MMDVM Firmware Types

For the RB STM32_DVM Boards

There have recently been some changes in the MMDVM project that have been causing some confusion for users of Pi-Star and our products. The purpose of this document is to help the end user understand these changes and give guidance on firmware compatibility with Pi-Star and the WPSD project.

The first thing to keep in mind is there are TWO parts to the MMDVM project: the modem firmware (which runs on the STM32 microcontroller on the DVM board) and MMDVMHost which runs on the “platform”. (Raspberry Pi, NanoPi Neo, or PC) These two pieces of code must talk to each other and speak the same protocol and at the same baud rate. Thus, they MUST MATCH.

Protocols:

When the MMDVM project was first conceived, the protocol between the two boards was merely passing packets of data (VOCODED voice packets and telemetry) and could easily pass all of this data at a rate of 115,200 baud. This protocol went through a few iterations as additional digital modes were added. MMDVMHost needed to be upgraded when the firmware on the modem board was upgraded to add the new mode.

Around the time the M17 mode was added, there was an interest in adding a simple FM repeater controller to the available modes in the MMDVM project. At first FM repeater functionality was accomplished internal to the modem. No FM voice was passed to the platform for processing. The above functionality is all classified as “MMDVM protocol Version 1”. (operating at 115,200 baud)

As things progressed further, there was desire to offer AllStar analog linking along with the simple FM repeat functionality. To accomplish this, the platform (MMDVMHost) needed to get an audio stream from the modem board. In order to pass this (considerably) lager amount of data the communications baud rate was increased to 460,800 baud. This is described as “MMDVM protocol Version 2”.

Unfortunately, the “upgraded” version 2 MMDVMHost code running on the platform is NOT automatically backwards compatible to the lower V1 baud rate. However, both PiStar and WPSD have a modem baud rate selection box.

To add yet another wrinkle in the baud rate confusion, the NanoPi Neo Platform (on which the MTR2k and NanoPi DVM boards are based) cannot run 460,800 baud due to a clock issue. Thus, the NanoPi based devices run at 500,000 baud for the higher baud rate.

RB STM32 Modems:

The Repeater-builder STM32_DVM modem boards started off using a STM32F105 microcontroller. This was the original Green (V1) board. It offered DMR, D-Star Yeasu System Fusion (YSF) and P25 protocols.

The Red (V2) board used the same F105 microcontroller, firmware, and protocols, the only addition was the CLIP indicator for RX audio adjustment. As more modes were being added to the MMDVM project, the F105 microcontroller was found to be inadequate.

The Blue (V3) modem design changed to a more powerful STM32F446 microcontroller. This allowed the addition of the NXDN protocol. Also, I/O lines were added between the Raspberry Pi's 40 pin connector and pins on the F446 to allow the host to put the STM in "bootloader mode" for remote firmware upgrades. The early V3 boards did not like to enter bootloader mode. It was found that grounding pins 28 and 29 fixed this issue. The V3a PCB has pin 29 grounded.

The Black (V4) board used the same F446 microcontroller and circuitry, but added an LED indicator for FM mode.

The STM32 for the MTR2000 is based upon the Black V4 modem.

The White V5 modem (as yet unreleased) uses an even more powerful STM32F722 microcontroller.

The STM32_NanoPi "appliance" uses the same F722 microcontroller.

Firmware:

The above modem boards and their associated microcontrollers necessitates the following firmware images:

V1, V2 (Green & Red) – F105 – only low baud rate (115,200)
V3 (Blue) – F446 without FM LED – Three baud rates (115,200 - 460,800 – 500,000)
V4 (Black) – F446 with FM LED – Three baud rates (115,200 - 460,800 – 500,000)

MTR2k – F446 with FM LED – Two baud rates (115,200 & 500,000)

V5 (White) – F722 – Three baud rates (115,200 - 460,800 – 500,000)

NanoPi_DVM – F722 – Two baud rates (115,200 & 500,000)