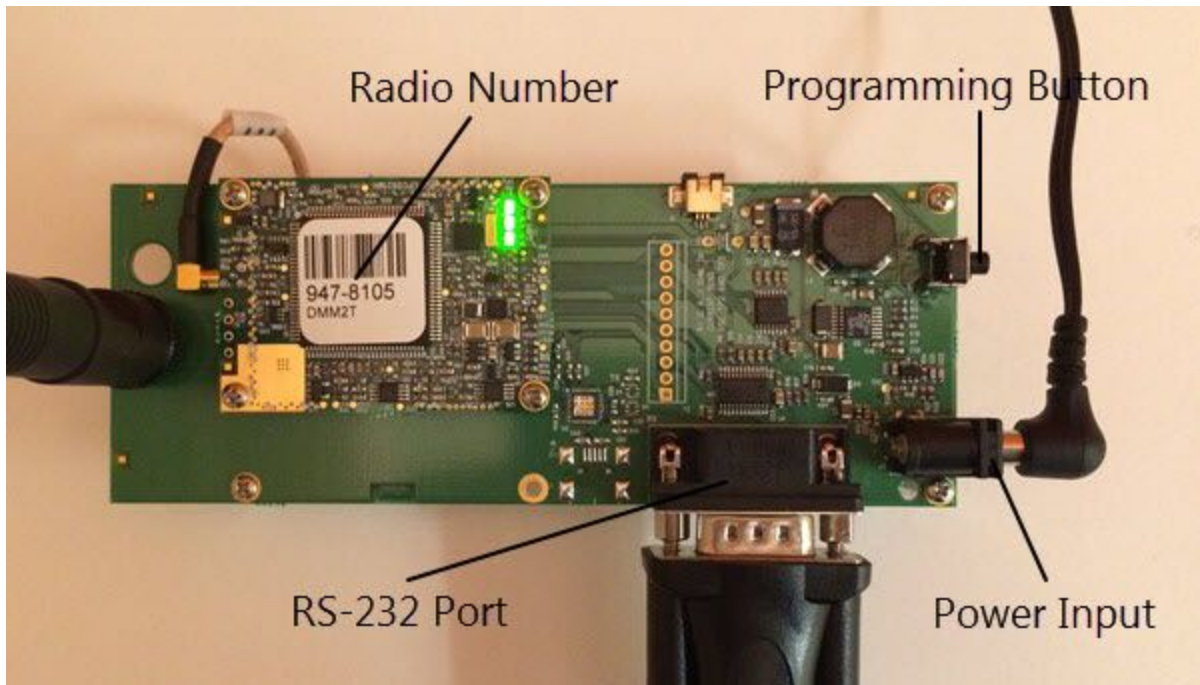
Fig 1. 900 MHz radio in programming mode

Entering Radio Programming Mode

Follow this steps to set radio in the programming mode.

- Attach antenna to the radio board. Radio should be never powered without antenna attached.
- Connect radio's RS-232 port to PC, use a USB to RS-232 adapter if necessary
- Power up the radio
- Open terminal program and configure port parameters to 19200 bps, 8 bits, no parity, 1 stop bit, no flow control.
  - In **CoolTerm**, click on Options button, set the parameters, then click Connect button.
  - In **GtkTerm**, click on Configuration -> Port (Shift+Ctrl+s)
- Press radio Programming Button located next to the Power Input on the radio board (see Fig 1). All three LEDs on the board should show solid green and you will be presented with the following menu on the terminal screen:
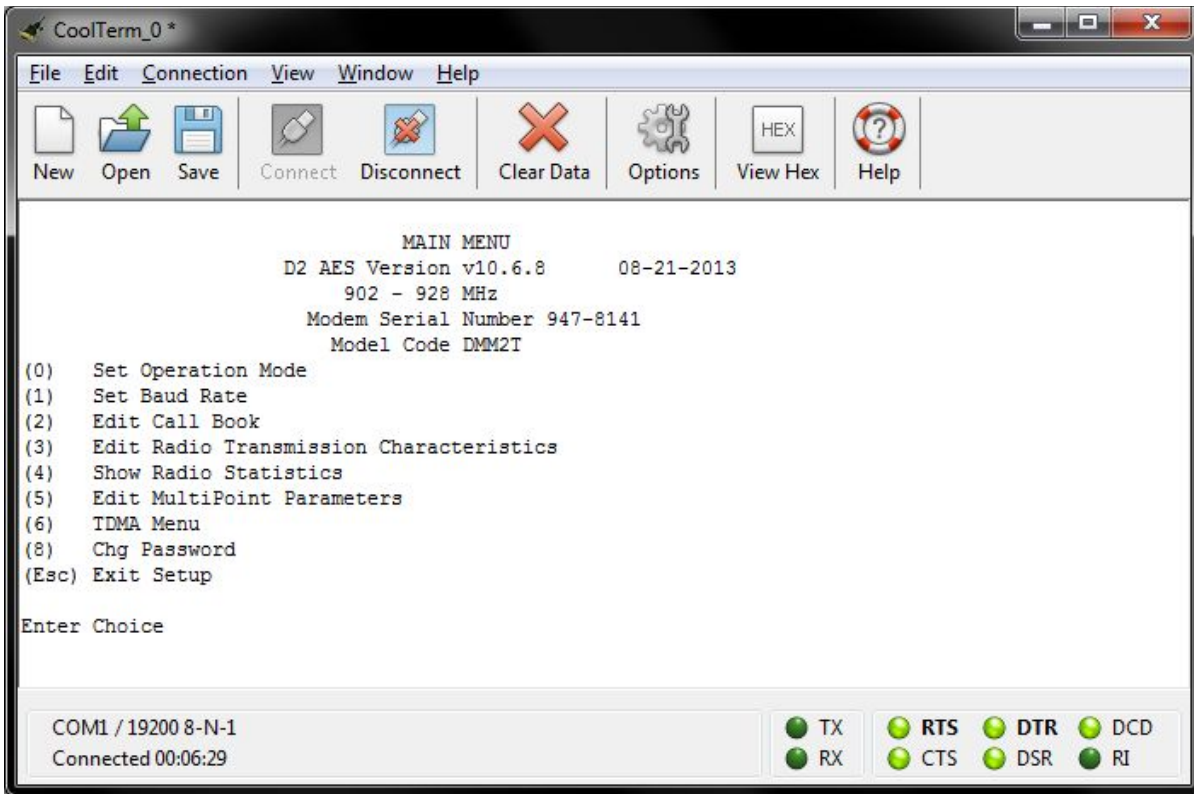
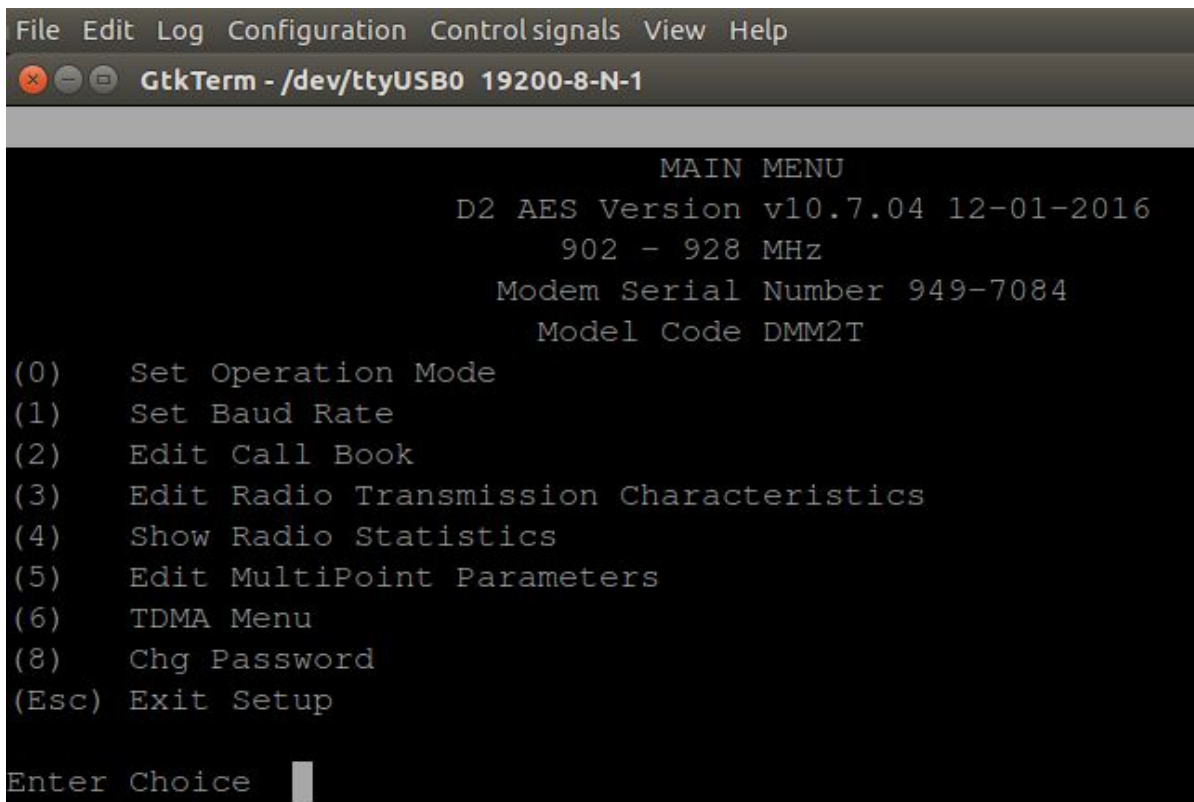Fig 2. 900 MHz radio programming screen on CoolTerm

Fig 3. 900 MHz radio programming screen on GtkTerm

Programming Radio for RTK Base Station

Follow this steps to program radio as a transmitter of RTK base station corrections. This radio will work as a **Point-to-MultiPoint master**. It will be able to transmit corrections to multiple rovers simultaneously.

- Enter radio programming mode as described in the above **Entering Radio Programming Mode** section.
- Press 0 (**Set Operation Mode**)
    - Press 2 (**Point to MultiPoint Master**)
    - Press Esc to return to the **Main Menu**
- Press 1 (**Set Baud Rate**)
    - Press 1 (**115,200**)
    - Press Esc to return to the **Main Menu**
- Press 5 (**Edit MultiPoint Parameters**)
    - Press 0 (**Number Repeaters**)
        - Press 0
    - Press 1 (**Master Packet Repeat**)
        - Press 0
    - Press 2 (**Max Slave Retry**)
        - Press 0
    - Press 6 (**Network ID**)
        - Enter desired network ID value in range from 0 to 4095 except 255 and press Enter (**value 255 will enable Call Book instead of Network ID**). It is recommended to use the last three or four (when lower than 4095) digits of the base station Radio Number as the network ID.
    - Press Esc to return to the **Main Menu**
- Optionally, to change radio power output, press 3 (**Edit Radio Transmission Characteristics**)
    - Press 5 (**RF Xmit Power**)
        - On 900 MHz radio enter desired power level in range 0 to 10 (0 = 5 mW, 3 = 80 mW, 5 = 230 mW, 7 = 480 mW, 10 = 1W)
        - On 2.4 GHz radio enter desired power level in dBm (20 dBm = 0.1W, 27 dBm = 0.5 W)
    - Press Esc to return to the **Main Menu**
- Press Esc to **Exit Setup**
- Power off the radio. Settings are saved in the radio's non-volatile memory. The radio is ready for RTK operation.

Programming Radio for RTK Rover

Follow this steps to program radio as a receiver of RTK corrections. This radio will work as a **Point-to-MultiPoint slave**. It will not be able to transmit any data. Only receive it. Use the same radio settings for all rover radios in the system with multiple rovers.

- Enter radio programming mode as described in the above **Entering Radio Programming Mode** section.
- Press 0 (**Set Operation Mode**)
  - Press 3 (**Point to MultiPoint Slave**)
  - Press Esc to return to the **Main Menu**
- Press 1 (**Set Baud Rate**)
  - Press 1 (**115,200**)
  - Press Esc to return to the **Main Menu**
- Press 5 (**Edit MultiPoint Parameters**)
  - Press 0 (**Number Repeaters**)
    - Press 0
  - Press 1 (**Master Packet Repeat**)
    - Press 0
  - Press 2 (**Max Slave Retry**)
    - Press 0 (**Note:** if transmission from rover to base is required, set **Max Slave Retry** to 1)
  - Press 3 (**Retry Odds**)
    - Press 0
  - Press 6 (**Network ID**)
    - Enter the same network ID value as set in RTK base station radio above and press <Enter>
  - Press Esc to return to the **Main Menu**
- Press Esc to **Exit Setup**
- Power off the radio. Settings are saved in the radio's non-volatile memory. The radio is ready for RTK operation.

LED Indicators

If the radio has been configured correctly, the LEDs should illuminate as shown in the table below.

	CD	TX	CTS
Base	🟥	🟥	off
Rover	🟩	off	🟥

Additional Information

For additional information about radio operation and programming read **User Manual and Reference Guide** available from FreeWave site (FreeWave site will require to register for downloading the document):

- MM2 (900 MHz)
- GXM (2.4 GHz)

Troubleshooting

For radios to communicate with other radios in the same network, the following five settings must match on all radios: Network ID, Frequency Key, RF Data Rate, Minimum Packet Size, Maximum Packet Size. If any of those settings don't match, the radios won't link.

In case of radio linking issues it is recommended to first set the radios to default settings and then adjust only the settings in the above instructions. Use FreeWave Tool Suite program to set radio to the default settings. Instructions are on page 10 of the Tool Suite manual.

To increase isolation between multiple networks in the same vicinity use different Frequency Key and Min/Max Packet Sizes on each network.