Machine Control Guide

Ki Pro Ultra and Ki Pro Ultra Plus

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AJA VIDEO SYSTEMS

Table of Contents

Chapter 1 –

Overview

This section describes aspects of the machine control protocol processing for Ki Pro Ultra and Ki Pro Ultra Plus accessible via the RS-422 port in the rear of the device.

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

This document will outline the differences from the Sony document.

Chapter 2 – Detailed Commands Descriptions

2.1. 0x00 0x11 – Device Type Request

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. 0x20 0x00 – Stop

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. 0x20 0x01 – Play

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. 0x20 0x02 – Record

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. 0x20 0x04 – Standby Off

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

2.6. 0x20 0x05 – Standby On

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

2.7. 0x20 0x08 – Deterministic Play Arm

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

2.8. 0x20 0x09 – Deterministic Play Disarm

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. 0x20 0x0F – Eject

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

2.10. 0x20 0x10 – Fast Forward

This command puts the device in fast forward playback. This is roughly 20x realtime 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.

2.11. 0x2X 0x11 – Jog Forward

This command jogs the device similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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.

2.11. 0x2X 0x11 – Jog Forward

This command jogs the device similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x2X 0x12 – Var Forward

This command initiates variable speed playback similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x2X 0x13 – Shuttle Forward

This command shuttles the device similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x20 0x20 – Rewind

This command puts the device in rewind playback. This is roughly 20x realtime 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. 0x2X 0x21 – Jog Reverse

This command jogs the device similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x2X 0x22 – Variable Reverse

This command initiates variable speed playback similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x2X 0x23 – Shuttle Reverse

This command shuttles the device similar to a VTR. It takes the same one or two byte payload as outlined in the SRW-5500 9 pin protocol document. 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. 0x20 0x30 – PreRoll

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.19. 0x20 0x42 – Auto Edit

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. 0x20 0x60 – Full EE Off

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. 0x20 0x61 – Full EE On

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. 0x20 0x63 – Selected EE On

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. 0x20 0x64 – Edit Off

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. 0x20 0x65 – Edit On

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. 0x24 0xE0 – Set Clip

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. 0x21 0x31 – Next/Prev Clip

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. 0x24 0x31 – Cue Up with Data

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.28. 0x40 0x10 – In Entry

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.29. 0x40 0x11 – Out Entry

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.30. 0x40 0x12 – A in Entry

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. 0x40 0x13 – A Out Entry

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. 0x40 0x14 – In Preset

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.33. 0x40 0x15 – Out Preset

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.34. 0x40 0x16 – A In Preset

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.

2.35. 0x40 0x17 – A Out Preset

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.

2.36. 0x40 0x18 – In Shift +

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.37. 0x40 0x19 – In Shift –

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.38. 0x40 0x1A – Out Shift +

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.39. 0x40 0x1B – Out Shift –

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.40. 0x40 0x1C – A In Shift +

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.

2.41. 0x40 0x1D – A In Shift –

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.

2.42. 0x40 0x1E – A Out Shift +

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.

2.43. 0x40 0x1F – A Out Shift –

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.

2.44. 0x40 0x20 – In Reset

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.45. 0x40 0x21 – Out Reset

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.46. 0x40 0x22 – A In Reset

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

2.47. 0x40 0x23 – A Out Reset

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

2.48. 0x44 0x30 – Edit Preset

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document. However, not all edit functionality is supported. Please see the “Editing” section below for details on how editing is implemented on the Ki Pro or Ki Pro Ultra Plus Ultra.

2.49. 0x40 0x34 – Head Select

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

2.50. 0x60 0xE0 – Clip ID Sense

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. 0x60 0x10 – In Data Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.52. 0x60 0x11 – Out Data Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.53. 0x60 0x12 – A In Data Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document. However, since audio split editing isn't supported, this command will return the video in timecode information.

2.54. 0x60 0x13 – A Out Data Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document. However, since audio split editing isn't supported, this command will return the video in timecode information.

2.55. 0x60 0x2E – Command Speed Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.56. 0x60 0x31 – PreRoll Time Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.57. 0x60 0x36 – Timer Mode Sense

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

2.58. 0x61 0x0A – TC Gen Data Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.59. 0x61 0x0C – Current Time Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document.

2.60. 0x61 0x20 – Status Sense

This command functions identically to the behavior outlined in the SRW-5500 9 pin protocol document. See the “Status Data” section below for a list of supported status bits.

2.61. 0xF0 0xEE – Error Code Sense

Returns AJA proprietary error code information.

Chapter 3 – Status Data

The following status bits are supported by the Ki Pro Ultra

DATA No.	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		SSTILL 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. Status Data Byte 0, Bit 0 – Local

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. Status Data Byte 1, Bit 0 – Play

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

3.3. Status Data Byte 1, Bit 1 – Record

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

3.4. Status Data Byte 1, Bit 2 – Fast Fwd

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

3.5. Status Data Byte 1, Bit 3 – Rewind

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

3.6. Status Data Byte 1, Bit 4 – Eject

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

3.7. Status Data Byte 1, Bit 5 – Stop

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

3.8. Status Data Byte 1, Bit 6 – Tension Release

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

3.9. Status Data Byte 1, Bit 7 – Standby

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

3.10. Status Data Byte 2, Bit 0 – Cue Ok

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. Status Data Byte 2, Bit 1 – Still

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

3.12. Status Data Byte 2, Bit 2 – Reverse

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

3.13. Status Data Byte 2, Bit 3 – Var

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. Status Data Byte 2, Bit 4 – Jog

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. Status Data Byte 2, Bit 5 – Shuttle

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. Status Data Byte 2, Bit 7 – Servo Lock

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. Status Data Byte 3, Bit 1 – Out Set

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

3.18. Status Data Byte 3, Bit 2 – Audio In Set

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.

3.19. Status Data Byte 3, Bit 3 – Audio Out Set

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. Status Data Byte 3, Bit 1 – Out Set

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

3.21. Status Data Byte 3, Bit 2 – Audio In Set

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.

3.22. Status Data Byte 3, Bit 3 – Audio Out Set

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.

3.23. Status Data Byte 3, Bit 1 – Out Set

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

3.24. Status Data Byte 3, Bit 2 – Audio In Set

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.

3.25. Status Data Byte 3, Bit 3 – Audio Out Set

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.

3.26. Status Data Byte 4, Bit 0 – Cue Up Complete

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

3.27. Status Data Byte 4, Bit 2 – Auto Edit

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.

3.28. Status Data Byte 4, Bit 4 – Edit

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

3.29. Status Data Byte 4, Bit 5 – Full EE

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.

3.30. Status Data Byte 4, Bit 6 – Selected EE

d

3.31. Status Data Byte 8, Bit 3 – Color Frame Lock

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

3.32. Status Data Byte 5, Bit 0 – Edit Preset A1

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.

3.33. Status Data Byte 5, Bit 1 – Edit Preset A2

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.

3.34. Status Data Byte 5, Bit 2 – Edit Preset LTC

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.

3.35. Status Data Byte 5, Bit 4 – Edit Preset Video

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.

3.36. Status Data Byte 5, Bit 5 – Edit Preset Assemble

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.

3.37. Status Data Byte 5, Bit 6 – Edit Preset Insert

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.

3.38. Status Data Byte 6, Bit 4 – Reverse Lamp

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

3.39. Status Data Byte 6, Bit 5 – Forward Lamp

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

3.40. Status Data Byte 6, Bit 6 – Still Lamp

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

3.41. Status Data Byte 10, Bit 0 – Deterministic Play Armed

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.

3.42. Status Data Byte 10, Bit 1 – Deterministic Play Ready

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.

3.43. Status Data Byte 12, Bit 0 – DA1

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.

3.44. Status Data Byte 12, Bit 1 – DA2

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.

3.45. Status Data Byte 12, Bit 2 – DA3

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.

3.46. Status Data Byte 12, Bit 3 – DA4

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.

3.47. Status Data Byte 12, Bit 4 – DA5

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.

3.48. Status Data Byte 12, Bit 5 – DA6

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.

3.49. Status Data Byte 12, Bit 6 – DA7

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.

3.50. Status Data Byte 12, Bit 7 – DA8

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.

3.51. Status Data Byte 14, Bit 0 – DA9

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.

3.52. Status Data Byte 14, Bit 1 – DA10

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.

3.53. Status Data Byte 14, Bit 2 – DA11

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.

3.54. Status Data Byte 14, Bit 3 – DA12

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.

3.55. Status Data Byte 12, Bit 7 – DA8

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.

3.56. Status Data Byte 14, Bit 0 – DA9

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.

3.57. Status Data Byte 14, Bit 1 – DA10

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.

3.58. Status Data Byte 14, Bit 2 – DA11

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.

3.59. Status Data Byte 14, Bit 3 – DA12

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:
    1. "Cue up Complete" flag (Bit 0, Byte Offset 2)
    2. "Function Abort" flag (Bit 7, Byte Offset 9)
    3. 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 takes 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.