

Rad V-Mux-110 with MiMOMax NDL

Description

This application note describes how to use a pair of Rad V-Mux-110 units to provide 4 wire audio and E&M signalling across a MiMOMax NDL radio link.

Connections Between the MiMOMax Radio and the V-Mux

To use a Rad V-Mux on a MiMOMax NDL link connect it as shown in Figure 1 below, the Ethernet connection on the V-Mux is to the Net Ethernet port as circled in Figure 2 and the Ethernet connection to the MiMOMax Radio is circled in Figure 3.

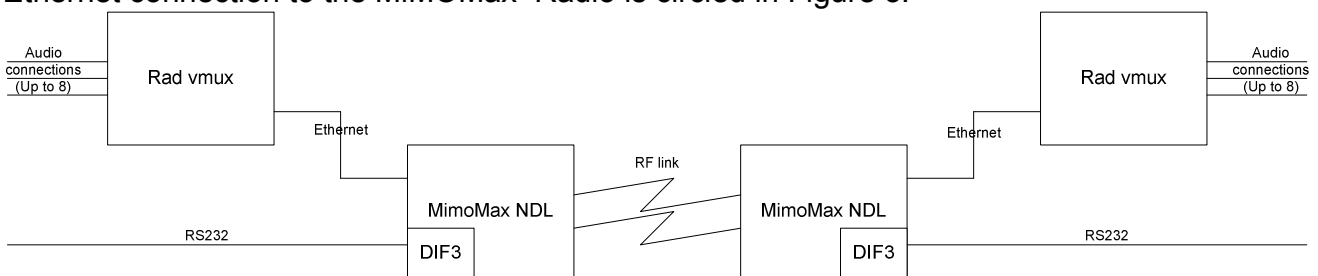


Figure 1: Connections between the Rad V-Mux and the MiMOMax NDL

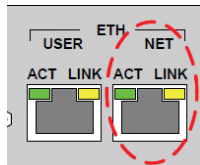


Figure 2: V-Mux Ethernet Connection

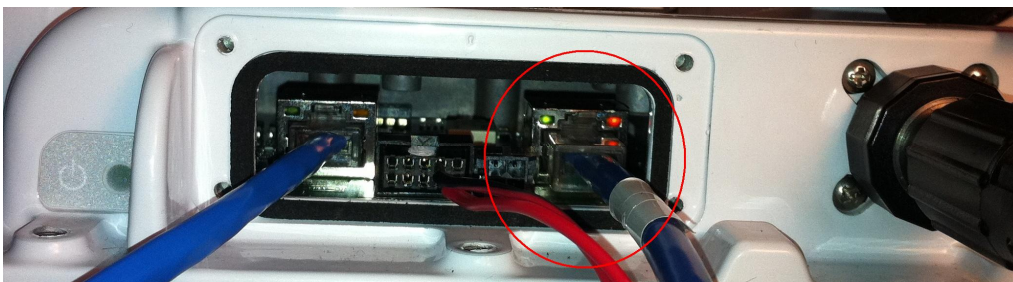


Figure 3: MiMOMax Radio Ethernet Connection

The V-Mux audio connections depend on the model of V-Mux being used; refer to the V-Mux manual for pin outs of these. If more Ethernet connections are needed an Ethernet Switch can be added between the V-Mux and the Radio or for a single extra Ethernet Port the V-Mux provides a built in switch and the user Ethernet port on the V-Mux can be used. If RS232 is required as well for example for MPT site controllers the MiMOMax Radio can provide this via the DIF3 Dual RS232 interface option.

V-Mux settings

The V-Mux needs to be set up with the following enabled.

- Jitter buffer on
- TOS set as express forward
- Fax and modem settings should be disabled

The jitter buffer is enabled in the advanced voice parameters menu see Figure 4 below, the jitter buffer needs to be enabled and the default size of 120 works well.

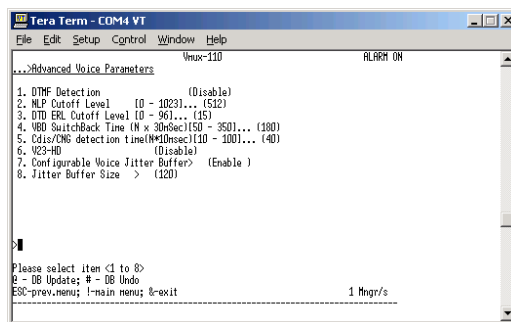


Figure 4: V-Mux advanced voice parameter menu

The TOS parameters for both signalling and media need to be set to 0xB8, this is done from the TOS Parameters menu which is shown in Figure 5 below.

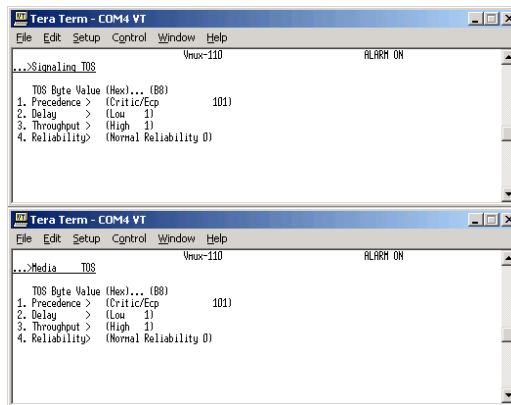


Figure 5: V-Mux ToS parameters menu

The Fax and modem settings are disabled in the Fax/modem menu which is shown in Figure 6 below.

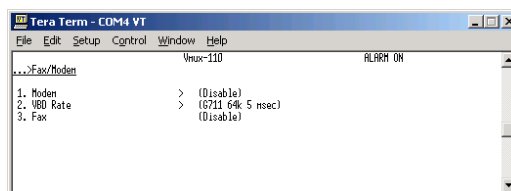


Figure 6: V-Mux voice parameters manu

CCMS Settings

The following settings need to be made in the radio.

- MDAP enabled, express forward, ROHC on express forward queue
- End to end serial enabled if RS232 is needed for MPT site controller

MDAP settings:

In order to ensure the audio gets higher priority than other IP traffic the MDAP settings need to be set correctly, Figure 7 and Figure 8 show the settings needed, the bandwidth allocation needs to be adjusted to match the system. The portion of the bandwidth used by the audio should be reserved for the EF class, to work out this portion use the bandwidth figures from page 5 of this document, the remaining bandwidth should be allocated to the BE class for normal Ethernet use.

QoS

MDAP configuration

Quality of Service

High Priority IP Queue (EF Only)

Bandwidth Allocation

EF (%)	<input type="text" value="90"/>
AF1 (%)	<input type="text" value="0"/>
AF2 (%)	<input type="text" value="0"/>
AF3 (%)	<input type="text" value="0"/>
AF4 (%)	<input type="text" value="0"/>
BE (%)	<input type="text" value="10"/>

Figure 7: MDAP DiffServ Quality of Service settings

High Priority IP Queue

Header compression

IP and Ethernet profile

UDP profile

RTP profile

Standard Priority IP Queue

Header compression

Figure 8: MDAP header compression settings

Serial Settings:

The end to end serial needs to be set up in the MiMOMax NDLs when used for MPT site controllers this is done in CCMS in the serial interfaces menu, the required settings are shown in Figure 9 below, replace the baud rate with the required baud rate.

Configure Serial Interfaces

Detected DIF version 3 (Asynchronous Serial)
Software Feature Enables allow End-to-end RS232 mode
Software Feature Enables allow RS232-to-IP (Terminal Server) mode

Async-serial mode

Serial port 1 settings

Serial port 1
BAUD rate
Data bits
Flow control
Loopback

Serial port 2 settings

Serial port 2
BAUD rate
Data bits
Loopback

Figure 9: Serial settings

Modulation settings:

The radio link needs to be set up to a modulation format that provides sufficient bandwidth for the required audio channels and leaves sufficient bandwidth for any other IP traffic using the link. The Modulation is set on the System Configuration menu in CCMS, and can be set to QPSK, 16QAM, 64QAM or 256QAM. For bandwidth figures for each mode and the required bandwidth for different numbers of audio channels see page 5 of this document.

Bandwidth Requirements

This section covers the available bandwidth once the radio muxing overheads are removed and the required bandwidth for the V-Mux when using G729a voice coding and a 30ms packetisation interval.

Modulation	Available Bandwidth (kbps)		This is measured with RS232 enabled but no traffic and MDAP enabled and no Voice traffic
	12.5kHz	25kHz	
QPSK	30	60	
16QAM	60	120	
64QAM	90	180	
256QAM	120	240	

Formula for bandwidth needed for Rad V-Mux, is 16kbps for 9600 RS232, 4k for headers and 8.5k per audio channel, this is when the DIF3 is used for RS232 and the Mux is using G729a voice coding and a 30ms packetisation interval.

Please Note that if other voice coders or packetisation intervals are used these numbers may not be valid.

Voice channels	BW Used (kbps)	These measurements are all completed with a RS232 channel at 9600 used 100% of the time, and the specified number of voice channel with a test tone used, The G729a voice coder is used at 8kbps and 30ms packetisation interval is used.
RS232 only	16	
1	28.5	
2	37	
3	45.5	
4	54	
5	62.5	
6	71	
7	79.5	
8	88	

Example:

A 25kHz QAM 16 NDL radio link has 120kbps available if 8 voice channels are used and a RS232 port at 9600 baud this will use 88kbps leaving just over 30kbps for other IP traffic.

Note:

The V-Mux has a 300Hz to 3kHz frequency response and does not pass CCTSS tones, the MiMOMax 4WA NiB supports CCTSS applications.