

CAV6.6 RNet Protocol Doc V1.01.00

For information concerning 3rd party control requirements see [Public RNet Protocol Requirements](#)

Document Version 1.01.00

This document is intended for CAV 6.6 firmware Version 1.02.00 thru 1.02.02

1. Introduction
2. Overview
3. Message Components
4. Buttons
5. Zone On/Off
6. All Zones On/Off
7. Source Select
8. Volume Select
9. Other Zone Parameters
10. Multiple Controllers
11. Displaying Strings
12. Using Request Messages
13. Using the Handshake Message
14. COM Port Settings

1. Introduction

This document describes how to control the Russound CAV6.6 through its serial port using the RNet communications protocol. It's assumed that the reader is familiar with the features and operation of the CAV6.6 when connected to Russound UNO-S2 keypads.

2. Overview

The Russound CAV6.6 controller uses a comprehensive communications protocol to interface with the various devices in the system, that is extended to the RS232 ports on its front and rear panels. Through these ports, virtually all aspects of the system operation can be performed. This document provides detailed descriptions of messages required to perform basic system functions as well as some of the more advanced features.

3. Message Components

3.1. Start of Message

This is the special value **0xF0** that indicates the beginning of a new message.

3.2. Target Device ID

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 ID and a Keypad ID. The "Target" Device ID defines which device we want to send a message *to*. Normally, all messages would be directed at the controller so the Target ID would be **C: 0, Z: 0, K: 0x7F** (see below).

3.2.1. Controller ID

On powerup, the CAV6.6 assigns the it's Controller ID and a Zone ID to all keypads connected to it. The Controller ID is set in the CAV's SETUP menu using 1 based numbering but in the Device ID it is 0 based (1 = 0, 2 = 1, 3 = 2, etc..). All systems have a controller 0 (the Root Controller) with additional controllers added (and numbered) as needed. A value of 0x7F can be used to send messages to all devices in the system.

3.2.2. Zone ID

Zone ID defines the zone for a particular device. For keypads, this defines which zone port on the CAV's rear panel that the keypad is connected to. The following special Zone ID values have been defined:

Value	Description
7F	Reserved
7E	Controller link
7D	Peripheral Device (Tuner, etc..)
7C	Trace

Aside from these values and 0-6 for the actual ports on a CAV, any value can be used for the Zone ID field.

3.2.3. Keypad ID

Keypad ID identifies particular keypads sharing a single zone. For UNO keypads, these are numbered 0-8 but the following values have specific meaning in the system:

Value	Description
7F	The controller itself
7E	Reserved
7D	Targets all keypads on a particular zone.
7C	A special ID used by keypads when they are requesting an id (Keypad ID) from the controller

All other keypad IDs have not been formally assigned so they can be used as needed.

3.3. Source Device ID

The source Device ID is the id of the device that is sending the message. For external devices controlling the system, these can be any value that is not in use by a real device in the system. The recommend Device ID external control systems is **C: 0, Z: 0, K: 0x70**.

3.4. Message Type

This defines the type of message that is being sent. The most important ones are as follows:

Value	Message Type	Description
0	Set Data	Sets a parameter's value.
1	Request Data	Requests a parameter's value
2	Handshake	Acknowledges a data send
5	Event	Triggers a system response that may set parameter value, update displays, etc.

In some cases, setting parameter values can be done in two ways, a Set Data message can be sent directly to the parameter, or an Event message can be sent to trigger the CAV6.6 to set the value. Event messages are a little easier to use, and may trigger other desired results (such as updating keypad displays, updating related parameters, etc.) where a Set Data message may not. because of this, this document describes using event messages to set data where desirable.

3.5. Paths

The data within each RNet device is organized in a heirarchical 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. Specific "directories" are defined for each zone in the system which contain the parameters for that zone. In other words, the difference between changing the source on zone 1 vs. zone 2 is a change in the path only.

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 3 levels deep might be represented as follows: 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).

3.6. Message Body

The message body varies depending on the particular type of message being sent. Refer to the particular messages for details.

3.7. Checksum

All messages include a checksum that helps protect the integrity of the message. The checksum is a

single byte that is calculated by adding the value of every byte in the message the preceeds it plus the number of bytes (byte count). Overflow is thrown away (only the low **7 bits** is used). The checksum itself and the end of message character are not included.

For example consider the following example:

Data (hex)	Notes
F0	Start of packet character
00	
67	
7C	
F1	Special "invert" char
0F	char to invert. actual value 0xF0
59	Checksum
F7	

$$0xF0 + 0x00 + 0x67 + 0x7C + 0xF1 + 0x0F = 0x2D3$$

$$0x2D3 + 6 \text{ (bytes)} = 0x2D9$$

We only use the first 7 bits of the low byte so our checksum is 0x59 (0x02D9 & 0x007F).

3.8. End of Message

The end of the message is the special value **0xF7** that identifies the end of the message.

3.9. Special Characters

The MSB of all message bytes for RNet are low except for several special characters.

Char	Description
F0	Start of message
F7	End of message
F1	Invert the bits of the byte that follows

If the data going into an RNet message includes any bytes values that have the MSB set true (> 127), the special "invert" character (0xF1) is inserted and all of the bits in the byte are inverted. When an RNet system detects an 0xF1, the 0xF1 is thrown away and the following byte is inverted.

4. Buttons

This section describes how to send various events associated with the buttons found on the IR remote and/or the UNO keypad. The method for transmitting these button events falls into two catagories: UNO Keypad Events and Non-UNO Keypad Events. The UNO keypad are the events the that UNO keypad is capable of sending. All others are only availble via the Russound UNO IR

Remote. Note that most of the UNO keypad buttons are duplicated on the IR remote. Note - all values are in hex.

4.1. UNO Keypad Events

This example shows the event resulting from a VOLUME UP button press in zone 1:

F0 00 00 7F 00 **00** 70 05 02 02 00 00 **7F** 00 00 00 00 00 01 **7B** F7

The values of each byte break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	Defines the zone affected.
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
02	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Source Path, Num Levels	No source path is used
7F	Event ID Lo Byte	VOLUME UP
00	Event ID Hi Byte	
00	Event Timestamp Lo Byte	unused
00	Event Timestamp Hi Byte	unused
00	Event Data Lo Byte	unused
00	Event Data Hi Byte	unused
01	Event Priority	Low priority (does not generate a handshake)
7B	Checksum	This must be recalculated for different zones
F7	End of message	

The following events can be sent with this message format:

--	--

Value	Description
64	Setup button
67	Previous/Rewind
68	Next/Fast Forward
69	Plus
6A	Minus
6B	Source step (steps through sources)
6C	Power On/Off
6D	Stop
6E	Pause
6F	Favorite 1
70	Favorite 2
73	Play
7f	Volume Up
80	Volume Down (Because this is > 7F, the special F1 character must be used)

Examples

Description	Data
Zone 2, Play	F0 00 00 7F 00 01 70 05 02 02 00 00 73 00 00 00 00 00 01 70 F7
Zone 3, Stop	F0 00 00 7F 00 02 70 05 02 02 00 00 6D 00 00 00 00 00 01 6B F7
Zone 4, Favorite 1	F0 00 00 7F 00 03 70 05 02 02 00 00 6F 00 00 00 00 00 01 7E F7

4.2. Source Control Events

Events unique to the IR remote are all sent using the special REMOTE_CONTROL_KEY event type with the actual keycode passed in as the data for the event. This example shows the event resulting from a MENU button press in zone 1:

```
F0 00 00 7F 00 00 70 05 02 02 00 00 F1 40 00 00 00 20 00 01 4E F7
```

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	
7F	Target Keypad Id	The controller itself

00	Source Controller Id	
00	Source Zone Id	Defines the zone affected.
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
02	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Source Path, Num Levels	No source path is used
F1	Invert	Invert the next byte
40	Event ID Lo Byte	0xBF = REMOTE_CONTROL_KEY_RELEASE
00	Event ID Hi Byte	
00	Event Timestamp Lo Byte	unused
00	Event Timestamp Hi Byte	unused
20	Event Data Lo Byte	strong>MENU Keycode
00	Event Data Hi Byte	unused
01	Event Priority	Low priority (does not generate a handshake)
4E	Checksum	This must be recalculated for different zones
F7	End of message	

4.2.1. Source Control Keycodes

strong>Value	strong>Description
01	"1" Button
02	"2" Button
03	"3" Button
04	"4" Button
05	"5" Button
06	"6" Button
07	"7" Button
08	"8" Button
09	"9" Button
0A	"0" Button
0B	Volume UP

0C	Volume Down
0D	Mute (for zone, not source)
0E	Channel Up
0F	Channel Down
10	Power
11	Enter
12	Previous Channel
13	TV/Video
14	Tv/VCR
15	A/B
16	TV/DVD
17	TV/LD
18	Input
19	TV/DSS
1A	Play
1B	Stop
1C	Search Forward
1D	Search Rewind
1E	Pause
1F	Record
20	Menu
21	Menu Up
22	Menu Down
23	Menu Left
24	Menu Right
25	Select
26	Exit
27	Display
28	Guide
29	Page Up
2A	Page Down
2B	Disk
2C	Plus 10
2D	Open/Close
2E	Random
2F	Track Forward
30	Track Reverse
31	Surround On/Off
32	Surround Mode

33	Surround Up
34	Surround Down
35	PIP
36	PIP Move
37	PIP Swap
38	Program
39	Sleep
3A	On
3B	Off
3C	11
3D	12
3E	13
3F	14
40	15
41	16
42	Bright
43	Dim
44	Close
45	Open
46	Stop 2
47	AM/FM
48	Cue
49	Disk Up
4A	Disk Down
4B	Info

Examples

strong>Description	strong>Data
Zone 2, Mute	F0 00 00 7F 00 01 70 05 02 02 00 00 F1 40 00 00 00 0D 00 01 3C F7
Zone 3, Menu	F0 00 00 7F 00 02 70 05 02 02 00 00 F1 40 00 00 00 20 00 01 50 F7
Zone 4, Record	F0 00 00 7F 00 03 70 05 02 02 00 00 F1 40 00 00 00 1F 00 01 50 F7

5. Zone On/Off

The simplest way to explicitly turn a zone On or Off is by using the ZONE_ON_OFF event. The event data fields determine the zone and On/Off state. This example shows using the ZONE_ON_OFF event message to execute an ON command for zone 1 of controller 1. Refer to the

Buttons section for information on toggling zone On/Off.%%

F0 00 00 7F 00 00 70 05 02 02 00 00 F1 23 00 01 00 00 01 12 F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	unused
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
02	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Source Path, Num Levels	No source path is used
F1	Invert	Invert the next byte
23	Event ID Lo Byte	0xDC = ZONE_ON_OFF event id
00	Event ID Hi Byte	
01	Event Timestamp Lo Byte	(overridden)0 = OFF, 1 = ON
00	Event Timestamp Hi Byte	unused
00	Event Data Lo Byte	Zone affected by this change
00	Event Data Hi Byte	unused
01	Event Priority	Low priority (does not generate a handshake)
12	Checksum	This must be recalculated for zone or state change
F7	End of message	

6. All Zones On/Off

The system can be sent a single message to set all zones ON or OFF. The CAV 6.6 has the option of enabling/disabling the ALL ON/OFF feature for specific zones. See the CAV 6.6 users guide for instructions on enabling/disabling ALL ON/OFF commands.

This example shows using the ALL_ZONES_ON_OFF event message to execute an ALL ON command.:

F0 7F 00 7F 00 00 70 05 02 02 00 00 F1 22 00 00 01 00 00 01 10 F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
7F	Target Controller Id	All devices
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	unused
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
02	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Source Path, Num Levels	No source path is used
F1	Invert	Invert the next byte
22	Event ID Lo Byte	0xDD = ALL_ZONES_ON_OFF event id
00	Event ID Hi Byte	
00	Event Timestamp Lo Byte	unused
01	Event Timestamp Hi Byte	(overridden)0 = ALL OFF, 1 = ALL ON
00	Event Data Lo Byte	unused
00	Event Data Hi Byte	unused
01	Event Priority	Low priority (does not generate a handshake)
10	Checksum	This must be recalculated for ALL OFF
F7	End of message	

7. Source Select

This message allows the source for a particular zone to selected directly. For stepping through the sources, refer to the Buttons section. Note - all values are in hex.

F0 00 00 7F 00 00 70 05 02 00 00 00 F1 3E 00 00 00 00 00 01 2A F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	Which zone we are changing (0 based)
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
00	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Source Path, Num Levels	No source path is used
F1	Invert	Invert the next byte
3E	Event ID Lo Byte	0xC1 = SOURCE_SELECT
00	Event ID Hi Byte	
00	Event Timestamp Lo Byte	
00	Event Timestamp Hi Byte	
00	Event Data Lo Byte	Selected Source: 1 (0 based)
00	Event Data Hi Byte	
01	Event Priority	Low priority (does not generate a handshake)
2A	Checksum	This must be recalculated for different sources and zones
F7	End of message	

The actual zone which affected by this message is defined by the Source Zone Id field.

Source Path

The source path defines the location in initiating system where the data originates, allowing standard RNet handler functions to be used. When these messages are created outside the RNet system, the source path has no meaning and can be ignored (set NumLevels ? to 0).

Examples

strong>Description	strong>Data
Zone 1, Source 2	F0 00 00 7F 00 00 70 05 02 00 00 00 F1 3E 00 00 00 01 00 01 2B F7
Zone 1, Source 3	F0 00 00 7F 00 00 70 05 02 00 00 00 F1 3E 00 00 00 02 00 01 2C F7
Zone 4, Source 2	F0 00 00 7F 00 03 70 05 02 00 00 00 F1 3E 00 00 00 01 00 01 2E F7

8. Volume Select

This message allows the volume for a particular zone to be set directly. Refer to the Buttons section for information on incrementing and decrementing volume.

This example shows how to set the volume in zone 1 of controller 1 to 18:

```
F0 00 00 7F 00 00 70 05 02 02 00 00 F1 21 00 12 00 00 00 01 21 F7
```

The values of each byte break out as follows:

strong>Value	strong>Field	strong>Description/Notes
F0	Start of message	
00	Target Controller Id	Cotroller 1
00	Target Zone Id	ignored
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
02	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Source Path, Num Levels	No source path is used
F1	Invert	Invert the next byte
21	Event ID Lo Byte	0xDE = SET_ZONE_VOLUME
00	Event ID Hi Byte	
12	Event Timestamp Lo Byte	Volume level (0 - 50, Displayed as 0 - 100)
00	Event Timestamp Hi Byte	

00	Event Data Lo Byte	Zone affected by this change
00	Event Data Hi Byte	
01	Event Priority	Low priority (does not generate a handshake)
21	Checksum	This must be recalculated for different sources and zones
F7	End of message	

9. Other Zone Parameters

Zone parameters are normally accessed by pressing and holding the Source button on the UNO keypad but they can be modified remotely using the following messages. Note that the keypad displays will not automatically update for these changes (except background color).

9.1. Setting Zone Parameters

These message form allows the value of a parameter to be set directly. The following message sets the Treble parameter for zone 1 to a value of -5 (a value of 10 is flat. See the table below for parameter values.):

F0 00 00 7F 00 00 70 00 05 02 00 00 00 01 00 00 00 01 00 01 00 05 04 F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	controller 1
00	Target Zone Id	ignored
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message
05	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Target Path, Level 3	Zone affected by this change
00	Target Path, Level 4	User menu
01	Target Path, Level 5	Treble parameter
00	Source Path, Num Levels	No source path is used

00	Packet Num Lo Byte	Use for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
01	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
05	Data Byte	The actual parameter value (see table below for legal ranges).
04	Checksum	This must be recalculated for different strings and devices.
F7	End of message	

9.2. Adjusting Zone Parameters

This section shows how to increment or decrement Zone parameters. The advantage to this over setting the values directly is that you don't need to worry about the range of the parameters. The following example shows the Bass parameter for zone 1 being increased.

```
F0 00 00 7F 00 00 70 05 05 02 00 00 00 00 00 69 00 00 00 00 00 01 6B F7
```

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	
00	Source Zone Id	
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
05	Message Type	An event message
05	Target Path, Num Levels	
02	Target Path, Level 1	Root menu
00	Target Path, Level 2	Run menu
00	Target Path, Level 3	Zone 1 (0 based)
00	Target Path, Level 4	User parameters
00	Target Path, Level 5	BASS parameter
00	Source Path, Num	No source path is used

	Levels	
69	Event ID Lo Byte	PLUS button event (to increment the parameter)
00	Event ID Hi Byte	
00	Event Timestamp Lo Byte	unused
00	Event Timestamp Hi Byte	unused
00	Event Data Lo Byte	unused
00	Event Data Hi Byte	unused
01	Event Priority	Low priority (does not generate a handshake)
67	Checksum	This must be recalculated for different sources and zones
F7	End of message	

To decrement a parameter, use 0x6A (MINUS) for the Event ID Lo Byte.

9.3. Zone Parameter Info

Path Value	Name	Range	Notes
00	Bass	0-20	0= -10, 10 = flat,20=+10
01	Treble	0-20	0= -10, 10 = flat,20=+10
02	Loudness	0-1	0=Off, 1=On
03	Balance	0-20	Left= -10, 10=Center,20=Right
04	Turn On Volume	0-50	0=off, 50=Full On, (displayed as 0-100)
05	Background Color	0-2	0=Off,1=Amber,2=Green
06	Do Not Disturb	0-1	0=Off, 1=On
07	Party Mode	0-3	0=Off,1=On,2=Master
08	Front A/V Enable	0-1	0=Off, 1=On

Examples

Description	Data
Increment Zone 2 Loudness	F0 00 00 7F 00 00 70 05 05 02 00 01 00 02 00 69 00 00 00 00 00 01 6E F7
Decrement Zone 2 Loudness	F0 00 00 7F 00 00 70 05 05 02 00 01 00 02 00 6A 00 00 00 00 00 01 6F F7
Decrement Zone 3 Balance	F0 00 00 7F 00 00 70 05 05 02 00 03 00 03 00 69 00 00 00 00 00 01 71 F7

10. Multiple Controllers

The Russound RNet system provides support for up to 6 connected controllers for a maximum of 36 separate zones. When a multi-controller system is configured, each controller is given a unique Controller ID. All of the controllers are linked together onto a common RNet buss so any messages sent to the RS232 port of controller 1 will be available to all controllers, and all keypads in the system.

All of the messages described in this document can be sent to any of the controllers in the system by simply changing the Target Controller ID to match the controller you'd like to send the message to.

The following examples send the a volume up command to the same zone but on different controllers:

strong>Description	strong>Data
Controller 1, Zone 2, Play	F0 00 00 7F 00 01 70 05 02 02 00 00 73 00 00 00 00 00 01 70 F7
Controller 2, Zone 2, Play	F0 01 00 7F 00 01 70 05 02 02 00 00 73 00 00 00 00 00 01 71 F7
Controller 6, Zone 2, Play	F0 05 00 7F 00 01 70 05 02 02 00 00 73 00 00 00 00 00 01 75 F7

Remember to recalculate the checksum or the message will be rejected by the controller.

11. Displaying Strings

Since the UNO keypad contains a text display, we've provided a message that will allow you to send text messages to all keypads simultaneously or individually. The following example displays the string "Hi There" on all keypads (or other devices with a text display) in the system:

F0 7F 00 00 00 00 70 00 02 01 01 00 00 00 01 00 10 00 01 2C 01 48 69 20 54 68 65 72 65 00 00 00 00 00 0D F7
--

The values of each by break out as follows:

strong>Value	strong>Field	strong>Description/Notes
F0	Start of message	
7F	Target Controller Id	All devices
00	Target Zone Id	ignored
00	Target Keypad Id	ignored
00	Source Controller Id	
00	Source Zone Id	
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message

02	Target Path, Num Levels	
01	Target Path, Level 1	Standard Interface
01	Target Path, Level 2	Display
00	Source Path, Num Levels	No source path is used
00	Packet Num Lo Byte	Use for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
10	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
01	Data Byte 1	Alignment (left)
2C	Data Byte 2	Low byte of "Flash" time in 10ms increments. 0 = constant (3 secs)
01	Data Byte 3	Hi byte of "Flash" time
48	Data Byte 4	ASCII text character "H"
69	Data Byte 5	ASCII text character "i"
20	Data Byte 6	ASCII text character " "
54	Data Byte 7	ASCII text character "T"
68	Data Byte 8	ASCII text character "h"
65	Data Byte 9	ASCII text character "e"
72	Data Byte 10	ASCII text character "r"
65	Data Byte 11	ASCII text character "e"
00	Data Byte 12	ASCII text character NULL
00	Data Byte 13	ASCII text character NULL
00	Data Byte 14	ASCII text character NULL
00	Data Byte 15	ASCII text character NULL
00	Data Byte 16	ASCII text character NULL
0D	Checksum	This must be recalculated for different strings and devices.
F7	End of message	

11.1. Flash Time

Messages can be displayed permanently or they can be flashed on the display for a brief time. The Flash Time field defines how long the string is displayed. The time is measured in 10ms increments with a value of 0 being constant display (will be overwritten by normal system activity).

11.2. Alignment

The alignment field defines how the message appears on the display. The following values are currently supported:

Value	Description
00	Centered
01	Left justified

11.3. Displaying On Specific Keypads

Display messages can also be sent to specific keypads in the system. This is accomplished by setting the Target Device ID for the particular keypad in question. For example, the following message is the same as above except that it will be sent to the 1st keypad on zone 3 of controller 1:

F0 00 00 00 00 00 70 00 02 01 01 00 00 00 01 00 10 00 00 00 00 48 69 20 54 68 65 72 65 00 00 00 00 00 60 F7
--

The values of each byte break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
02	Target Zone Id	Zone 1
00	Target Keypad Id	Keypad 1
00	Source Controller Id	
00	Source Zone Id	
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message
02	Target Path, Num Levels	
01	Target Path, Level 1	Standard Interface
01	Target Path, Level 2	Display
00	Source Path, Num Levels	No source path is used
00	Packet Num Lo Byte	Use for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
10	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
00	Data Byte 1	Alignment (centered)

00	Data Byte 2	Low byte of "Flash" time in 10ms increments. (constant)
00	Data Byte 3	Hi byte of "Flash" time
48	Data Byte 4	ASCII text character "H"
69	Data Byte 5	ASCII text character "i"
20	Data Byte 6	ASCII text character " "
54	Data Byte 7	ASCII text character "T"
68	Data Byte 8	ASCII text character "h"
65	Data Byte 9	ASCII text character "e"
72	Data Byte 10	ASCII text character "r"
65	Data Byte 11	ASCII text character "e"
00	Data Byte 12	ASCII text character NULL
00	Data Byte 13	ASCII text character NULL
00	Data Byte 14	ASCII text character NULL
00	Data Byte 15	ASCII text character NULL
00	Data Byte 16	ASCII text character NULL
62	Checksum	
F7	End of message	

12. Using Request Messages

The Request Data message is used to receive parameter data from the CAV 6.6. This may be used to receive zone power state volume level, etc. When a Request Data message is sent to the CAV6.6, a Set Data message is generated by the CAV6.6 back to the sender. Since the Set Data message is of high priority, a Handshake message must be sent back to the CAV6.6 to acknowledge the data send. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds. This is due to the CAV6.6 trying to re-send the data.

Data can be requested discretely for each zone parameter, or all of the zone information can be requested in a single message.

12.1 Request All Zone Info

This message is used to request all of the zone's parameter values at once. This can be very useful for updating panel displays, etc. This example shows how to request zone information for zone 1 of controller 1:

Request Message sent to CAV6.6:

F0 00 00 7F 00 00 70 01 04 02 00 00 07 00 00 7C F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
-------	-------	-------------------

F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	not used
7F	Target Keypad Id	The controller itself
00	Source Controller Id	not used
00	Source Zone Id	not used
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message
04	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Target Path, Level 3	Zone to get info from
07	Target Path, Level 4	Zone Info
00	Source Path, Num Levels	No source path is used
00	Request Message Type	Request Data
7C	Checksum	This must be recalculated.
F7	End of message	

Zone Info return message from CAV 6.6

This is an example of a return Set Data message sent by the CAV6.6 in response to the above Request message. Once the return message is received it is necessary to send a Handshake message. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds. This is due to the CAV6.6 trying to re-send the data.

F0 00 00 70 00 00 7F 00 00 04 02 00 00 07 00 00 01 00 0C 00 01 05 0B 0C 0A 01 0A 01 00 00 00 00 5D F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller ID used to request data
00	Target Zone Id	Zone ID used to request data
70	Target Keypad Id	Keypad ID used to request data
00	Source Controller Id	Controller 1
00	Source Zone Id	not used
7F	Source Keypad Id	The controller itself

00	Message Type	Data message
00	Target Path, Num Levels	No source path was used when request was sent
04	Source Path, Num Levels	
02	Source Path, Level 1	Root Menu
00	Source Path, Level 2	Run Mode
00	Source Path, Level 3	Zone that info was requested
07	Source Path, Level 4	Zone Info
00	Packet Num Lo Byte	Used only for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
0C	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
01	Data Byte	Current Zone On/Off (0 = Off, 1 = On)
05	Data Byte	Current Selected Source (Source 6)
0B	Data Byte	Current Volume level (11)
0C	Data Byte	Current Bass level (+2)
0A	Data Byte	Current Treble level (Flat)
01	Data Byte	Current Loudness On/Off (On)
0A	Data Byte	Current Balance level (Center)
01	Data Byte	Current Sys On (0 = All zones are Off, 1 = Any zone is on)
00	Data Byte	Current Shared Source (0 = Not Shared, 1 = Shared)
00	Data Byte	Current Party Mode (0 = Off, 1 = On, 2 = Master)
00	Data Byte	Current Do Not Disturb mode (0 = Off, 1 = On)
00	Data Byte	Reserved
5D	Checksum	Calculated by CAV6.6.
F7	End of message	

12.2 Request Zone On/Off

The zone On/Off state for a particular one can be requested by using the Request message below. This example shows a request for On/Off state from zone 1 of controller 1.

F0 00 00 7F 00 00 70 01 04 02 00 00 06 00 00 7B F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	not used
7F	Target Keypad Id	The controller itself
00	Source Controller Id	not used
00	Source Zone Id	not used
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message
04	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Target Path, Level 3	Zone to get info from
06	Target Path, Level 4	Zone On/Off state
00	Source Path, Num Levels	No source path is used
00	Request Message Type	Request Data
7B	Checksum	This must be recalculated.
F7	End of message	

Zone On/Off return message from CAV 6.6

This is an example of a return Set Data message sent by the CAV6.6 in response to the above Request message. Once the return message is received it is necessary to send a Handshake message. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds. This is due to the CAV6.6 trying to re-send the data.

F0 00 00 70 00 00 7F 00 00 04 02 00 00 06 00 00 01 00 01 00 01 03 F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller ID used to request data
00	Target Zone Id	Zone ID used to request data
70	Target Keypad Id	Keypad ID used to request data
00	Source Controller Id	Controller 1

00	Source Zone Id	not used
7F	Source Keypad Id	The controller itself
00	Message Type	Data message
00	Target Path, Num Levels	No source path was used when request was sent
04	Source Path, Num Levels	
02	Source Path, Level 1	Root Menu
00	Source Path, Level 2	Run Mode
00	Source Path, Level 3	Zone that info was requested
06	Source Path, Level 4	Zone On/Off
00	Packet Num Lo Byte	Used only for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
01	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
01	Data Byte	Zone On/Off (0 = Off, 1 = On))
03	Checksum	Calculated by CAV6.6
F7	End of message	

12.3 Request Zone's Selected Source

The selected source for a particular one can be requested by using the Request message below. This example shows a request for selected source from zone 1 of controller 1.

F0 00 00 7F 00 00 70 01 04 02 00 00 02 00 00 77 F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	not used
7F	Target Keypad Id	The controller itself
00	Source Controller Id	not used
00	Source Zone Id	not used
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message

04	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Target Path, Level 3	Zone to get info from
02	Target Path, Level 4	Source
00	Source Path, Num Levels	No source path is used
00	Request Message Type	Request Data
77	Checksum	This must be recalculated.
F7	End of message	

Selected Source return message from CAV 6.6

This is an example of a return Set Data message sent by the CAV6.6 in response to the above Request message. Once the return message is received it is necessary to send a Handshake message. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds. This is due to the CAV6.6 trying to re-send the data.

F0 00 00 70 00 00 7F 00 00 04 02 00 00 02 00 00 01 00 01 00 02 00 F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller ID used to request data
00	Target Zone Id	Zone ID used to request data
70	Target Keypad Id	Keypad ID used to request data
00	Source Controller Id	Controller 1
00	Source Zone Id	not used
7F	Source Keypad Id	The controller itself
00	Message Type	Data message
00	Target Path, Num Levels	No source path was used when request was sent
04	Source Path, Num Levels	
02	Source Path, Level 1	Root Menu
00	Source Path, Level 2	Run Mode
00	Source Path, Level 3	Zone that info was requested
02	Source Path, Level 4	Source
00	Packet Num Lo Byte	Used only for multi packet messages

00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
01	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
02	Data Byte	Current Selected Source (Source 3)
00	Checksum	Calculated by CAV6.6
F7	End of message	

12.4 Request Zone Volume Level

The Volume level for a particular one can be requested by using the Request message below. This example shows a request for Volume level from zone 1 of controller 1.

F0 00 00 7F 00 00 70 01 04 02 00 00 01 00 00 76 F7
--

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller 1
00	Target Zone Id	not used
7F	Target Keypad Id	The controller itself
00	Source Controller Id	not used
00	Source Zone Id	not used
70	Source Keypad Id	Arbitrary keypad ID not otherwise used by the system
00	Message Type	Data message
04	Target Path, Num Levels	
02	Target Path, Level 1	Root Menu
00	Target Path, Level 2	Run Mode
00	Target Path, Level 3	Zone to get info from
01	Target Path, Level 4	Volume
00	Source Path, Num Levels	No source path is used
00	Request Message Type	Request Data
76	Checksum	This must be recalculated.
F7	End of message	

Volume level return message from CAV 6.6

This is an example of a return Set Data message sent by the CAV6.6 in response to the above Request message. Once the return message is received it is necessary to send a Handshake message. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds. This is due to the CAV6.6 trying to re-send the data.

F0 00 00 70 00 00 7F 00 00 04 02 00 00 01 00 00 01 00 01 00 07 04 F7

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller Id	Controller ID used to request data
00	Target Zone Id	Zone ID used to request data
70	Target Keypad Id	Keypad ID used to request data
00	Source Controller Id	Controller 1
00	Source Zone Id	not used
7F	Source Keypad Id	The controller itself
00	Message Type	Data message
00	Target Path, Num Levels	No source path was used when request was sent
04	Source Path, Num Levels	
02	Source Path, Level 1	Root Menu
00	Source Path, Level 2	Run Mode
00	Source Path, Level 3	Zone that info was requested
01	Source Path, Level 4	Volume
00	Packet Num Lo Byte	Used only for multi packet messages
00	Packet Num Hi Byte	
01	Num Packets Lo Byte	This is a single packet message
00	Num Packets Hi Byte	
01	Num Data Bytes Lo Byte	How many bytes of raw data are in the packet
00	Num Data Bytes Hi Byte	
07	Data Byte	Volume level (7)
04	Checksum	Calculated by CAV6.6
F7	End of message	

Other zone parameter values can also be requested discreetly. See the Other Zone Parameters section for the paths for the parameters below:

Bass

Treble
 Loudness
 Balance
 Turn On Volume
 Background Color
 Do Not Disturb
 Party Mode
 Front A/V Enable

13. Using the Handshake Message:

NOTE: CAV 6.6 Firmware V1.02.02 does not require handshaking when the keypad ID used to send data is 0x70.

When the CAV6.6 sends a Set Data message, the receiver must acknowledge the message with a Handshake message. Failure to send the Handshake message will result in a system delay of approximately 2.5 seconds, while the CAV6.6 tries to re-send the data. The CAV6.6 will also send a Handshake message in response to a Set Data message that it is sent. It is not necessary to process the incoming Handshake message from the CAV6.6. Using the Handshake message becomes necessary when using the Request message. The CAV6.6 responds to the Request message with a Set Data message. This message must be acknowledged.

This example shows the appropriate Handshake message sent in response to the Volume level return message above.

Volume level return Set Data message from CAV6.6:

```
F0 00 00 70 00 00 7F 00 00 04 02 00 00 01 00 00 01 00 01 00 07 04 F7
```

Handshake message sent to CAV6.6 to acknowledge data message:

```
F0 00 00 7F 00 00 70 02 02 6C F7
```

The values of each by break out as follows:

Value	Field	Description/Notes
F0	Start of message	
00	Target Controller ID	Controller that sent data message
00	Target Zone Id	
7F	Target Keypad Id	The controller itself
00	Source Controller Id	Controller ID used to request data
00	Source Zone Id	Zone ID used to request data
70	Source Keypad Id	Keypad ID used to request data
02	Message Type	Handshake message
02	Handshake Type	Data Handshake

6C	Checksum	This must be recalculated.
F7	End of message	

14. COM Port Settings

14.1 Conneciton Settings

The following settings must be made to the RS-232 port used to interface with the CAV6.6

- 19200 baud
- 1 Start bit
- 1 Stop bit
- No flow control

14.2 Connector Type/Pinout

- Connector: Female DB-9
- Pin 1: NC
- Pin 2: CAV 6.6 Transmit
- Pin 3: CAV 6.6 Receive
- Pin 4: NC
- Pin 5: Ground
- Pin 6: NC
- Pin 7: NC
- Pin 8: NC
- Pin 9: NC