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PRV-LX1

RS-422A Command Protocol Manual

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Version 3.02

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1.0 Foreword

The PRV-LX1 can be controlled externally using RS-422A commands. Control is applied through the REMOTE IN and REMOTE OUT D-Sub 9 connector on the rear panel. Set the RS-422A REMOTE controls through the main menu. Press the **Function** button on the PRV-LX1's front panel to access the menu. Control Settings are accessed through the **Setup** menu.

The REMOTE IN connector is used when controlling this unit with an external device. The REMOTE OUT connector is used for external control with this unit.

Note: This document is valid for PRV-LX1 System Version 3.01/1.04 or later/

2.0 Communication Signal

The PRV-LX1 conforms to EIA RS-422A and includes a full duplex communication channel. The transfer speed is 38.4kb per second.

Data Format:

Start Bit: 1 bit
Data: 8 bits
Parity (ODD): 1 bit
Stop Bit: 1 bit

3.0 Cabling

Pin	Master	Slave
1	Ground	Ground
2	RX-	TX-
3	TX+	RX+
4	Xmit Common	Rcv Common
5	Spare	Spare
6	Rcv Common	Xmit Common
7	RX+	TX+
8	TX-	RX-
9	Ground	Ground

4.0 Command Block Format

The controlling device and the PRV-LX1 communicate through the interchange of command blocks. The bytes in each command block are assigned as follows:

CMD-1 (MSD)	Data Count (LSD)	CMD-2	Data-1		Data-15 (MAX)	Checksum
1 Byte		1 Byte	1 Byte		1 Byte	1 Byte

- CMD-1/DATA COUNT CMD-1 is the upper 4 bits, DATA COUNT is the lower 4 bits
- CMD-2
- DATA-1 up to DATA-N, where n is the value in data count
- CHECKSUM

CMD-1

Indicates the function and direction of the command:

0	System Control (Controller -> PRV-LX1)
1	Return for 0, 2, or 4 of cmd-1 (PRV-LX1-> Controller)
2	Transport Control (Controller -> PRV-LX1)
4	Preset/Select Control (Controller -> PRV-LX1)
6	Sense Request (Controller -> PRV-LX1)
7	Sense Returned (PRV-LX1-> Controller)
E	PRV-LX1 Original Command (Controller -> PRV-LX1)
F	PRV-LX1 Original Return (PRV-LX1->Controller)

DATA COUNT

Indicates the number of bytes (maximum 15) inserted between CMD-2 and CHECKSUM

CMD-2

Designates the command
(refer to the Command Table for definitions)

DATA-1 to DATA-N

Data that corresponds to those indicated by the command
(refer to the Command Table for data formats)

CHECKSUM

Lower eight bits of the sum of the bytes in the command block

Communications Protocol

The controlling device initiates the communication. PRV-LX1 returns a response within 9 milliseconds. The response may be:

- NAK + Error Data : undefined command or communications error
- COMMAND + Data : received a command that requests data
- ACK : received a command that requests no data

The controller must ensure that no more than a 10 msec lapse occurs between bytes in a command block.

The controller must immediately stop sending data when it receives a NAK + Error Data message. The unit must wait at least 10 msec before resending the command.

The controller should wait at least 10msec to receive a response from the PRV-LX1. The unit should not send another command during this time.

When the controller does not receive a response from the PRV-LX1 within the 10 msec timeout, it assumes that communication has ceased and sends the command again.

- Error descriptions are listed in this manual under the section entitle Command Formats
  If the PRV-LX1 detects a communication error, it sends a NAK and an error code to the controller.

5.0 Command Table

Code	Command		Response
00 11	Device Type Request	12 11 xx xx	Device Type
20 00	Stop	10.01	ACK
20 01	Play	10 01	ACK
20 02	Rec(ord)	10 01	ACK
20 04	Standby OFF	10 01	ACK
20 05	Standby ON	10 01	ACK
20 0F	Eject	10 01	ACK
20 10	Fast Forward	10 01	ACK
20 20	Rewind	10 01	ACK
21 11 xx 22 11 xx yy	Jog Forward	10 01	ACK
21 12 xx 22 12 xx yy	Var Forward	10 01	ACK
21 13 xx 22 13 xx yy	Shuttle Forward	10 01	ACK
21 21 xx 22 21 xx yy	Jog Reverse	10 01	ACK
21 22 xx 22 22 xx yy	Var Reverse	10 01	ACK
21 23 xx 22 23 xx yy	Shuttle Reverse	10 01	ACK
20 30	Pre-Roll	10 01	ACK
24 31	Cue Up With Data	10 01	ACK
44 14	In Data Preset	10 01	ACK
44 15	Out Data Preset	10 01	ACK
4x 30	Edit Preset	10 01	ACK
44 31	Preroll Time Preset	10 01	ACK
60 36	Timer Mode Sense	71 36	Timer Mode Status
61 0A 01	TC Gen Data Sense	74 08	Gen TC Data
61 0C 01	Current Time Sense	74 04	LTC Time Data
61 20 xx	Status Sense	7x 20 xx	Status Data
E3 51 11 nn	Title Search	10 01	ACK
E2 51 21 n	Chapter Search	10 01	ACK
E1 51 22	Chapter Mark	10 01	ACK
E1 51 81	Title Number Sense	E3 51 91 nn	Title Number Data
E1 51 82	Chapter Number Sense	E2 92 n	Chapter Number Data
E3 51 71 nn	Title Delete	10 01	ACK
E3 51 72 nn	Trimming Title Preset	10 01	ACK
E5 51 73 fsmh	Trimming In Preset	10 01	ACK
E5 51 74 fsmh	Trimming Out Preset	10 01	ACK
E1 51 75	Trimming	10 01	ACK
E1 51 83	HDD Capa Sense	E3 51 93 nn	HDD Capacity(GB)
E1 51 8F	Mode Sense	E2 51 9F xx	Mode Data

6.0 Command Formats

00 11 Device Type Request
PRV-LX1 Responds with a 12 11 Device Type Message containing 2 bytes of data

TV System	DATA 1	DATA2
NTSC	F0	51
PAL	F1	51

10 01 ACK
PRV-LX1 sends this data when it receives a command from a Controller

11 12 NAK
When a communication error is detected, the PRV-LX1 sends this command with a “1” in the following position indicating the appropriate error condition.

7	6	5	4	3	2	1	0
Time Out	Framing Error	Overrun Error	Parity Error	X	Checksum Error	X	Undefined Command

20 00 Stop
PRV-LX1 stops when Playing or Recording
If Stop is sent during a Time Shift PLAY recording, the unit continues recording and returns to the scene that the PRV-LX1 is recording.

20 01 Play
Starts Playing Title 1 of the selected drive. If the Time Shift PLAY setting is enabled when this command is sent to the recording HDD, the PRV-LX1 attempts to Time Shift PLAY the title being recorded.

* During Time Shift PLAY, Status Data is Play not Rec

20 02 Record
PRV-LX1 begins recording on the selected Drive(s) and/or to the HDD from a Stop condition.

20 04 Standby OFF
If the unit receives this command when stopped, the unit changes to Standby Off.

20 05 Standby ON
If the unit receives this command when in Standby Off, it toggles to Standby On.

20 0F Eject
Send this command to eject a disc from DVD1 or DVD2 when each drive is stopped. If [Eject Setting] is set to *Finalize&Eject*, the disc is finalized before the tray opens.

20 10 Fast Forward
During playback, this command executes 192x speed Scan Forward through to the end of the title then pauses the playback. In Time Shift PLAY mode, the command executes 192x speed Scan Forward then transfers to Play when it nears the recording scene. (1 – 6 minutes).

20 20 Rewind

During playback or Time Shift PLAY, this command executes 192x speed Scan Reverse then pauses playback at the beginning of the title.

21 11 xx Jog Forward

22 11 xx yy Jog Forward

21 12 xx Variable Forward

22 12 xx yy Variable Forward

21 13 xx Shuttle Forward

22 13 xx yy Shuttle Forward

21 21 xx Jog Reverse

22 21 xx yy Jog Reverse

21 22 xx Variable Reverse

22 22 xx yy Variable Reverse

21 23 xx Shuttle Reverse

22 23 xx yy Shuttle Reverse

During Play, Time Shift PLAY the playing speed will vary according to the speed indicated in DATA-1(xx). When indicating “0” to DATA-1(xx) while recording, PRV-LX1 pauses recording.

PRV-LX1 ignores the “yy”.

DATA-1(xx)	Speed
00	Still (Pause)
01 to 16	1/90 Slow
17 to 25	1/30 Slow
26 to 35	1/16 Slow
36 to 44	1/8 Slow
44 to 54	1/4 Slow
55 to 63	1/2 Slow
64	1X Play
65 to 88	6X Scan
89 to 98	12X Scan
99 to108	24X Scan
109 to 117	48X Scan
118 to 127	96X Scan
128 to 255	192X Scan

20 30 Preroll

Search to a particular position. Calculate the position value by subtracting the preroll time (set by the command 44.31 Preroll Time Preset) from the value stored in the command 44.14 In DATA Preset.

24 31 Cue Up With Data

Cues the PRV-LX1 to the indicated time code and pauses.

DATA – 1		DATA – 2		DATA – 3		DATA – 4	
10 Frames	1 Frame	10 Seconds	1 Second	10 Minutes	1 Minute	10 Hours	1 Hour
MSD	LSD	MSD	LSD	MSD	LSD	MSD	LSD

44 14 In Data Preset

Preset the value from DATA-1 to DATA-4 to the memory. Data format is same as the format of ”24:31 Cue Up With Data” command. Using the ”44:31 Preroll” command, search to the position that is the value of Preroll Time subtracted from In Data.

44 15 Out Data Preset

The PRV-LX1 sends back an ACK; however, the command data is ignored.

44 30 Edit Preset

The PRV-LX1 sends back an ACK; however, the command data is ignored.

44 31 Preroll Time Preset

Preset the value from DATA-1 to DATA-4 to the memory. Data format is same as the format of ”24:31 Cue Up With Data” command. Using the ”44:31 Preroll” command, search to the position that is the value of the Preroll Time subtracted from In Data.

60 36 Timer Mode Sense

The unit returns the “71:36:00” Time Mode Status = TIME CODE

61 0A 01 Time Code Generator Sense (Gen TC)

The unit returns “74:08:00:00:00:00” Gen Time Data = 0.

61 0C 01 Current Time Sense (LTC TIME)

The unit returns current time code of Recording or Playing title with “74:04 LTC Time Data”. While recording in Time Shift PLAY, the playing title’s current time code is returned. Data format is the same as the ”24:31 Cue Up With Data” command.

61 20 Status Sense

When the PRV-LX1 receives a 61 20 Status Sense command, it returns a 7X 20 Status Data response. The starting byte number and number of bytes requested are encoded in DATA-1, with starting register in the high nibble (bits 7-4) and the requested byte count in the low nibble (bits 3-0).

Data – 1

Start Data Number	Data Size
MSD	LSD

MSD (Bit 7~ 4) Specify what data from “7X:20 Status Data” shall be returned.

LSD (Bit 3~0) Specify the data number (in Bytes) that shall be returned by the ”7X:20 Status Data” command.

7X 20 Status Data

Return all or part of the following data that corresponds to the “61:20 Status Sense” command

Data #	MSB Bit – 7	Bit – 6	Bit – 5	Bit – 4	Bit – 3	Bit – 2	Bit – 1	LSB Bit – 0
0			UnThread					Local
1	Standby		Stop	Eject	REW	FF	Rec	Play
2	Servo Lock		Shuttle	Jog	VAR	Tape Dir	Still	Cue Up
3								
4								Preroll

UNTREAD: bit set when the selected drive is open
LOCAL: bit set when [Operation/Control Setting/Control] is set to Local
(remote command is not available unless set to Remote)
STANDBY: bit set in StandbyON mode - also set under Rec and Play
STOP: bit set in Stop mode
EJECT: bit set when the selected drive is unloading
REW: bit set in Full Rewind mode
FF: bit set in Full Forward mode
REC: bit set when recording - with TimeShift Play mode turned on while recording, this bit is cleared
PLAY: bit set in Rec or Play
SERVO LOCK: bit set in Rec or Play
SHUTTLE: bit set in Shuttle mode
JOG: bit set in Jog mode
VAR: bit set in Var mode
TAPE DIR: bit set in Reverse Play
STILL: bit set in Record–Pause or Play–Pause
CUE UP: when the PRV-LX receives a ”20:30 Preroll” or “24:31 Cue Up With Data” command, this bit is set after searching is complete and the unit switches to Pause
(bit is cleared when playing point moves beyond the search point)
PREROLL: bit set when a “20:30 Preroll” or “24:31 Cue Up With Data” command is received
(kept till searching is completed)

E3 51 11 Title Search (PRV-LX1 original command)

The command searches to a recorded title number
Values are 1-255 (0x01 0x00 – 0x55 0x02)

DATA – 2		DATA – 3	
10 Titles	1 Title	always 0	100 Titles
MSD	LSD	MSD	LSD

Execute title search to the title number given by DATA-2 and DATA-3. When Time Shift PLAY is enabled when recording, if the search title number is same as the title number being recorded, Time Shift PLAY executes. However, if the search title number is smaller than Title number being recorded, another title plays while recording.

E2 51 21 Chapter Search (PRV-LX1 original command)

The command searches to a recorded chapter number
Values are 1-99 (0x01 – 0x99)

DATA – 2

10 Chapters	1 Chapter
MSD	LSD

Chapter number is given by DATA-2. Available chapter numbers are from 1 to 99.

E1 51 22 Chapter Mark (PRV-LX1 original command)

This command inserts a chapter mark in the Title being recorded.

E1 51 81 Title Number Sense (PRV-LX1 original command)

The command returns the total number of titles in the selected project when playback is stopped and returns the recording title number when recording. When a title is playing or in TimeShift PLAY, the unit returns the playing title number. “E3 51 91 n n Title Number Data”, where nn is the title number.

E3 51 91 Title Number Data (PRV-LX1 original command)

This command corresponds with the “E1:51:81 Title Number Sense” command. The unit returns the total number of titles in the selected project when playback is stopped and returns to the recording title number when recording. When a title is playing or in TimeShift PLAY, the unit returns the playing title number. Data format is the same as the “E3:51:11 Title Search” command.

E1 51 82 Chapter Number Sense (PRV-LX1 original command)

This command returns current chapter number, “E3 51 92 nn Chapter Number Data”, where nn is the chapter number. When recording, the unit returns the recording chapter number executed by the ”E3:51:92 Chapter Number Data” command.
Returns the playing chapter number during playback or in TimeShift PLAY.

E3 51 92 Chapter Number Data (PRV-LX1 original command)

This command corresponds with the “E1:51:82 Chapter Number Sense” command. The unit returns the recording chapter number when recording. When a chapter is playing or in TimeShift PLAY, the unit returns the playing chapter number. Data format is the same as the “E2:51:21 Chapter Search” command.

E3 51 71 Title Delete (PRV-LX1 original command)

The command deletes the recorded title number.
Values are 1-255 (0x01 0x00 – 0x55 0x02)

When a stopped unit receives this command, the title specified by Data–2 and Data–3 is deleted. With the ”E1:51:8F Mode Sense” command, it is possible to know if the deletion is complete. Issuing the ”E1:51:81 Title Number Sense” command before and after the deletion, confirms that the number of titles in the selected project has been reduced. If the number of titles has not been reduced then the title deletion has failed so error handling should be executed. Data format is the same as the “E3:51:11 Title Search” command.

E3 51 72 Trimming Title Preset (PRV-LX1 original command)

The command presets the trimming title number.
Values are 1-255 (0x01 0x00 – 0x55 0x02)

Trimming title number executed by ”E1:51:75 Trimming” command is specified by DATA-2, DATA-3, and the title number preset in the memory. Data format is the same as the “E3:51:11 Title Search” command.

E5 51 73 Trimming In Preset (PRV-LX1 original command)

The command presets the trimming In Point. When the unit is stopped, the trimming IN point, executed by “E1:51:75 Trimming”, is specified by DATA-2 – DATA-5, and the preset point in the memory. Data format is the same as the “24:31 Cue Up With Data” command.

E5 51 74 Trimming Out Preset (PRV-LX1 original command)

The command presets the trimming Out Point. When the unit is stopped, the trimming OUT point, executed by “E1:51:75 Trimming”, is specified by DATA-2 – DATA-5, and the preset point in the memory. Data format is the same as the “24:31 Cue Up With Data” command.

E1 51 75 Trimming (PRV-LX1 original command)

This command trims the current title by creating a new title. When the unit is stopped, the title specified by ”E3:51:72 Trimming Title Preset” is trimmed from the IN point (specified by ”E5:51:73 Trimming In Preset”) to the OUT point (specified by ”E5:51:74 Trimming Out Preset”) then made into another title. With the ”E1:51:8F Mode Sense” command, it is possible to know if the trimming is finished. Issuing ”E1:51:81 Title Number Sense” before and after the trimming confirms that the number of titles in the selected project have increased after the trimming. If the number of titles has not increased, the trimming has failed so error handling should be executed.

E1 51 83 HDD Capa Sense

This command returns remaining capacity of the internal HDD, E3 51 93 n n, HDD Capa(GB) where nn is the capacity.
Ex: 102GB (0x02, 0x01)

E3 51 93 HDD Capa(GB)

When the unit receives the ”E1:51:83 HDD Capa Sense” command, the remaining capacity of the internal HDD is returned. The remaining capacity is specified in Gbytes by DATA-2 and DATA-3.

DATA – 2		DATA – 3	
10 GBs	1 GBse	always 0	100 GBs
MSD	LSD	MSD	LSD

E1 51 8F Mode Sense

This command returns Mode Data E2 51 9F XX where XX is the code.
Ex: 01l:Recording, FF:RecError, 71:Title Delete, 75:Trimming

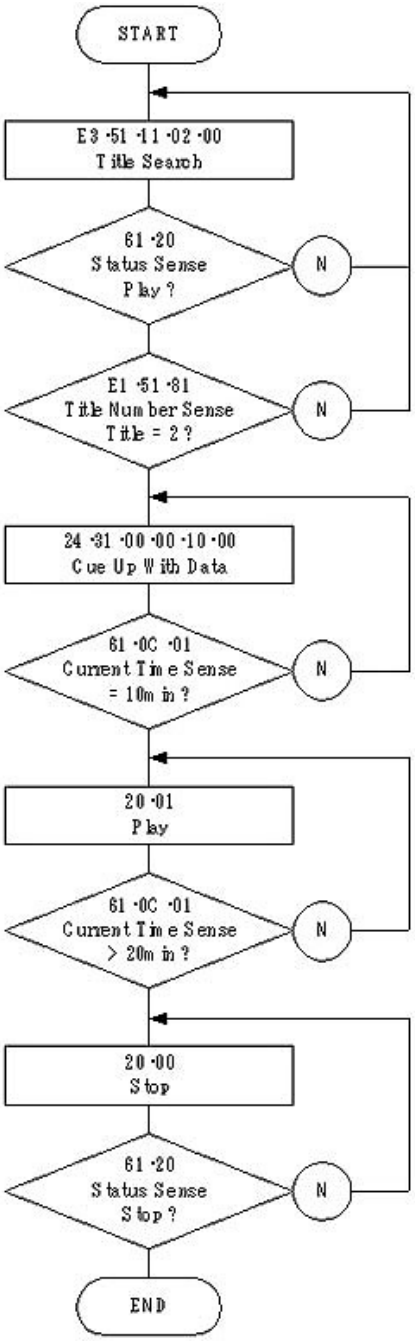
E2 51 9F Mode Data

When the unit receives the ”E1:51:8F Mode Sense” command, the current status of the unit is reported as the value of DATA-2.

DATA – 2	Status of the PRV-LX1
01	During recording and Time Shift PLAY in recording mode
FF	Rec error
71	Executing title delete
75	Executing trimming

7.0 Procedure for Issuing Command

<Example 1>

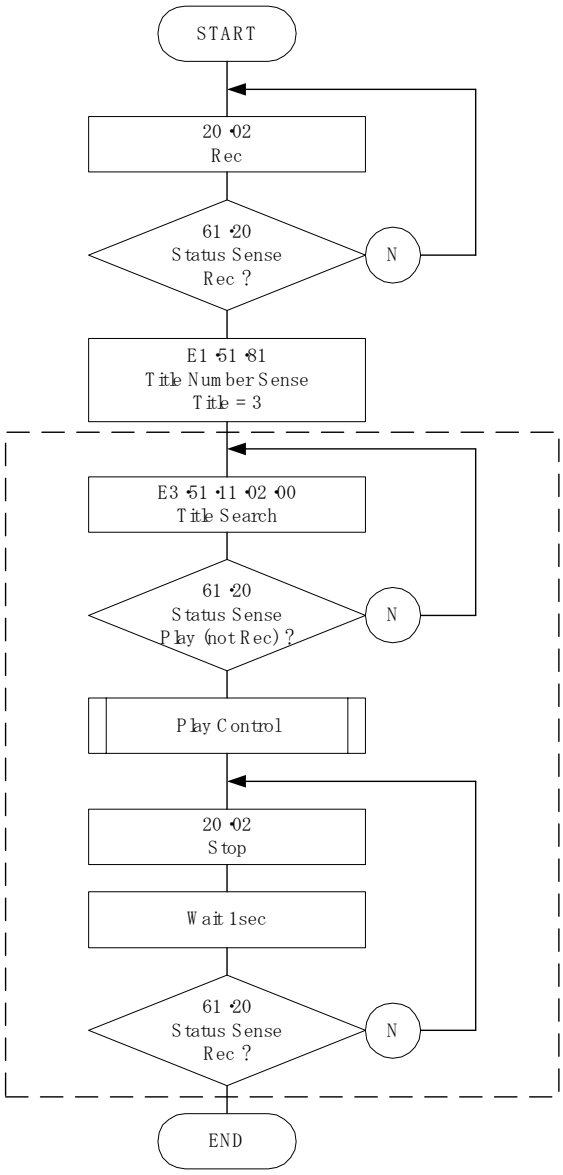


< Example 1> is an example of playing Title 2, from the scene10minutes to 20minutes
“Drive Select” and “Selecting the project” are not possible to be remotely controlled.
It is possible to get total title number of current project by "E1 51 81 Title Number Sense" command in Stop condition.

Total time of the title cannot be acquired directly by a remote command. However, when a title is played by remote commands (e.g. "20 10 Fast Forward"), the title is *Paused* at the end of the title.

To calculate the total time of the title, use the "61 0C 01 Current Time Sense" command when PAUSE is returned by the "61 20 Status Sense " command.

<Figure 2>



<Figure 2> is an example of playing Title 2 while recording Title 3 to HDD.

On HDD Rec, it is possible to play a title other than the title being recorded when the Time Shift PLAY setting is set to Enable.
“20:02 Stop” command stops Play in Time Shift PLAY condition during recording, and stops Recording in Rec condition.

The unit cannot start recording while in Playback mode. It also cannot stop recording directly during TimeShift PLAY. Stop TimeShift PLAY first to stop recording.

8.0 Product-Specific Notes

8.1 Recording Delay

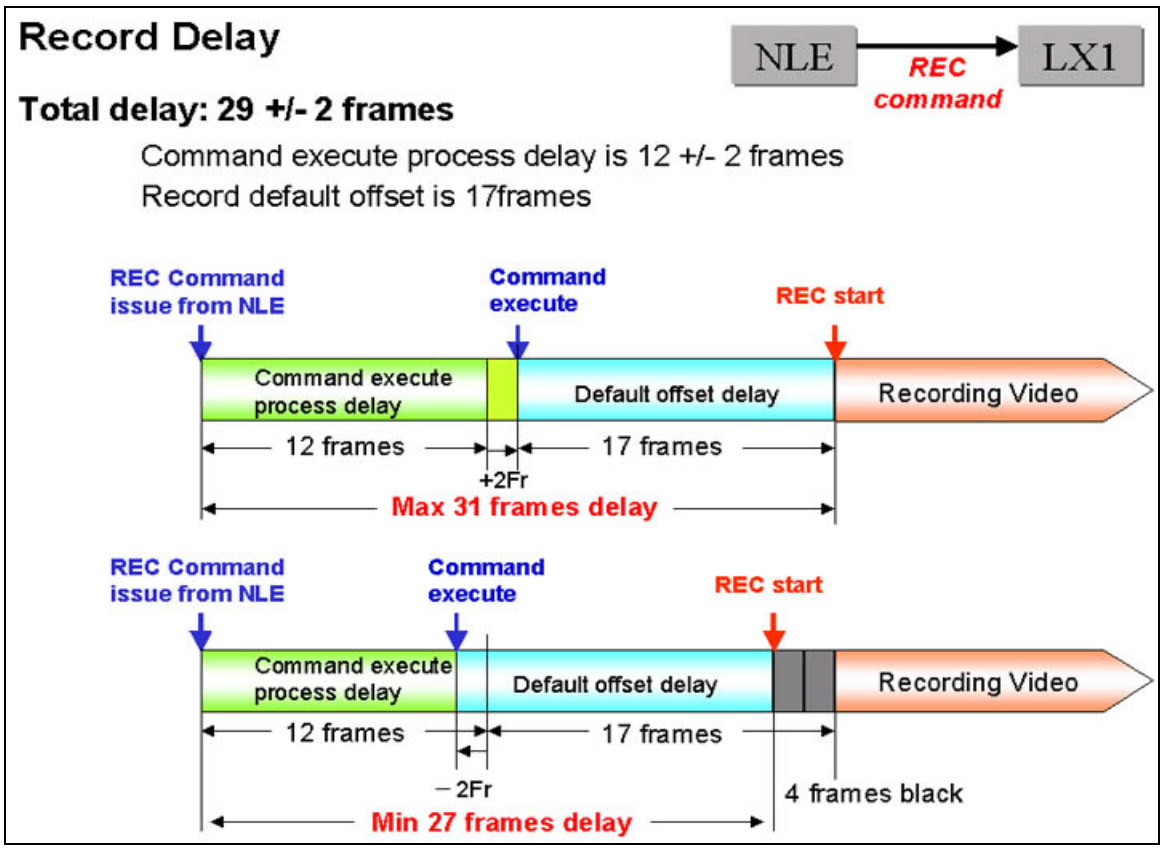
There is a short delay of approximately 29+/-2 frames between when the PRV-LX1 is issued a record command and the command is executed.

This delay is a result of the following:

- Requires 12 frames for encoding system setup
- Execution of the command may take +2 frames
- Execution of the command may take–2 frames
- Record default offset for the LX1 is 17 frames

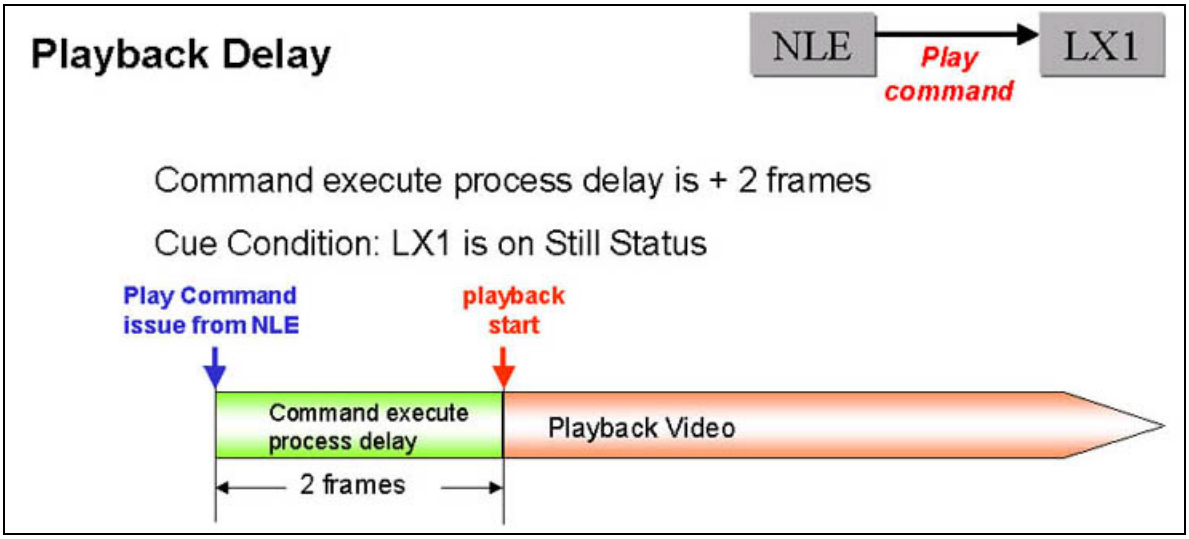
The above delay shows the calculation of a maximum +29 frames +/- 2 frames delay.

Pioneer Electronics suggest that PRV-LX1 users pad these frame times to the head/tail of the selected I/O points to ensure that an entire video sequence is recorded.



8.2 Playback Delay

When the PRV-LX1 is issued a play command, it experiences up to a +2 frames delay in the execution of the command. The decoding system requires 2 frames to accomplish setup.



8.3 PRV-LX1 as Recording Device

When issuing a "pause" command while recording, the PRV-LX1 continues recording within the same title/clip, maintaining continuous time-code.

* *To issue a "pause" command the user must issue a "shuttle 0" command. This pauses the recording to insert a chapter mark at the closest GOP of encoded video then recording continues. The [Auto Chapter] setting should be set to manual.*
* *Issuing a "stop" command closes the recorded title/clip as defined by the DVD spec. All subsequent recordings via serial control start with a new title/clip and the LX1 begins generating new time-code within that title/clip.*

8.4 PRV-LX1 as the Source Device

When the PRV-LX1 is the source device being controlled via serial control with an NLE or edit control device, the following limitation applies.

When an external control device is controlling the LX1 and a "search and play" command is sent via serial control, the PRV-LX1 reports back frame numbers every 50ms. The PRV-LX1 cannot return the precise time-code. The unit may return the same value as requested earlier or may skip the frame while Recording or Playing.

* *Manually record without using serial control when the recorder is to be used as a source. Or, if the external control device offers the ability to change the time-code query speeds, change the speed to 50ms to match the PRV-LX1.*

9.0 Appendix

Command Matrix by System Version

Commands	2.04/1.03	2.51/1.03	≥ 3.00/1.04
00 11 Device Type	X	X	X
20.00 Stop	X	X	X
20.01 Play	X	X	X
20.02 Rec(ord)	X	X	X
20.04 Standby OFF			X
20.05 Standby ON			X
20.0F Eject	X	X	X
20.10 Fast Forward	X	X	X
20.20 Rewind	X	X	X
20.30 Preroll			X
21.11 xx Jog Forward			X
21.12 xx Var Forward			X
21.13 xx Shuttle Forward			X
21.21 xx Jog Reverse			X
21.22 xx Var Reverse			X
21.23 xx Shuttle Reverse			X
22.11 xx yy Jog Forward			X
22.12 xx yy Var Forward			X
22.13 xx yy Shuttle Forward			X
22.21 xx yy Jog Reverse			X
22.22 xx yy Var Reverse			X
22.23 xx yy Shuttle Reverse			X
24.31 Cue Up With Data	X	X	X
44.14 In Preset			X
44.15 Out Preset			X
44 31 Preroll Time Preset			X
4x.30 Edit Preset			X
60 36 Timer Mode Sense	X	X	X
61 0A 01 Gen Data Sense	X	X	X
61 0C 01 Current Time Sense	X	X	X
61 20 xx Status Sense	X	X	X
E1 51 22 Chapter Mark			X
E1 51 75 Trimming			X
E1 51 81 Title Number Sense			X
E1 51 82 Chapter Number Sense			X
E1 51 83 HDD Capa Sense			X
E1 51 8F Mode Sense			X
E2 51 21 n Chapter Search			X
E3 51 11 nn Title Search			X
E3 51 71 nn Title Delete			X
E3 51 72 nn Trimming Title Preset			X
E5 51 73 fsmh Trimming In Preset			X
E5 51 74 fsmh Trimming Out Preset			X

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