Russound VM1
Video Matrix

RNET® Protocol & Specifications
RS-232/USB Communication

Document V1.00.00

Video Matrix Quick Start

This document is meant to give you, the integrator, the knowledge of our protocol to be able to control our Video Matrix.

Step 1: Connection

Connect your control system to the VM1 using a USB type A to type B or a DB9 to DB9 STRAIGHT THROUGH Serial cable

NOTE
If connecting to the VM1 using USB, the VM1 USB drivers must be installed, these drivers can be found on the Document Center at www.russound.com in the Video Distribution section.

Serial Cable Pin Out

1 – NC	6 – NC
2 – Transmit	7 – NC
3 – Receive	8 – NC
4 – NC	9 – NC
5 – Ground	

Step 2: COM settings

Use the following COM settings

19200 baud rate
8 Data bits
1 Start bit
1 Stop bit
No flow control
No parity

Step 3: Test string

Using a TV/Monitor with component video input connected to the Zone 1 video receiver (VMR1), and a video input connected to the Source 1 and 2 input on the VM1,

Turn on the VM1 and send the following Source 2 selection command for Zone 1 of the video matrix

F0 00 **00** 77 00 00 70 00 04 010 4 00 **00** 02 04 00 00 00 01 00 01 00 **01 0C** F7

At power on the VM1 Zone 1 should display Source 1 video and then switch to Source 2 input when the string is sent.

Russound

1 Introduction

This document describes how to control the Russound VM1. Remote access is provided through the USB and RS-232 serial ports located on the rear of the VM1 using the following **RNET**® Communications Protocol. It is assumed that the reader is familiar with the features and operation of the VM1. All commands use Hexadecimal or HEX values. In descriptive text these are indicated by preceding the value with a **0x**. Zero-based values are also used in certain areas and are noted as such. This means that a value of **0x00 = 1, 0x01 = 2, and 0x02 = 3** etc… Throughout this document all bytes within message packets not in bold must be referenced exactly as they appear.

2 Overview

The VM1 use a comprehensive Communications Protocol called **RNET** which has been extended to the RS-232 and USB ports. Through these ports, virtually all aspects of the device operation can be performed. This document provides detailed descriptions of messages required to perform basic device operation.

3 RNET Message Packet Format

Header				Body	Trailer	
0xF0	Target Device ID	Source Device ID	Type	Body	Checksum	0xF7

Every **RNET** message has a consistent format. There are three major components: Message Header, Message Body and Message Trailer. Each of these is explained here in some detail.

MSB stands for **M**ost **S**ignificant **B**it which is the left-most bit of an 8-bit byte (MSB = Bit 7 = **0**0010001). There are two special characters used in this protocol. These special characters have the MSB set to high (1). All Bytes within the message of an **RNET** packet have the MSB set to low (0) except for these two special characters. The special characters with the MSB set to high (1) are the "**Start of Message Character**", and the "**End of Message Character**", which are explained within this document.

3.1 Message Header

Each message consists of a "Message Header" which is compiled of a **Start of Message Character**, **Target Device ID**, **Source Device ID**, and the **Message Type**.

3.1.1 Start of Message Character

As previously stated, there are two special characters. One of these is the Start of Message Character **0xF0** which is a special HEX value that indicates the beginning of a new message.

3.1.2 Target Device ID

The Target Device ID defines to which device the message is being sent. Every device on an **RNET™** system has a unique "Device ID" that allows messages to be sent to it. Each Device ID consists of a Controller ID, a Zone (Port) ID, and a Keypad ID. In the case of a Controller with zone Keypads, the purpose of each Device ID field is apparent. In the case of the Video Matrix, these fields will have slightly different meanings. These fields are explained in more detail below.

3.1.2.1 Target Controller ID

When communicating with a Video Matrix and all its variants, the Controller ID is always set to a value of **0x00**

3.1.2.2 Target Zone (Port) ID

Zone ID defines the Zone for a particular device. For the Video Matrix, this defines which zone on the Video Matrix that is being controlled. The Video Matrix can be configured to be a four or eight zone device (4 – Zone = 0x00 – 0x03 and 8 – Zone = 0x00 – 0x07)

3.1.2.3 Target Keypad ID

When communicating with a Video Matrix and all its variants, the Keypad ID is always set to **0x77**. The value **0x77** in the Keypad ID field indicates that the Target Device is a Russound Video Matrix.

3.1.2.4 Target Device ID Example

Example 1 shows a complete Target Device ID for a Video Matrix Zone 1 in an **RNET** system.

Example 1:

Value (HEX)	Device ID Field	Description
00	Controller ID	
00	Zone (Port) ID	Zone 1 = 0x00 (Zero Based)
77	Keypad ID	Video Matrix

3.1.3 Source Device ID

The "Source" Device ID is the identification of the Device that is sending the message. For external devices controlling the system, like an automation and control system, these can be any value that is a unique value among devices attached to the system. The recommend Device ID for external control systems is **Controller ID: 0x00, Zone ID: 0x00,** and **Keypad ID: 0x70**.

3.1.3.1 Source Controller ID

For 3rd party devices, this should be set to a value of **'0x00'.**

3.1.3.2 Source Zone (Port) ID

For 3rd party devices, this should be set to a value of **'0x00'.**

3.1.3.3 Source Keypad ID

The recommend Keypad ID for external control systems is **0x70**, which is a Keypad ID other than those used in the system.

3.1.4 Message Type

This value defines the type of message that is being sent. The only messages sent to the Video Matrix are "Set Data" messages and have a value of 0x00.

3.1.4.1 Paths

The Data within each RNET device is organized in a hierarchical tree similar to a computer's disk drive. When sending Data or Events from one system to another, a Path is specified to define exactly which object should be modified. Target and Source Paths are usually defined, but for the sake of remotely controlling the system, only the Target Path is of interest.

Paths in RNET messages are defined by first specifying how deep the path is, followed by the numeric values of each directory. For example, a Path that was three levels deep might be represented as "**3.1.2.8**". The "**3**" at the beginning defines how deep the Path is. The numbers that follow are the subdirectories. Think of the numbers as folder names (folder "**8**" is inside folder "**2**" which is inside folder "**1**"). Bear in mind that the folders are unique for each level, so folder "1" can be in folder "1" of the next level up (just like folders on a computer).

3.2 Message Body

The message body contains specific data which varies in value and byte count depending on the particular **Message Type** being sent. Refer to the particular messages.

3.2.1 Data Messages

A **Set Data** message can be sent directly to the parameter to set a parameter's value.

3.3 Message Trailer

The Message Trailer consists of the **Checksum** and **End of Message Character**. The **Checksum** value changes and needs to be re-calculated whenever any one of the preceding characters in the message is changed. The **Checksum** is always followed by the **End of Message Character**.

3.3.1 Checksum

All messages include a **Checksum** that helps protect the integrity of the message. The **Checksum** is a single byte that can be calculated using the following formula (see example below):

Checksum Calculation Example:

F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	03	06	F7

Step #1 - Add the HEX value of every byte in the message that precedes the Checksum: *Example*:

F0+00+02+77+00+00+70+00+04+01+04+00+02+02+04+00+00+00+01+00+01+00+03 = 0x01EF

Step #2 - Count the number of bytes which precede the Checksum and convert that value from DEC to HEX (byte count). Add the byte count in HEX to the previously calculated sum of bytes:

Example – **0x01EF + 0x17 (23 DEC = 0x17 HEX) = 0x0206**

Step #3 - This value is then **AND**-ed with the HEX value 0x007F (7F is the highest BIN value for 7 bits = 1111111). Only the low 7 bits are used so overflow is discarded:

Example - **0x0206 AND 0x007F = 0x06 = Checksum**

3.3.2 End of Message Character

The **End of Message Character** (**0xF7**) is the special HEX value that indicates the end of the message.

4 DIRECT SOURCE SELECTION

The way to select a Source per Zone is by using discrete Source Select command. The Data Byte 23 determines the Source that is being selected. Zero-based values are used for the Source Numbers (i.e. **0=1, 1=2, and 2=3** etc…)

4.1 Set Source

Byte#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Value	F0	00	**zz**	77	00	00	70	00	04	01	04	00	**zz**	02	04	00	00	00	01	00	01	00	##	**xx**	F7

zz = zone number -1
Byte 23 = selected source number-1
xx = checksum

5 RUSSOUND VM1 RS-232 HEX CODE LISTING

Zone 1

Source																									
1	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	00	7F	F7
2	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	01	00	F7
3	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	02	01	F7
4	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	03	02	F7
5	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	04	03	F7
6	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	05	04	F7
7	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	06	05	F7
8	F0	00	00	77	00	00	70	00	04	01	04	00	00	02	04	00	00	00	01	00	01	00	07	06	F7

Russound

Zone 2

Source																								
1	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	00	01	F7
2	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	01	02	F7
3	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	02	03	F7
4	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	03	04	F7
5	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	04	05	F7
6	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	05	06	F7
7	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	06	07	F7
8	F0	00	01	77	00	00	70	00	04	01	04	00	01	02	04	00	00	00	01	00	01	00	07	08	F7

Zone 3

Source																								
1	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	00	03	F7
2	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	01	04	F7
3	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	02	05	F7
4	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	03	06	F7
5	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	04	07	F7
6	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	05	08	F7
7	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	06	09	F7
8	F0	00	02	77	00	00	70	00	04	01	04	00	02	02	04	00	00	00	01	00	01	00	07	0A	F7

Zone 4

Source																								
1	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	00	05	F7
2	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	01	06	F7
3	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	02	07	F7
4	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	03	08	F7
5	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	04	09	F7
6	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	05	0A	F7
7	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	06	0B	F7
8	F0	00	03	77	00	00	70	00	04	01	04	00	03	02	04	00	00	00	01	00	01	00	07	0C	F7

Russound

Zone 5

Source																								
1	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	00	07	F7
2	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	01	08	F7
3	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	02	09	F7
4	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	03	0A	F7
5	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	04	0B	F7
6	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	05	0C	F7
7	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	06	0D	F7
8	F0	00	04	77	00	00	70	00	04	01	04	00	04	02	04	00	00	00	01	00	01	00	07	0E	F7

Zone 6

Source																								
1	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	00	09	F7
2	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	01	0A	F7
3	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	02	0B	F7
4	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	03	0C	F7
5	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	04	0D	F7
6	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	05	0E	F7
7	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	06	0F	F7
8	F0	00	05	77	00	00	70	00	04	01	04	00	05	02	04	00	00	00	01	00	01	00	07	10	F7

Zone 7

Source																								
1	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	00	0B	F7
2	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	01	0C	F7
3	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	02	0D	F7
4	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	03	0E	F7
5	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	04	0F	F7
6	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	05	10	F7
7	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	06	11	F7
8	F0	00	06	77	00	00	70	00	04	01	04	00	06	02	04	00	00	00	01	00	01	00	07	12	F7

Russound

Zone 8

Source																								
1	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	00	0D	F7
2	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	01	0E	F7
3	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	02	0F	F7
4	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	03	10	F7
5	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	04	11	F7
6	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	05	12	F7
7	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	06	13	F7
8	F0	00	07	77	00	00	70	00	04	01	04	00	07	02	04	00	00	00	01	00	01	00	07	14	F7