Machine Control Guide

Ki Pro Ultra Products

AJA

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Chapter 1 – Introduction

1.0 Overview

This document describes aspects of the machine control protocol processing for Ki Pro Ultra 12G, Ki Pro Ultra Plus, and Ki Pro Ultra digital video recorder/players. It is intended for engineers, either software or hardware, who are interested in controlling Ki Pro hardware via its RS-422 interface.

The guiding document for this protocol is the Sony Video Cassette Recorder/Player, Protocol of Remote (9-pin) Connector, 2nd Edition (Revised 11), and more specifically the SRW-5500 information presented in that document.

Aside from introductory information, this AJA document includes only the command and status information supported by AJA's Ki Pro Ultra and Ki Pro Ultra Plus recorder/players.

Some of the commands and status bits described are actually emulated, to allow a device controller to communicate with a Ki Pro as if it were a VTR, instead of a disk recorder. These commands and statuses may not indicate an actual change of the Ki Pro's operational state, because the underlying Ki Pro hardware does not provide that functionality.

In this document the definitions of CONTROLLER and DEVICE are:

- "CONTROLLER" indicates the unit that controls a device.
- "DEVICE" indicates the device (Ki Pro) that is controlled by a unit.

1.1 Interface System Overview

- Conforming to EIA RS-422A.
- Full duplex communications channel is utilized.
- Data is transmitted asynchronously, bit serial, word serial with data exchange between devices.
- Standard transmission rate on the interface bus is 38.4 kilobits per second (kbps).
- The data word utilized by the interface system is as follows:

Figure 1. Data Word
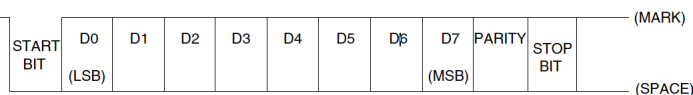
- 1 START BIT + 8 DATA BITs + 1 PARITY BIT + 1 STOP BIT. ODD parity : The total of "1"s in D0+D1+ . . . D7+PARITY equals an odd number.

1.2 Command Block Format (CMD BLOCK)

The communication between the CONTROLLER and the DEVICE is composed of CMD-1 + DATA COUNT, CMD-2 + DATA and CHECKSUM, and is transmitted from CMD-1 + DATA COUNT in order.

When DATA COUNT is zero, the data is not transmitted.

When it is not zero, the data corresponding to the value is inserted between CMD-2 and CHECKSUM.

Figure 2. Command Block Format
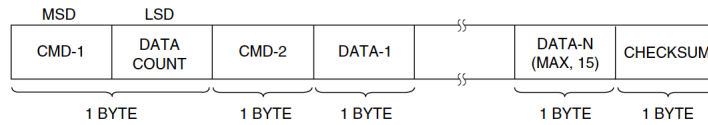
1.3 Connector Pin Assignment

The pin assignment of the CONTROLLER and the DEVICE is shown in the following table. The interface connector is a 9 pin D-sub miniature female (D-9S).

Figure 3. RS-422 Pinouts

Pin	CONTROLLER	DEVICE (Ki Pro)
1	Frame Ground	Frame Ground
2	Receive A	Transmit A
3	Transmit B	Receive B
4	Transmit Common	Receive Common
5	Spare	Spare
6	Receive Common	Transmit Common
7	Receive B	Transmit B
8	Transmit A	Receive A
9	Frame Ground	Frame Ground

A and B are defined as shown below.

Figure 4. Transmit and Receive

1.4 Communication Protocol

1. All communications between the CONTROLLER and the DEVICE will be under the direct supervision of the CONTROLLER. When the DEVICE receives the COMMAND from CONTROLLER, the following COMMAND is returned.
   - ACK : In case the DEVICE receives a COMMAND not requiring data
   - COMMAND + DATA : In case the DEVICE receives a COMMAND requiring data
   - NAK + ERROR DATA : In case a communication error is detected or an undefined COMMAND is received

2. The CONTROLLER must not transmit additional COMMAND blocks to a DEVICE prior to response to a previous COMMAND block.

3. The CONTROLLER must transmit bytes in a COMMAND block with intervals less than 10 milliseconds. If a DEVICE detects an interruption of a byte in a COMMAND BLOCK that exceeds 10 milliseconds, it executes a TIME-OUT error sequence, voids the receiving COMMAND block, and transmits a NAK (TIME OUT).

4. When a DEVICE receives a COMMAND block from the CONTROLLER, the DEVICE must transmit a response within 9 milliseconds. Therefore if the CONTROLLER cannot receive the appropriate response from the DEVICE within 10 milliseconds after transmitting the COMMAND block,

the CONTROLLER detects a communication error, and must execute an appropriate process.

5. When the DEVICE detects a communication error, it must immediately transmit a NAK to the CONTROLLER. (The contents of an error is shown on the COMMAND tables.) When the CONTROLLER receives a NAK, it must immediately stop transmission of the COMMAND block. The DEVICE must not accept a subsequent command within 10 milliseconds after that (except NAK-UNDEFINED command) and must execute a necessary process.

Chapter 2 – Detailed Command Descriptions

2.0 Commands Overview

This chapter describes the commands available for controlling AJA's Ki Pro Ultra and Ki Pro Ultra Plus digital video recorder/players.

NOTE: *The 0xXX 0xXX values indicate the two bytes that are sent at the beginning of a command block (Figure 2 on page 7).*

2.1 Device Type Request – 0x00 0x11

The Ki Pro Ultra and Ki Pro Ultra Plus will respond with the following, depending on the "35.6 RS-422 ID" setting:

ID Returned	RS-422 ID (35.6) Value
0x20 0xA1	SRW-5500 (default)
0x20 0xA0	SRW-5000
0xE0 0x11	Ki Pro Ultra

2.2 Stop – 0x20 0x00

Issuing this command during playback will cause the device to go into still playback output. Issuing while still will cause the device to go into capture mode. Issuing this command while capturing will cause the device to stop capturing. Please note that transition from playback to capture may take up to two seconds to complete. This command responds with ACK, but will do so before the transport has changed state. Use the status bits to determine when the device has actually stopped.

2.3 Play – 0x20 0x01

Issuing this command while still, will cause the device to go into normal speed playback. Issuing this command while the device is in capture mode will cause the device to go into playback mode and begin playing back at normal speed. Please note there may be a delay of up to two seconds when switching from capture to playback mode. This command responds with ACK, but will do so before the transport has changed state. Use the status bits to determine when the device has actually started playback.

2.4 Record – 0x20 0x02

Issuing this command while in playback mode will cause the device to enter capture mode and begin capturing video at the current timecode. It will always create a new clip (i.e. never record over a previously selected clip). Upon completion of capture, this new clip will now be the single clip available for playback. This command will respond with ACK, but will do so before the transport has changed state. Use the status bits to determine when the device has actually started capture.

2.5 Standby Off – 0x20 0x04

This has no effect on the device. It will respond with ACK to maintain compatibility with typical controllers.

2.6 Standby On – 0x20 0x05

This has no effect on the device. It will respond with ACK to maintain compatibility with typical controllers.

2.7 Deterministic Play Arm – 0x20 0x08

This arms the deterministic (i.e. frame accurate) playback start. Please see the Deterministic Playback chapter later in this document for details on this feature. This command responds with ACK.

2.8 Deterministic Play Disarm – 0x20 0x09

This disarms a previously armed deterministic play command. Please see the deterministic play section later in this document for details on this feature. This command responds with ACK.

2.9 Eject – 0x20 0x0F

This command has no effect on the device. It will respond with ACK to maintain compatibility with typical controllers.

2.10 Fast Forward – 0x20 0x10

This command puts the device in fast forward playback. This is roughly 20x real time speed. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

Speed Data Payload Description

When one of the commands listed below is received, the DEVICE starts running in accordance with speed data defined by DATA-1 and DATA-2.

- Var Forward – 0x2X 0x12
- Shuttle Forward – 0x2X 0x13
- Jog Reverse – 0x2X 0x21
- Variable Reverse – 0x2X 0x22
- Shuttle Reverse – 0x2X 0x23

When only DATA-1 is given, (X = 1) and the tape speed will be defined as follows.

TAPE SPEED = $10^{(N/32 - 2)}$, N : SPEED DATA (DECIMAL)

TAPE SPEED	SPEED	DATA
STILL	0	(0H)
0.1 times normal speed	32	(20H)
1.0 times normal speed	64	(40H)
About 2.9 times normal speed	79	(4FH)

TAPE SPEED = $10^{(N/32 - 2)} + N'/256 \times \{10^{[(N+1)/32 - 2]} - 10^{(N/32 - 2)}\}$

N = SPEED DATA OF DATA-1 (DECIMAL), N' = SPEED DATA OF DATA-2 (DECIMAL)

2.11 Jog Forward – 0x2X 0x11

This command jogs the device similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.12 Var Forward – 0x2X 0x12

This command initiates variable speed playback similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.13 Shuttle Forward – 0x2X 0x13

This command shuttles the device similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.14 Rewind – 0x20 0x20

This command puts the device in rewind playback. This is roughly 20x real time speed. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.15 Jog Reverse – 0x2X 0x21

This command jogs the device similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.16 Variable Reverse – 0x2X 0x22

This command initiates variable speed playback similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.17 Shuttle Reverse – 0x2X 0x23

This command shuttles the device similar to a VTR. It takes a one or two byte payload as defined in *"Speed Data Payload Description" on page 10*. This command responds with ACK, but will do so before the transport state has changed. Use the status bits to determine when the device has actually changed state.

2.18 PreRoll – 0x20 0x30

When this command is received, the DEVICE is prerolled to the tape position that is obtained by subtracting the preroll time from the IN POINT.

PREROLL TIME is fixed at 5 seconds.

IN POINT is defined by the "In Entry – 0x40 0x10" command.

2.19 Auto Edit – 0x20 0x42

This command initiates an auto edit. Please see the section below labeled "Editing" for details on how editing functionality is implemented on the Ki Pro Ultra.

2.20 Full EE Off – 0x20 0x60

This command has no real effect on the device. The device will, however, track the state of Full EE in the "Full EE" status bit.

2.21 Full EE On – 0x20 0x61

This command has no real effect on the device. The device will, however, track the state of Full EE in the "Full EE" status bit.

2.22 Selected EE On – 0x20 0x63

This command has no real effect on the device. The device will, however, track the state of Selected EE in the "Selected EE" status bit. This bit will be cleared upon edit completion.

2.23 Edit Off – 0x20 0x64

This command stops an edit. There is a three frame delay between when the edit off command is received and when the edit actually stops. Please see the "Editing" section below for details on how editing functionality is implemented on the Ki Pro Ultra.

2.24 Edit On – 0x20 0x65

This command starts an edit. There is a three frame delay between when the edit on command is received and when the edit actually starts. Please see the "Editing" section below for details on how editing functionality is implemented on the Ki Pro Ultra.

2.25 Set Clip – 0x24 0xE0

This command sets the current clip index from the currently selected playlist. It takes a four byte payload containing the 32 bit unsigned integer clip ID. The first payload byte sent is the least significant byte of the 32 bit clip ID. This will cause the device to cue up to the beginning of the set clip ID and go into still playback.

2.26 Next/Prev Clip – 0x21 0x31

This command, when supplied with the following payloads, will cause the device to jump the next or previous clip in the currently selected playlist. The following payload bytes are accepted:
- 0x01 – Next Clip
- 0xFF – Previous Clip

2.27 Cue Up with Data – 0x24 0x31

This command is used for cueing up the DEVICE to the position assigned by the time data of DATA-1 through DATA-4. Units of respective data are as follows:

DATA-1		DATA-2		DATA-3		DATA-4	
10 Frame	1 Frame	10 Second	1 Second	10 Minute	1 Minute	10 Hour	1 Hour
MSD	LSD	MSD	LSD	MSD	LSD	MSD	LSD

2.28 In Entry – 0x40 0x10

2.29 Out Entry – 0x40 0x11

These two commands are used for storing the value of the TIMER or the TIME CODE data, which is displayed on the DEVICE, into the IN, OUT memory as IN POINT, OUT POINT data.

2.30 A In Entry – 0x40 0x12

Split audio editing is not supported by Ki Pro or Ki Pro Ultra Plus Ultra, however this command will respond with ACK to maintain compatibility with typical controllers.

2.31 A Out Entry – 0x40 0x13

Split audio editing is not supported by Ki Pro or Ki Pro Ultra Plus Ultra, however this command will respond with ACK to maintain compatibility with typical controllers.

2.32 In Preset – 0x40 0x14

2.33 Out Preset – 0x40 0x15

These two commands are used for presetting the value, which has been given by the DATA-1 to DATA-4, into the IN or OUT memory.

For the data format, see *"2.27 Cue Up with Data – 0x24 0x31" on page 13*

2.34 A In Preset – 0x40 0x16

2.35 A Out Preset – 0x40 0x17

Split audio editing is not supported by Ki Pro, however these two commands will respond with ACK to maintain compatibility with typical controllers.

2.36 In Shift + (plus) – 0x40 0x18

2.37 In Shift – (minus) – 0x40 0x19

These two commands are used for adding or subtracting the value of the TIME DATA, which has been stored as IN POINT, by one frame.

2.38 Out Shift + (plus) – 0x40 0x1A

2.39 Out Shift – (minus) – 0x40 0x1B

These two commands are used for adding or subtracting the value of the TIME DATA, which has been stored as OUT POINT, by one frame.

2.40 A In Shift + (plus) – 0x40 0x1C

2.41 A In Shift – (minus) – 0x40 0x1D

Split audio editing is not supported by Ki Pro or Ki Pro Ultra Plus Ultra, however these two commands will respond with ACK to maintain compatibility with typical controllers.

2.42 A Out Shift + (plus) – 0x40 0x1E

2.43 A Out Shift – (minus) – 0x40 0x1F

Split audio editing is not supported by Ki Pro or Ki Pro Ultra Plus Ultra, however these two commands will respond with ACK to maintain compatibility with typical controllers.

2.44 In Reset – 0x40 0x20

2.45 Out Reset – 0x40 0x21

These two commands are used for turning off the IN, OUT, AUDIO IN or AUDIO OUT indicator.

2.46 A In Reset – 0x40 0x22

2.47 A Out Reset – 0x40 0x23

Split audio editing is not supported by Ki Pro Ultra or Ki Pro Ultra Plus, however these two commands will respond with ACK to maintain compatibility with typical controllers.

2.48 Edit Preset – 0x44 0x30

This command is used to select the edit mode and the video/audio preset channels. The DEVICE sets all channels to "1" when the ASSEMBLE mode is selected.

Not all edit functionality is supported. Please see *"Chapter 5 Editing" on page 24* for details on how editing is implemented on the Ki Pro Ultra. In particular, the device always captures all audio and video with an edit operation (regardless of what gets selected in the preset). Audio split editing is not supported. Ki Pro Ultra creates a new clip instead of changing an existing clip. The new clip, however, does have the timecode the edit operation gave it.

Each bit in the DATA-1 is defined as follows.

BIT-7	BIT-6	BIT-5	BIT-4	BIT-3	BIT-2	BIT-1	BIT-0
	INSERT	ASSEMBLE	VIDEO		TIME CODE	A2 (CUE)	A1 (CUE)

2.49 Head Select – 0x40 0x34

This has no effect on the device. It will respond with ACK to maintain compatibility with typical controllers.

2.50 Clip ID Sense – 0x60 0xE0

This command responds with a four byte payload containing the current clip 32bit integer index within the current playlist. The least significant byte will be the first byte sent.

2.51 In Data Sense – 0x60 0x10

2.52 Out Data Sense – 0x60 0x11

These two commands are used for requesting the IN/OUT DATA. Ki Pro Ultra devices only support one set of in/out points since audio split editing isn't supported. The audio in/out points will always just set or return the Ki Pro global in/out points.

For the data format, see *"2.27 Cue Up with Data – 0x24 0x31" on page 13*

REQUEST COMMAND	RESPONSE COMMAND
60.10 : IN DATA SENSE	74.10 : IN DATA
60.11 : OUT DATA SENSE	74.11 : OUT DATA
60.12 : A IN DATA SENSE	74.12 : A IN DATA
60.13 : A OUT DATA SENSE	74.13 : A OUT DATA

2.53 A In Data Sense – 0x60 0x12

2.54 A Out Data Sense – 0x60 0x13

Because KI Pro doesn't support audio split editing, these two commands will return the video in or out timecode information.

2.55 Command Speed Sense – 0x60 0x2E

This command is used for requesting the operating TAPE SPEED COMMAND of the DEVICE. When the DEVICE receives this command, it returns command "71.2E : COMMAND SPEED DATA" command.

2.56 PreRoll Time Sense – 0x60 0x31

This command is used to request the PREROLL TIME setting data of the DEVICE. Because Ki Pro Ultra only supports a fixed 5 sec preroll, this command will always return a timecode value of 00:00:05:00, not ACK.

2.57 Timer Mode Sense – 0x60 0x36

This command has no effect on the device. It will respond with ACK to maintain compatibility with typical controllers.

2.59 Current Time Sense – 0x61 0x0C

This command is used for requesting the TIME DATA. The DEVICE will make a response according to the content of DATA-1.

When accurate time data is requested in the normal playback mode, the following condition must be satisfied.

- Select external reference mode.
- CURRENT TIME SENSE command and its return must be completed within the field-2.

[DATA-1] The response command to the request command is as follows.

BIT-7	BIT-6	BIT-5	BIT-4	BIT-3	BIT-2	BIT-1	BIT-0
		VITC UB	LTC UB		TIMER-1	VITC TIME	LTC TIME
	MSB				LSB		
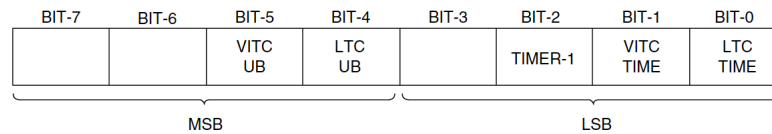
This command also provides USER'S BIT responses, but only for RS-422 compatibility. Ki Pro Ultra devices do not store actual user bit information in the resulting Quicktime files. Instead userbits are always set to 00000000, and this value will be returned in the response, rather than an ACK.

2.60 Status Sense – 0x61 0x20

This command is used for requesting the status of the DEVICE.

It specifies the data to be sent back by the "7X.20 : STATUS DATA" command according to DATA-1 added to this command.

[DATA-1]

BIT-7	BIT-6	BIT-5	BIT-4	BIT-3	BIT-2	BIT-1	BIT-0
	MSB				LSB		
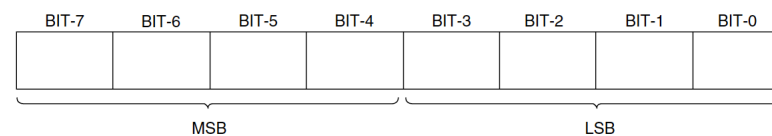
MSD (BIT-7 to 4) : Indicates the starting DATA No. of the data to be sent back.

LSD (BIT-3 to 0) : Indicates the number of data bytes (1H to FH) to be sent back.

Example.

When the DATA-1 of this command is "2A", the STATUS DATA of the DEVICE will send back ten bytes from the DATA No.2, i. e.

DATA No.2 to DATA No.B.

See *"Chapter 3 Status Data"* for a list of supported status bits.

2.61 Error Code Sense – 0xF0 0xEE

Returns AJA proprietary error code information.

Chapter 3 – Status Data

3.0 Status Overview

The following status bits are supported by the Ki Pro Ultra and Ki Pro Ultra Plus:

Figure 5. Supported Status Data

DATA	BIT-7	BIT-6	BIT-5	BIT-4	BIT-3	BIT-2	BIT-1	BIT-0
0x00								LOCAL
0x01	STANDBY ON	TENSION RELEASE	STOP	EJECT	REWIND	FAST FWD	REC	PLAY
0x02	SERVO LOCK		SHUTTLE	JOG	VAR	REVERSE	STILL	CUE UP COMPLETE
0x03	AUTO MODE				AUDIO OUT	AUDIO IN	OUT	IN
0x04	SELECT EE ON	FULL EE ON		EDIT		AUTO EDIT		CUE UP
0x05		INSERT	ASSEMBLE	VIDEO		TIME CODE	A2 (CUE)	A1 (CUE)
0x06		STILL LED ON	FWD LED ON	REV LED ON				
0x07								
0x08					CF LOCK			
0x09								
0x0A							DET PLAY READY	DET PLAY ARMED
0x0B								
0x0C	DA8	DA7	DA6	DA5	DA4	DA3	DA2	DA1
0x0D								
0x0E					DA12	DA11	DA10	DA9
0x0F								

3.1 Local – Status Data Byte 0, Bit 0

This bit will be high when the device is under RS-422 control via the 35.2 "Remote Control" configuration setting. When not under RS-422 control, the RS-422 port will still service requests for information (ex: current timecode or clip index), but will not service any commands which require action by the device. These commands will, however, still be ACK'ed.

3.2 Play – Status Data Byte 1, Bit 0

This bit will be high whenever the device is in normal speed playback or record.

3.3 Record – Status Data Byte 1, Bit 1

This bit will be high whenever the device is in record or has started an edit operation has been started.

3.4 Fast Fwd – Status Data Byte 1, Bit 2

This bit will be high whenever the device is in forward playback at a rate of 20x or higher.

3.5 Rewind – Status Data Byte 1, Bit 3

This bit will be high whenever the device is in reverse playback at a rate of 20x or higher.

3.6 Eject – Status Data Byte 1, Bit 4

This bit will be high whenever the device is in the process of shutting down.

3.7 Stop – Status Data Byte 1, Bit 5

This bit will be high whenever the device is in still playback.

3.8 Tension Release – Status Data Byte 1, Bit 6

This bit will be high whenever the device is in the process of shutting down.

3.9 Standby – Status Data Byte 1, Bit 7

This bit will be high whenever the device is not in capture mode.

3.10 Cue Ok – Status Data Byte 2, Bit 0

This bit will be high whenever a cue up command completes. It will be cleared on the next cue command (and subsequently go high again when that cue command completes).

3.11 Still – Status Data Byte 2, Bit 1

This bit will be high whenever the device is in still playback.

3.12 Reverse – Status Data Byte 2, Bit 2

This bit will be high whenever the device is in reverse playback (this includes jog/shuttle/var/rewind).

3.13 Var – Status Data Byte 2, Bit 3

This bit will be high whenever the device has received a variable speed playback command. It will be cleared whenever the device enters a mode outside variable speed playback.

3.14 Jog – Status Data Byte 2, Bit 4

This bit will be high whenever the device has received a jog playback command. It will be cleared whenever the device enters a mode outside jog playback.

3.15 Shuttle – Status Data Byte 2, Bit 5

This bit will be high whenever the device has received a shuttle playback command. It will be cleared whenever the device enters a mode outside shuttle playback.

3.16 Servo Lock – Status Data Byte 2, Bit 7

This bit will be high whenever the device is in normal forward playback or record and has started rolling. Status Data Byte 3, Bit 0 – In Set

This bit will be high whenever the edit in point has been set.

3.17 In Set - Status Data Byte 3, Bit 0

This bit will be high whenever the edit in point has been set.

3.18 Out Set – Status Data Byte 3, Bit 1

This bit will be high whenever the edit out point has been set.

3.19 Audio In Set – Status Data Byte 3, Bit 2

The device does not support split audio editing, however to maintain compatibility with typical controllers, this bit will be set whenever the video in point is set.

3.20 Audio Out Set – Status Data Byte 3, Bit 3

The device does not support split audio editing, however to maintain compatibility with typical controllers, this bit will be set whenever the video in point is set.

3.21 Cue Up Complete – Status Data Byte 4, Bit 0

This bit will be high when a cue up operation has completed. It will be cleared on the start of a subsequent cue operation.

3.22 Auto Edit – Status Data Byte 4, Bit 2

This bit will be high when auto edit has been started. It will be cleared by the completion of the auto edit either by success or failure.

3.23 Edit – Status Data Byte 4, Bit 4

This bit will be high when an edit operation has started. It will be cleared when the edit operation has completed.

3.24 Full EE – Status Data Byte 4, Bit 6

The device does not support full EE, however this bit will be set if the enable Full EE On command has been sent. It will be cleared if the Full EE Off command has been sent.

3.25 Selected EE – Status Data Byte 4, Bit 7

The device does not support Selected EE, however this bit will be set if the Selected EE On command has been sent. It will be cleared upon edit completion.

3.26 Edit Preset A1 – Status Data Byte 5, Bit 0

This bit reflects the A1 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.27 Edit Preset A2 – Status Data Byte 5, Bit 1

This bit reflects the A2 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.28 Edit Preset LTC – Status Data Byte 5, Bit 2

This bit reflects the LTC edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.29 Edit Preset Video – Status Data Byte 5, Bit 4

This bit reflects the Video edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.30 Edit Preset Assemble – Status Data Byte 5, Bit 5

This bit reflects the Assemble edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.31 Edit Preset Insert – Status Data Byte 5, Bit 6

This bit reflects the Insert edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.32 Reverse Lamp – Status Data Byte 6, Bit 4

This bit will be high whenever the device's transport is moving in reverse.

3.33 Forward Lamp – Status Data Byte 6, Bit 5

This bit will be high whenever the device's transport is moving forward.

3.34 Still Lamp – Status Data Byte 6, Bit 6

This bit will be high whenever the device's transport is still.

3.35 Color Frame Lock – Status Data Byte 8, Bit 3

This bit will be high whenever the device is in normal forward playback or record and is rolling.

3.36 Deterministic Play Armed – Status Data Byte 10, Bit 0

This bit will be high whenever the device has been armed for deterministic playback via the deterministic play arm command. However, it will only be set if the conditions support arming for deterministic playback (see the "Deterministic Playback" section for further details). It will be cleared upon completion of a deterministic playback.

3.37 Deterministic Play Ready – Status Data Byte 10, Bit 1

This bit will be high whenever the device is ready for deterministic playback. This will happen sometime after the device has been armed for deterministic playback. Only after this bit is high will deterministic playback be assured to be frame accurate.

3.38 DA1 – Status Data Byte 12, Bit 0

This bit reflects the DA1 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.39 DA2 – Status Data Byte 12, Bit 1

This bit reflects the DA2 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.40 DA3 – Status Data Byte 12, Bit 2

This bit reflects the DA3 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.41 DA4 – Status Data Byte 12, Bit 3

This bit reflects the DA4 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.42 DA5 – Status Data Byte 12, Bit 4

This bit reflects the DA5 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.43 DA6 – Status Data Byte 12, Bit 5

This bit reflects the DA6 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.44 DA7 – Status Data Byte 12, Bit 6

This bit reflects the DA7 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.45 DA8 – Status Data Byte 12, Bit 7

This bit reflects the DA8 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.46 DA9 – Status Data Byte 14, Bit 0

This bit reflects the DA9 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.47 DA10 – Status Data Byte 14, Bit 1

This bit reflects the DA10 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.48 DA11 – Status Data Byte 14, Bit 2

This bit reflects the DA11 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

3.49 DA12 – Status Data Byte 14, Bit 3

This bit reflects the DA12 edit preset value set by the Edit Preset command. This device has limited edit support. Please refer to the "Editing" section below for further details.

Chapter 4 – Deterministic Playback

The amount of time between the issuance of a normal play command and when the device actually begins to play is variable and dependent on several factors like the type of storage media in the device and the clip media type.

If it becomes necessary to start playback in a frame accurate manner, you can choose to use the device's deterministic playback functionality. This functionality assumes that the device is locked to an external video reference and the controller is receiving this same reference. It also assumes that the controller is timing the transmission of commands to the device at the beginning of each frame (as determined by the video reference).

In order to arm for deterministic playback, the device must have previously been put into still playback. If you attempt to arm deterministic playback without having done this, the arm will fail and the deterministic playback arm enable bit in the status will never go high.

Here is the basic strategy for using the deterministic playback functionality. This example assumes the controller is controlling multiple devices and is making sure they all start at the same point in time (thus ensuring all the device's playback is synchronized).

1. Controller should cue all devices to their start timecode using the cue up command (0x24 0x31). This will put all the devices into still playback and parked on the frame that was given as part of the cue command.

2. Poll the status and check for one of the following:
   - "Cue up Complete" flag (Bit 0, Byte Offset 2)
   - "Function Abort" flag (Bit 7, Byte Offset 9)
   - Timeout (5 seconds is reasonable)

   If Function Abort or Timeout, this is an error condition, sync will not be possible.

3. Wait an additional two seconds. This delay allows for the worst case of the device coming out of EtoE mode (which will require some settling time).

4. Issue a sync playback arm command (0x20 0x08). This will setup the device to prepare for sync playback. After this command is issued, the "sync playback armed" status bit will be high (Bit 0, Byte Offset 0x0A). You can clear the sync playback arming by issuing the sync playback disarm command (0x20 0x09). This will put the device back into normal playback mode (and still playback on the current frame). It will also clear the bit mentioned previously. Any transport command (besides play) will clear the sync playback arming.

5. Wait for the "sync playback ready" status bit (Bit 1, Byte Offset 0x0A) to go high. When this bit goes high, this is an indication that the device is now ready to accept a play command and it will be guaranteed to start with a fixed delay.

6. Issue the play command (0x20 0x01). At this point, the device will start playback after some fixed number of frames from the frame of command issue. When controlling multiple devices, it is important that timing of the play command to each device happen at roughly the same time.

Chapter 5 – Editing

When the device has been put under RS-422 control, the device emulates a video tape machine with a virtual 24 hour timecode range. Only the selected clip, with its existing timecode sub-range will actually "exist" in this range. The 24 hour timecode range is there to make editing possible.

When the device starts an edit, either traditional (edit on / edit off) or auto edit, the actual edit start will cause a new clip to be created on the device. It's within this new clip the edit material will be recorded. It is not possible on this device to edit within an existing clip. Once the edit completes, the resulting clip will now become the clip contained in the virtual 24 hour timecode.

To maintain compatibility with typical controllers, the device will maintain the individual edit preset flags, however they will generally be ignored by the device. The device will always capture all audio and video with an edit operation (regardless of what gets selected in the preset). This also means that audio split editing is not supported. The device will also ignore the assemble and insert flag (only requiring that one of them be set). In effect, since the 24 hour timecode always exists, the device will always be doing an insert edit.