

# Serial Interface Design Specification

## 1. Objectives

This document will describe the serial interface protocol that is used by an external controller to communicate with the decoder board, which is based upon the CS98200 and was created by Videon Central, Inc.

## 2. Scope

This document will provide the information necessary to thoroughly understand the design of the serial interface protocol. The detail provided and the references made in this document will be sufficient enough for an engineer to implement and build upon the serial interface protocol.

## 3. References

<u>Document File ID</u>	<u>Document Title</u>
-------------------------	-----------------------

## 4. Product or System Description

The decoder board supports DVD Video, DVD Audio, CD, and MP3 playback as well as audio pass through and video pass through. It is intended to operate as a slave to an external controller board from which it accepts all commands and to which it sends system status information and miscellaneous requests.

## 5. Serial Protocol

The UART module of the CS98200 provides an RS-232 serial interface and is the basis of the protocol that is used for communication between the decoder board and an external controller board. This module is configured in the following manner:

- 1.) Baud Rate: 19200
- 2.) Data Bits: 8
- 3.) Stop Bits: 1
- 4.) Parity: None
- 5.) Delay Between Transmitted Data Bytes: None

Messages that are passed from the external controller board to the decoder board are referred to “commands” and messages that are passed from the decoder board to the external controller are referred to as “status” or “requests”.

Since it is intended to operate as a slave, the decoder board receives all user and mode change commands from the external controller board. Settings that are local to the decoder board are

stored in non-volatile memory during power down while all external settings are stored in non-volatile memory on the external controller board. These external settings are sent to the decoder board by the external controller board upon power up via an initialize command.

## 5.1 Message Structure

The serial protocol is based upon variable length messages of the following structure:

Byte 0	Byte 1	Byte 2	Byte 3	Bytes 4 to (N – 2)	Byte (N – 1)
Sync Byte	Count	ID	Opcode	Data	Check Sum

### 5.1.1 Sync Byte

The sync byte indicates the beginning of a new serial message and always contains a value of 0xFE. If 0xFE is found anywhere else in the serial message, an educated decision must be made by the module receiving the message to interpret it as the start of a new message or as data within the current message.

### 5.1.2 Count

The count byte indicates the number of bytes in the serial message from the ID byte through the end of the data bytes.

### 5.1.3 ID

The ID byte indicates the source of the serial message. If this byte contains a 0x01, then the decoder board sent the message. If this byte contains a 0x02, then the external controller sent the message. A value of 0x00 within this byte is reserved.

### 5.1.4 Opcode

The opcode byte indicates the operation to be performed. A list of the possible opcode values and associated operations may be found in the sections below.

### 5.1.5 Data

The data bytes contain any and all information required to carry out the operation indicated by the opcode.

### 5.1.6 Check Sum

The check sum byte is the sum of the count byte, the ID byte, and all data bytes in the serial message. If this sum is greater than 0xFF, then the check sum byte equals the least significant byte of the sum. The receiving module should recalculate the check sum value once the message has been completely received. This calculated check sum value should be compared against the message check sum value to verify that the message has been received correctly.

The decoder board responds to each command message it receives from the external controller board with a command acknowledge message. In a similar manner, the external controller board responds to requests it receives from the decoder board with a request acknowledge message.

## 6. Supported Functions

Messages may travel from the external controller board to the decoder board or from the decoder board to the external controller. All supported messages will be described in the sections below.

### 6.1 Command List

The commands described in this section may be sent from the external controller board to the decoder board.

#### 6.1.1 Eject

Issues an eject command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x01	-----	0x05

#### 6.1.2 Power On

Places the system in the power on state.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x02	-----	0x06

#### 6.1.3 Power Off

Places the system in the power off state.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x03	-----	0x07

#### 6.1.4 Play

Issues a play command with a track number as the data. If track number 0 is specified, then a normal play command is issued. If a non-zero track number is specified, then a play track command with the given track number is issued.

Data[0]: MSB of the track number

Data[1]: LSB of the track number

\*\* Note: The data associated with this command is not currently used.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	4	0x02	0x04	Data	Varies

#### 6.1.5 Stop

Issues a stop command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x05	-----	0x09

### 6.1.6 Pause

Issues a pause command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x06	-----	0x0A

### 6.1.7 Track Up

Issues a track up command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x07	-----	0x0B

### 6.1.8 Track Down

Issues a track down command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x08	-----	0x0C

### 6.1.9 Slow Forward

Issues a slow forward command. Each successive command moves to the next slow forward mode. These modes are valid for DVD only and are listed below:

Slow Forward 1: Play 1/2 Real-time

Slow Forward 2: Play 1/4 Real-time

Slow Forward 3: Play 1/8 Real-time

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x09	-----	0x0D

### 6.1.10 Fast Forward

Issues a fast forward command. Each successive command moves to the next fast forward mode. These modes are dependant upon the disc source and are listed below:

DVDV/DVDA: 2X, 4X, 8X, 16X, 30X, 60X

CD: 2X, 4X, 8X, 16X

MP3: 4X

Note that for DVDV and CD, if a fast reverse command is issued while the system is in a fast forward mode, the scan rate will be reduced. For example, if the system is in fast forward 60X mode when a fast reverse command is issued, the system will enter fast forward 30X mode. If the system is in fast forward 2X mode when a fast reverse command is issued, the system will enter normal play mode.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x0A	-----	0x0E

### 6.1.11 Un-rated Disc

If the OSD is generated and managed by the decoder board, this command is intended for internal use only. Used to inform the serial interface task running on the decoder board that un-rated disc has been inserted into the drive.

If the OSD is generated and managed by the external controller board, this command is not limited to internal use. Used to inform the external controller board that un-rated disc has been inserted into the drive. Upon receipt of this command, it is up to the external controller board to restrict or not restrict playback depending on the current parental settings.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x0B	-----	0x0F

### 6.1.12 Angle Toggle

Increments the current angle by 1. If the last angle has been reached, the current angle becomes the first angle. This command is only valid for DVDV discs that contain multi-angle scenes. If any OSD is present on the screen, this command is ignored.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x0C	-----	0x10

### 6.1.13 Display

Issues a display command. This command launches the full OSD status bar for the current source without the associated OSD menu.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x0D	-----	0x11

### 6.1.14 Restore Factory Defaults

Issues a restore factory defaults command. Restores the appropriate settings to their factory default value. This command is only valid when there is no disc in the drive.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x0E	-----	0x12

### 6.1.15 Frame Forward

Issues a single step command. The system must be in pause mode before this command may be issued. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x10	-----	0x14

### 6.1.16 Slow Reverse

Issues a slow reverse command. Each successive command moves to the next slow reverse mode. These modes are valid for DVDV only and are listed below:

Slow Reverse 1: Play 1/2 Real-time

Slow Reverse 2: Play 1/4 Real-time

Slow Reverse 3: Play 1/8 Real-time

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x11	-----	0x15

### 6.1.17 Fast Reverse

Issues a fast reverse command. Each successive command moves to the next fast reverse mode. These modes are dependant upon the disc source and are listed below:

DVDV/DVDA: 2X, 4X, 8X, 16X, 30X, 60X

CD: 2X, 4X, 8X, 16X

MP3: 4X

Note that for DVDV and CD, if a fast forward command is issued while the system is in a fast reverse mode, the scan rate will be reduced. For example, if the system is in fast reverse 60X mode when a fast forward command is issued, the system will enter fast reverse 30X mode. If the system is in fast reverse 2X mode when a fast forward command is issued, the system will enter normal play mode.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
------	-------	----	--------	------	--------

0xFE	2	0x02	0x12	-----	0x16
------	---	------	------	-------	------

### 6.1.18 Cursor Up

Issues a cursor up command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x13	-----	0x17

### 6.1.19 Cursor Left

Issues a cursor left command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x14	-----	0x18

### 6.1.20 Cursor Right

Issues a cursor right command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x15	-----	0x19

### 6.1.21 Cursor Down

Issues a cursor down command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x16	-----	0x1A

### 6.1.22 Enter

Issues an enter command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x17	-----	0x1B

### 6.1.23 Disc Menu

Issues a disc menu command. This command is only valid for DVD discs and is used to jump to the on disc DVD menu.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x18	-----	0x1C

### 6.1.24 Repeat

Cycles through the repeat modes available for the current disc source:

DVDV: Repeat Disc, Repeat Title, Repeat Chapter, Repeat Off

DVDA/CD/MP3: Repeat Disc, Repeat Track, Repeat Off

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x19	-----	0x1D

### 6.1.25 Repeat Track

Issues a repeat track command. This command is only valid for DVDA/CD/MP3 discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x1A	-----	0x1E

### 6.1.26 Random

Issues a random command. Toggles random mode on or off. The random mode depends on the current disc source:

DVDV: Random Chapter

DVDA/CD/MP3: Random Track

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x1B	-----	0x1F

### 6.1.27 Audio

Issues an audio command to move to the next audio track. If the move is successful, a status bar is displayed to indicate the new audio track. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x1C	-----	0x20

### 6.1.28 Subtitle

Issues a subtitle command to move to the next subtitle. If the move is successful, a status bar is displayed to indicate the new subtitle. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x1D	-----	0x21



### 6.1.29 Jump

Issues a jump command. This command is varies depending on the disc source:

DVDV:

Data[0]: Chapter

Data[1]: Title

DVDA:

Data[0]: Track

Data[1]: Group

CD/MP3:

Data[0]: Track

Data[1]: Index (not referenced)

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	4	0x02	0x1E	Data	Varies

### 6.1.30 Help

Issues a command to launch the appropriate help menu. This command is only valid when the settings level OSD menu is active.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x1F	-----	0x23

### 6.1.31 Return

Issues a return command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x20	-----	0x24

### 6.1.32 Title Menu

Issues a title menu command. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x21	-----	0x25

### 6.1.33 Repeat Chapter

Issues a repeat chapter command. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x22	-----	0x26

### 6.1.34 Repeat Title

Issues a repeat title command. This command is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x23	-----	0x27

### 6.1.35 Repeat Disc

Issues a repeat disc command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x24	-----	0x28

### 6.1.36 AB Repeat

Issues an AB repeat command. This command is only supported for DVDV discs. Each successive command moves to the next stage of AB repeat. These stages are listed below:

AB Repeat 1: Set point A

AB Repeat 2: Set point B and begin AB repeat

AB Repeat 3: Repeat off

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x25	-----	0x29

### 6.1.37 Repeat Off

Issues a repeat off command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x26	-----	0x2A

### 6.1.38 Random On

Issues a random on command. This command is dependant upon the disc source as shown below:

DVDV: Random Chapter

DVDA/CD/ MP3: Random Track

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x27	-----	0x2B

**6.1.39 Random Off**

Issues a random off command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x28	-----	0x2C

**6.1.40 0**

Issues a number 0 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x29	-----	0x2D

**6.1.41 1**

Issues a number 1 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x2A	-----	0x2E

**6.1.42 2**

Issues a number 2 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x30	-----	0x34

**6.1.43 3**

Issues a number 3 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x31	-----	0x35

**6.1.44 4**

Issues a number 4 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x32	-----	0x36

**6.1.45 5**

Issues a number 5 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x33	-----	0x37

**6.1.46 6**

Issues a number 6 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x34	-----	0x38

**6.1.47 7**

Issues a number 7 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x35	-----	0x39

**6.1.48 8**

Issues a number 8 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x36	-----	0x3A

**6.1.49 9**

Issues a number 9 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x37	-----	0x3B

**6.1.50 Plus-10**

Issues a plus-10 command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x2F	-----	0x33

### 6.1.51 Zoom

Cycles through the available zoom modes (2x, 4x, 8x) and is only valid for DVDV discs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x2E	-----	0x32

### 6.1.52 Page Up

Pages up the MP3 OSD track list, if possible. This command is only valid for MP3 CDs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x38	-----	0x3C

### 6.1.53 Page Down

Pages down the MP3 OSD track list, if possible. This command is only valid for MP3 CDs.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x39	-----	0x3D

### 6.1.54 OPCODE 0x3A (RESERVED)

### 6.1.55 Set TV Mode

Places the system into interlaced mode or progressive mode.

Data[0]: TV mode (0 = interlaced, 1 = progressive)

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	3	0x02	0x3B	Data	Varies

### 6.1.56 OPCODE 0x3C (RESERVED)

### 6.1.57 OPCODE 0x40 (RESERVED)

### 6.1.58 OSD Menu

Toggles the state of the OSD setup menu. Displays the OSD setup menu if it is not active or hides the OSD setup menu if it is active.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x41	-----	0x45

### 6.1.59 OSD Menu Hide (INTERNAL USE ONLY)

Hides the OSD setup menu.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x42	-----	0x46

### 6.1.60 Configure Serial Interface

Configures many of the serial interface timers and determines the rate at which the external controller board receives status information.

The data associated with this message is described below. If a data field is set to 0x00, the timer interval associated with that field is not changed.

Data[0]: Receive status interval of the external controller board in 100 ms intervals. If this field is set to 0xFF, the timer interval will be set to the default. Default = 500 ms.

Data[1]: Response timeout time of the external controller board in 100 ms intervals to requests by the decoder board. If this field is set to 0xFF, the timer interval will be set to the default. Default = 1000 ms.

Data[2]: Status Bar view time. This timer determines how long (in seconds) the status bar will be displayed. Default = 5 seconds.

Data[3]: Menu view time. This timer determines how long (in seconds) the menu will remain visible after the last input command. Default = 30 seconds.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	6	0x02	0x43	Data	Varies

### 6.1.61 Set Volume Level

Sets the new volume level of the system.

Data[0]: New volume level (0-100).

\*\* Note: This command only displays the volume status bar on the OSD and does not actually set the volume level on the decoder board.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	3	0x02	0x45	Data	Varies

### 6.1.62 OPCODE 0x49 (RESERVED)

### 6.1.63 OPCODE 0x4A (RESERVED)

### 6.1.64 Set Mute Mode

Sets the mute mode of the system.

Data[0]: Mute mode (0 = mute, 1 = un-mute).

\*\* Note: This command only displays the mute status bar on the OSD and does not actually set the mute state on the decoder board.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	3	0x01	0x4B	Data	Varies

### 6.1.65 Clear

Issues a clear command. Used to clear all OSD from the screen.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x4C	-----	0x50

### 6.1.66 Initialize External Data

This command is issued immediately after system startup or reset to initialize the OSD data bank on the decoder board. The external controller board should issue this command only after it has verified that the decoder board is up and running.

The data associated with this command includes all parameters that are stored external to the decoder board. This data is shown below:

< TBD >

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	<TBD>	0x02	0x4D	Data	Varies

### 6.1.67 Parental Lock (INTERNAL USE ONLY)

Used to inform the serial interface that the currently playing DVD disc has exceeded parental levels. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x4E	-----	0x52

### 6.1.68 Display Password

If the OSD is generated and managed by the decoder board, this command is intended for internal use only. Used to inform the serial interface that the user should be prompted to enter a password.

If the OSD is generated and managed by the external controller board, this command is not limited to internal use. Used to inform the external controller board that the system has entered the “locked” state due to an

exceeded parental level or the attempted viewing of an un-rated title when un-rated titles are set to require a password.

Upon receipt of this command, it is up to the external controller board to display the password prompt and inform the decoder board when the system should exit the locked state. Please see the 98200 Device Interface Specification for more details.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x4F	-----	0x53

### 6.1.69 Get Software Version

Requests the decoder board to send the version number of the software it is currently running to the external controller board. The decoder board acknowledges the receipt of this command before the software version is sent.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x50	-----	0x54

### 6.1.70 Disable Auto-Status

Issues a status off command. The external controller board should issue this command if it does not wish to receive periodic unsolicited status information from the decoder board.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x51	-----	0x55

### 6.1.71 Get Status

Requests the decoder board to send a status message to the external controller board.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x52	-----	0x56

### 6.1.72 Enable Auto-Status

Issues a status on command. The external controller board should issue this command if it wishes to receive periodic unsolicited status information from the decoder board.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x53	-----	0x57



### 6.1.73 Request Acknowledgement

Issues an acknowledgement that a request has been received from the decoder board.

Data[0]: Status (0 = pass, 1 = fail)

Data[1]: Opcode of the request being acknowledged

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	4	0x02	0x54	Data	Varies

### 6.1.74 OPCODE 0x55 (RESERVED)

### 6.1.75 OPCODE 0x56 (RESERVED)

### 6.1.76 OPCODE 0x57 (RESERVED)

### 6.1.77 OPCODE 0x58 (RESERVED)

### 6.1.78 OPCODE 0x59 (RESERVED)

### 6.1.79 OPCODE 0x5A (RESERVED)

### 6.1.80 Set Audio Format

Informs the decoder board of the audio format that is currently being decoded.

Data[0]: Audio format as shown below:

Direct	= 0
Mono	= 1
Stereo	= 2
PLII Music	= 3
PLII Movie	= 4
Neo:6 Cinema	= 5
Neo:6 Music	= 6
Neo:6	= 7
DTS	= 8
DTS ES-Matrix	= 9
DTS ES-Discrete	= 10
Dolby Digital	= 11
Dolby Digital EX	= 12
No Signal	= 13
Multi-channel	= 14

---

<BLANK>	= 15
Analogue	= 16
PCM	= 17
PLIIX	= 18
5.1	= 19
Dolby Digital 5.1	= 20
DD 5.1	= 21
DTS 5.1	= 22
Stereo 96	= 23
24/96	= 24
44.1KHz	= 25
48KHz	= 26
88.2KHz	= 27
96KHz	= 28
176.4KHz	= 29
192kHz	= 30
DD 1/1	= 31
DD 1/0	= 32
DD 2/0	= 33
DD 3/0	= 34
DD 2/1	= 35
DD 3/1	= 36
DD 2/2	= 37
DD 3/2	= 38
DD 1/1.1	= 39
DD 1/0.1	= 40
DD 2/0.1	= 41
DD 3/0.1	= 42
DD 2/1.1	= 43
DD 3/1.1	= 44
DD 2/2.1	= 45
DD 3/2.1	= 46
DTS 1/1	= 47
DTS 1/0	= 48
DTS 2/0	= 49

---

DTS 3/0	= 50
DTS 2/1	= 51
DTS 3/1	= 52
DTS 2/2	= 53
DTS 3/2	= 54
DTS 1/1.1	= 55
DTS 1/0.1	= 56
DTS 2/0.1	= 57
DTS 3/0.1	= 58
DTS 2/1.1	= 59
DTS 3/1.1	= 60
DTS 2/2.1	= 61
DTS 3/2.1	= 62
Analogue 1	= 63
Analogue 2	= 64
Analogue 3	= 65
Analogue 4	= 66
Analogue 5	= 67
Analogue 6	= 68
Optical 1	= 69
Optical 2	= 70
Coaxial 1	= 71
Coaxial 2	= 72
DVD	= 73
Laser Disc	= 74
TV	= 75
Satellite	= 76
Cable	= 77
HD record	= 78
VCR	= 79
Game	= 80
PC	= 81
Pre-amp	= 82
CD	= 83
CDR	= 84

Tuner	= 85
DAB	= 86
Mini-disc	= 87
DAT	= 88
Tape	= 89
Aux	= 90
DVDA	= 91
SACD	= 92
User 1	= 93
User 2	= 94
User 3	= 95
Bass Mix On	= 96
Bass Mix Off	= 97
Cine EQ On	= 98
Cine EQ Off	= 99
Midnight On	= 100
Midnight Off	= 101
Auto	= 102

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	3	0x02	0x5B	Data	Varies

### 6.1.81 Time Selection

Issues a time search command.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x5C	-----	0x60

### 6.1.82 Status Timer Expired (INTERNAL USE ONLY)

Used to inform the serial interface task running on the decoder board that status timer has expired. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x5D	-----	0x61

**6.1.83 Show Source (INTERNAL USE ONLY)**

Used to inform the serial interface task running on the decoder board that the active source was set successfully. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x5E	-----	0x62

**6.1.84 OPCODE 0x5F (RESERVED)**

**6.1.85 OPCODE 0x60 (RESERVED)**

**6.1.86 Is Alive**

Used by the external controller board in order to determine whether or not the decoder board is up and running. The external controller board knows that the decoder board is “alive” once it has received an acknowledgement of this command.

At initial start up, the external controller board must successfully issue this command before it may send the decoder board any other commands.

\*\* Note: While it is being updated, the decoder board will not acknowledge this command or any other command and will appear to be unresponsive. Do not reset the decoder board at any point during the update process unless instructed to do so.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x80	-----	0x84

**6.1.87 Repeat Last Message**

The external controller board sends this command any time it needs the decoder board to repeat the previous message. The decoder board acknowledges the receipt of this message before its previous message is repeated.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x81	-----	0x85

**6.1.88 Memory Write (USED FOR DEBUGGING ONLY)**

Allows the external controller board to write to a memory location on the decoder board. This is to be used for debugging purposes only.

Data[0-3]: Address to be written to, where Data[0] is the MSB and Data[3] is the LSB.

Data[4-7]: Data to be written to the above address, where Data[4] is the MSB and Data[7] is the LSB.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	10	0x02	0x82	Data	Varies

### 6.1.89 Memory Read (USED FOR DEBUGGING ONLY)

Allows the external controller board to read a memory location on the decoder board. After this command is issued, the decoder board responds with a command acknowledgement command followed by a send memory read result command. This is to be used for debugging purposes only.

Data[0-3]: Address to be read from, where Data[0] is the MSB and Data[3] is the LSB.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	6	0x02	0x83	Data	Varies

### 6.1.90 DLIST Next

Issues a DLIST next command to the decoder board. This command is only valid during DVDA playback.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x78	-----	0x7B

### 6.1.91 DLIST Previous

Issues a DLIST previous command to the decoder board. This command is only valid during DVDA playback.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x79	-----	0x7C

### 6.1.92 DLIST Go-To

Issues a DLIST go-to command to the decoder board. This command is only valid during DVDA playback.

Data[0-1]: DLIST number to go-to.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	4	0x02	0x7A	Data	Varies

### 6.1.93 DLIST Home

Issues a DLIST home command to the decoder board. This command is only valid during DVDA playback.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
------	-------	----	--------	------	--------

0xFE	2	0x02	0x7B	-----	0x7F
------	---	------	------	-------	------

### 6.1.94 MemSet

Allows the external controller board to set a “bookmark” on a DVDV disc.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x7C	-----	0x80

### 6.1.95 MemRecall

Allows the external controller board to recall a “bookmark” on a DVDV disc.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x02	0x7D	-----	0x81

## 6.2 Request List

The commands described in this section may be sent from the decoder board to the external controller board as requests. Each of these commands is preceded with “MCU” to indicate that they are destined for the external controller board. The external controller board is required to acknowledge each request issued by the decoder board. For more information, see the definition of the “Request Acknowledge” command in the above section.

### 6.2.1 OPCODE 0x61 (RESERVED)

### 6.2.2 OPCODE 0x62 (RESERVED)

### 6.2.3 OPCODE 0x63 (RESERVED)

### 6.2.4 OPCODE 0x64 (RESERVED)

### 6.2.5 OPCODE 0x65 (RESERVED)

### 6.2.6 OPCODE 0x66 (RESERVED)

### 6.2.7 OPCODE 0x67 (RESERVED)

### 6.2.8 OPCODE 0x68 (RESERVED)

### 6.2.9 OPCODE 0x69 (RESERVED)

### 6.2.10 OPCODE 0x6A (RESERVED)

### 6.2.11 OPCODE 0x6B (RESERVED)

### 6.2.12 OPCODE 0x6C (RESERVED)

### 6.2.13 MCU Set MP3 Track Name

Sends the current MP3 track name to the external controller board for display on the VFD.

Data[0-50]: MP3 Track Name (includes the terminating null character)

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	13	0x01	0x6D	Data	Varies

#### 6.2.14 OPCODE 0x6E (RESERVED)

#### 6.2.15 OPCODE 0x6F (RESERVED)

#### 6.2.16 MCU Command Acknowledgement

Issues an acknowledgement that a command has been received from the external controller board. This message is sent after the serial interface task running on the decoder board has verified the command and placed it in the processing queue.

Data[0]: Status as shown below:

Pass (command in processing queue)	= 0
Fail (incorrect check sum)	= 1
Busy (processing queue is full)	= 2
Not Supported (command invalid)	= 3

Data[1]: Opcode of the command being acknowledged

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	4	0x01	0x70	Data	Varies

#### 6.2.17 MCU Unsolicited Status

If auto status is enabled, the decoder board sends periodic unsolicited status information to the external controller. Auto status is enabled by default. For more information, see the definition of the following commands in the sections above: “Disable Auto-Status”, “Get Status”, and “Enable Auto-Status”.

It is important to note that the decoder board does not expect the external controller board to acknowledge an unsolicited status message.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	16	0x01	0x72	Data	Varies

This message contains 14 data bytes that are individually defined below:

##### Byte 1

System Status

Bit 0 Power 0 = off, 1 = on



Bit 1	Disc	0 = no disc, 1 = disc
Bit 2	Drawer	0 = open, 1 = closed
Bit 3	OSD Slider Bar	0 = off, 1 = on
Bit 4	OSD Status Bar	0 = off, 1 = on
Bit 5	Digital Audio Output	0 = DVD audio, 1 = encoded
Bit 6	Skipping	0 = not skipping, 1 = skipping
Bit 7	OSD Menu	0 = off, 1 = on

### Byte 2

#### Disc type

DISC_DVD_VIDEO	= 0
DISC_DVD_AUDIO	= 1
DISC_CDDA	= 2
DISC_FILE	= 3
DISC_FILE_URD	= 4
DISC_UPDATE	= 5
DISC_BAD	= 6
DISC_NONE	= 7
DISC_UNKNOWN	= 8
DISC_VCD	= 9

### Byte 3

#### Audio Sampling Frequency

Unknown	= 0
FS_8000	= 1
FS_11025	= 2
FS_12000	= 3
FS_16000	= 4
FS_22050	= 5
FS_24000	= 6
FS_32000	= 7
FS_44100	= 8
FS_48000	= 9
FS_64000	= 10
FS_88200	= 11
FS_96000	= 12
FS_128000	= 13

FS_176400	= 14
FS_192000	= 15
SPDIF	= 16

**Byte 4**

Current Transport State

Stop	= 0
Play	= 1
Pause	= 2
Forward Step	= 3
Reverse Step	= 4
Forward 1/8	= 5
Reverse 1/8	= 6
Forward 1/4	= 7
Reverse 1/4	= 8
Forward 1/2	= 9
Reverse 1/2	= 10
Forward 2X	= 11
Reverse 2X	= 12
Forward 4X	= 13
Reverse 4X	= 14
Forward 8X	= 15
Reverse 8X	= 16
Forward 16X	= 17
Reverse 16X	= 18
Forward 30X	= 19
Reverse 30X	= 20
Forward 60X	= 21
Reverse 60X	= 22
Reading New Disc	= 23

**Byte 5**

Audio Format

Unknown	= 0
AC3	= 1
MPEG1	= 2
MPEG2	= 3

PCM	= 4
DTS	= 5
SDDS	= 6
MP3	= 7
WMA	= 8
DVD Audio PCM	= 9
MLP	= 10
AAC	= 11
PNG	= 12
HDCD	= 13
MP3ENC	= 14
None	= 15

**Byte 6**

Chapter

8-bit value representing chapter

**Byte 7**

Title / Track

8-bit value representing title / track

**Byte 8**

Time (Hours)/Format

Bits 0 – 5 value representing Time (hours)

Bits 6 – 7 Time format. Not supported for DISC\_FILE,  
DISC\_FILE\_URD, or DISC\_VCD.

0 – Title/Total time elapsed (default)

1 – Title/Total time remaining

2 – Chapter/Track time elapsed

3 – Chapter/Track time remaining

**Byte 9**

Time (Minutes)

8-bit value representing Time (minutes)

**Byte 10**

Time (Seconds)

8-bit value representing Time (seconds)

**Byte 11**

Angle

8-bit value representing Angle

**Byte 12**

Repeat / Random Mode

- 0 Repeat / Random Off
- 1 Repeat Set A
- 2 Repeat AB
- 3 Repeat Disc
- 4 Repeat Title
- 5 Repeat Chapter
- 6 Repeat Track
- 7 Random Title
- 8 Random Chapter
- 9 Random Track

**Byte 13**

Audio Channel Configuration

Bits 0 – 3 Input Channel Configuration

- 0 - dual mono (1/0 + 1/0)
- 1 - mono (1/0)
- 2 - L, R (2/0)
- 3 - L, C, R (3/0)
- 4 - L, R, S (2/1)
- 5 - L, C, R, S (3/1)
- 6 - L, R, Ls, Rs (2/2)
- 7 - L, C, R, Ls, Rs (3/2)

Bit 7 LFE Input Channel Configuration

- 0 – LFE not present
- 1 – LFE present

**Byte 14**

Video Status

- Bits 0 – 1 Aspect ratio (0 = 16:9 WS, 1 = 4:3 LB, 2 = 4:3 PS)
- Bit 2 Composite (0 = off, 1 = on)
- Bit 3 Output Format (0 = NTSC, 1 = PAL)
- Bit 4 CDDA Navigator Queue Status
  - 0 – Empty
  - 1 - Full

### 6.2.18 MCU Send Software Version

Sends four data bytes containing the version of the software executing on the decoder board. The first three bytes indicate the version of Cirrus code base and the last byte indicates the current revision number.

Version[0]: Cirrus Code Version First Number

Version[1]: Cirrus Code Version Middle Number

Version[2]: Cirrus Code Version Last Number

Version[3]: Revision Number

For example, if Data[0] = 1, Data[1] = 2, Data[2] = 3, and Data[3] = 4 the decoder software version is 1.2.3.4. This would mean that the Cirrus code base is version 1.2.3 and the current revision is 4.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	6	0x01	0x73	Version	Varies

### 6.2.19 MCU Menu Up (INTERNAL USE ONLY)

Used to inform the serial interface task running on the decoder board that an OSD menu is active. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x01	0x74	-----	0x77

### 6.2.20 MCU Status Bar Up (INTERNAL USE ONLY)

Used to inform the serial interface task running on the decoder board that an OSD status bar is active. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x01	0x75	-----	0x78

### 6.2.21 MCU Restrict Content On (INTERNAL USE ONLY)

Used to inform the serial interface task running on the decoder board that it must begin restricting content. This is done when the system is restricting the playback of un-rated discs. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x01	0x76	-----	0x79

### 6.2.22 MCU Restrict Content Off (INTERNAL USE ONLY)

Used to inform the serial interface task running on the decoder board that it must stop restricting content. This command is intended for internal use only.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	2	0x01	0x77	-----	0x7A

### 6.2.23 MCU Send Memory Read Result (USED FOR DEBUGGING ONLY)

Sends the contents of a memory location on the decoder board specified by a previous memory read command. This is to be used for debugging purposes only.

Data[0-3]: Contents of memory location, where Data[0] is the MSB and Data[3] is the LSB.

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	6	0x01	0x84	Data	Varies

### 6.2.24 MCU Set Unsolicited Error

Sends an unsolicited error message to the external controller board.

Data[0]: Error Code

- Invalid Region Code = 0
- Operation Not Possible = 1
- Unsupported Disc = 2

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	3	0x01	0x7E	Data	Varies

## 6.3 Device Command Format

The device command format makes it possible for the decoder board to communicate with the external controller board and for the external controller board to communicate with the decoder board. Several devices may also be communicated with via these two modules. The device command format is described below. For more specifics on the supported device commands, please see the section entitled “Device Command List”.

### 6.3.1 Device Set

Sends a device set command from the decoder board to the external controller board or from the external controller board to the decoder board. The data associated with this command is in the following format:

Data[0]: Device ID (CS98200, Scalar, etc.)

Data[1]: Parameter (Output Format, Video Format, etc.)

Data[2]: Device data length

Data[3...n]: Device data

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	Varies	0x01/0x02	0x2B	Data	Varies

### 6.3.2 Device Get

Sends a device get command from the decoder board to the external controller board or from the external controller board to the decoder board. The data associated with this command is in the following format:

Data[0]: Device ID (CS98200, Scalar, etc.)

Data[1]: Parameter (Output Format, Video Format, etc.)

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	Varies	0x01/0x02	0x2C	Data	Varies

### 6.3.3 Device Send Get Result

Sends the result of the previous device get command from the decoder board to the external controller board or from the external controller board to the decoder board. The data associated with this command is in the following format:

Data[0]: Device ID (CS98200, Scalar, etc.)

Data[1]: Parameter (Output Format, Video Format, etc.)

Data[2]: Device data length

Data[3...n]: Device data

SYNC	COUNT	ID	OPCODE	DATA	CK_SUM
0xFE	Varies	0x01/0x02	0x2D	Data	Varies

## 6.4 Device Command List

Below is a list of the supported devices and their associated device ID:

```
typedef enum tagDEVICE_ID
{
    DEVICE_98200    = 0,
    DEVICE_SCALAR  = 1,
    RESERVED       = 2,
    DEVICE_MCU     = 3,
} DEVICE_ID;
```

The sections below will describe all of the supported device commands. Please see the CS98200 Device Interface Specification for a description of the supported device commands.

### 6.4.1 Video Format

Sends a video format command to the appropriate device.

Data[0]: Video format as show below:

RGB = 0  
RGBHV = 1  
YUV = 2  
YUVHV = 3

DEVICE	PARAMETER	DATA LENGTH	DATA
DEVICE_SCALAR	0x01	1	Data

### 6.4.2 Memory Access

This parameter is used for generic device memory read, write, and send result commands. Data and data length vary for read and write commands, and depend on memory address and data width for the specified device. In the case of external memory with 32-bit address and 16-bit data:

Generic device set command (0x2B) is used for memory write -

Data[0..3] = Memory address

Data[4..5] = Memory data

Data Length = 6

Generic device get command (0x2C) is used for memory read –

Data[0..3] = Memory address

Data Length = 4

Generic device send result command (0x2D) in response to memory read –

Data[0..1] = Memory data

Data Length = 2

DEVICE	PARAMETER	DATA LENGTH	DATA
Varies	0x08	Varies	Data

### 6.4.3 Audio Hardware Status

Indicates presence of optional audio board(s) connected to host MCU.

Data[0]:



0x00 No audio hardware connected

DEVICE	PARAMETER	DATA LENGTH	DATA
DEVICE_MCU	0x0B	1	Data

#### 6.4.4 Video DAC Control

Enables or disables video on the Scalar.

Data[0] (bits 0 – 3): Scalar Individual DAC Control

- Bit 0: DVI output enable bit.
- Bit 1: BNC output enable bit.
- Each output is disabled when its corresponding bit is set 0 and enabled when set to 1.
- These bits are only valid if Data[0] (bits 4 – 7) are set to 0x05.

Data[0] (bits 4 – 7): Scalar Video Control

- 0x00 Do nothing
- 0x01 Mute Scalar video
- 0x02 Un-mute Scalar video
- 0x03 Power on the Scalar
- 0x04 Power off the Scalar
- 0x05 Power on/off Scalar DACs individually

If this command is issued as a “device get” command, the current Scalar video DAC settings will be returned in the following manner:

Data[0]: Scalar DAC Settings:

- Bit 0: DVI output enable bit.
- Bit 1: BNC output enable bit.

DEVICE	PARAMETER	DATA LENGTH	DATA
DEVICE_SCALAR	0x0D	1	Data

## 7. Special Cases

This section will describe the expected behavior of the serial interface in a few special cases.

### 7.1 System Startup

The decoder board and the external controller board are booted independently. Therefore, synchronization upon system startup is important. The external controller board is expected

to issue repeated “Is Alive” messages until it receives a successful “Command Acknowledgement” message. Once this occurs, the external controller board and the decoder board are both assumed to be up and running and normal operation may begin.

As soon as the decoder board is up and running it will send periodic unsolicited status information to the external controller board. The external controller board has the option of enabling or disabling the feature. For more information, see the definition of the following commands in the sections above: “Disable Auto-Status”, “Get Status”, “Enable Auto-Status”, and “MCU Unsolicited Status”.

## **7.2 Rapid Successive Commands**

At various times during normal operation, the external controller board may hammer the decoder board with rapid successive commands. The decoder board is expected to issue a “Command Acknowledgement” message for each command it receives.

If it is still busy processing the previous command, the current command is ignored and the decoder board indicates that it is busy via the data associated with the acknowledgement message. It is up to the external controller board to decide whether or not this command should be sent again.

If it is not busy, the decoder board indicates whether or not the previous command was successful via the data associated with the acknowledgement message and accepts the current command for processing.

## **7.3 Invalid Command Data**

It is possible for an error to occur during the receipt of a serial message. This occurs when the check sum calculated by the receiver of the message does not match the check sum embedded within the message.

When the external controller board encounters this error, it may or may not ask the decoder board to send the message again by issuing a “Repeat Last Message” command. When the decoder board encounters this error, it will inform the external controller board via the data associated with the “Command Acknowledgement” message. It is up to the external controller board to decide whether or not the previous command should be sent again.

## **7.4 Command Acknowledgement Not Received**

It is possible for the external controller board to not receive a “Command Acknowledgment” message for each command it issues. If this occurs, the external controller board times out after a pre-determined timeout interval and begins sending “Is Alive” messages to the decoder board to verify that it is still up and running. If the decoder board does not respond to any “Is Alive” messages after a pre-determined number have been sent, then the external controller board, must assume that the decoder board is no longer up and running. The only exception to this is if the decoder board is currently in update mode, in which case it will not acknowledge any commands and will appear to be unresponsive.

## **7.5 Request Acknowledgement Not Received**

It is possible for the decoder board to not receive a “Request Acknowledgment” message for each request it issues. If this occurs, the decoder board times out after a pre-determined timeout interval and issues the request again. This is repeated until a “Request Acknowledgement” is received. In the meantime, the decoder board does not accept additional commands and acknowledges all incoming commands with a “Command Acknowledge” message that indicates it is busy.

## **8. Appendices**

### **8.1 Cheers UART Interface**

The UART interface on the Cheers decoder board is a LVTTTL level RS-232. This is the typical interface out of a processor into the MAX232 type RS232 transceivers. RX and TX are required; there is no need for CTS / RTS.

*End of Document*

## RDV 1092 / RDV 1093 RS232 Controller Command List

**Table: RDV 1092 Waveform format expected:**

Baud Rate	Parity	Valid Data Bits	Stop Bit Value	Handshaking	Data Type
19200	N	8	1	None	String

**Table: RDV 1092 expected format of a request by RS232 controller:**

### Standard Command

Start	Count	Device ID	Key	Checksum
0xFE	0x02	0x02	0xFF	0xFF

### Data Command

Start	Count	Device ID	Key	Data 1	Data 2	Checksum
0xFE	0x04	0x02	0xFF	0xFF	0xFF	0xFF

### Table 1: Standard Command List

NOTE: The values in the table below show the exact byte sequence of all requests. The device will expect the bytes only - no spaces, no delimiter, etc. The controlling device may implement its own method to download each command sequence. The numerical values in the first column are Hexadecimal.

RDV 1092 HEX	Command	Command Description
FE 02 02 01 05	Eject	Eject
FE 02 02 02 06	Power On	Power On
FE 02 02 03 07	Power Off	Power Off
FE 02 02 04 08	Play	Play
FE 02 02 05 09	Stop	Stop
FE 02 02 06 0A	Pause	Pause
FE 02 02 07 0B	Track Up	Track Up
FE 02 02 08 0C	Track Down	Track Down
FE 02 02 09 0D	Slow Forward	Slow Forward
FE 02 02 0A 0E	Fast Forward	Fast Forward
FE 02 02 0C 10	Angle	Angle
FE 02 02 0D 11	Display	Display
FE 02 02 0E 12	Restore Factory Defaults	Restore Factory Defaults
FE 02 02 10 14	Frame Forward	Frame Forward
FE 02 02 11 15	Slow Reverse	Slow Reverse
FE 02 02 12 16	Fast Reverse	Fast Reverse
FE 02 02 13 17	Cursor Up	Cursor Up
FE 02 02 14 18	Cursor Left	Cursor Left
FE 02 02 15 19	Cursor Right	Cursor Right
FE 02 02 16 1A	Cursor Down	Cursor Down
FE 02 02 17 1B	Enter	Enter
FE 02 02 18 1C	Disc Menu	Disc Menu
FE 02 02 19 1D	Repeat	Repeat
FE 02 02 1A 1E	Repeat Track	Repeat Track

<b>RDV 1092 HEX</b>	<b>Command</b>	<b>Command Description</b>
FE 02 02 1B 1F	Random	Random (Toggle)
FE 02 02 1C 20	Audio	Audio
FE 02 02 1D 21	Subtitle	Subtitle
FE 02 02 20 24	Return	Return
FE 02 02 21 25	Title Menu	Title Menu
FE 02 02 22 26	Repeat Chapter	Repeat Chapter
FE 02 02 23 27	Repeat Title	Repeat Title
FE 02 02 24 28	Repeat Disc	Repeat Disc
FE 02 02 25 29	A-B Repeat	A-B Repeat
FE 02 02 26 2A	Repeat Off	Repeat Off
FE 02 02 27 2B	Random On	Random On
FE 02 02 28 2C	Random Off	Random Off
FE 02 02 29 2D	0	0
FE 02 02 2A 2E	1	1
FE 02 02 2E 32	Zoom	Zoom
FE 02 02 2F 33	+10	+10
FE 02 02 30 34	2	2
FE 02 02 31 35	3	3
FE 02 02 32 36	4	4
FE 02 02 33 37	5	5
FE 02 02 34 38	6	6
FE 02 02 35 39	7	7
FE 02 02 36 3A	8	8
FE 02 02 37 3B	9	9
FE 02 02 38 3C	Page Up	Page Up
FE 02 02 39 3D	Page Down	Page Down
FE 02 02 41 45	OSD	Setup Menu
FE 02 02 4C 50	Clear	Clear
FE 02 02 5C 60	Time	Time Search

**Table 2: Data Command List**

The values in the table below are commands expecting a data key for byte 5 and byte 6. The exact response of the unit will depend upon the data keys sent. In addition, the checksum will vary as well depending upon the data keys.

<b>RDV 1092 HEX</b>	<b>Command</b>	<b>Data Byte Purpose</b>
FE 04 02 1E XX XX XX	Jump	Jump to specific track or chapter
FE 04 02 1E 01 00 25	Jump Track 1	Jump to track 1
FE 04 02 1E 02 00 26	Jump Track 2	Jump to track 2
FE 04 02 1E 03 00 27	Jump Track 3	Jump to track 3
FE 04 02 1E 04 00 28	Jump Track 4	Jump to track 4
FE 04 02 1E 05 00 29	Jump Track 5	Jump to track 5
FE 04 02 1E 06 00 2A	Jump Track 6	Jump to track 6
FE 04 02 1E 07 00 2B	Jump Track 7	Jump to track 7
FE 04 02 1E 08 00 2C	Jump Track 8	Jump to track 8
FE 04 02 1E 09 00 2D	Jump Track 9	Jump to track 9
FE 04 02 1E 0A 00 2E	Jump Track 10	Jump to track 10