Guide

VDCP Protocol

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Revision: 20

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VDCP Protocol Guide

The video disk communications protocol will use a tightly coupled leader-follower methodology. The controlling device will take the initiative in communications between the controlling device (automation) and the controlled device. The topology will be point to point. The video disk protocol conforms to the OSI (open system interconnection) reference model.

Layer 1, is the physical layer which consists of the electrical and mechanical specifications. Layer 2, the data link level covers the synchronization and error control for the information transmitted over the physical link. Layers 3 and 4 provide network functionality and are not applicable. Layer 5, the session layer, provides the control structure for communications between applications: establishes, manages, and terminates connections (sessions) between cooperating applications. Level 6, the presentation layer, contains the control language (dialect). The command tables and command description provides this functionality.

A time line command set has been included for systems that must use the protocol over a non-deterministic network environment.

Revision History

20: Revised 5/31/23

- Brought into authoring system.
- Added VDCP commands for 50p timing.

19: Revised 8/19/09

- Updated documentation template and legal boilerplate.

18: Revised 2/24/03

- Added 2X.67, 3X.67 ASI Program Number commands.

17: Revised 08/04/00

- Added to Command Table the Variable Length ID commands 8X, AX, BX, DX
- Added 3X.05 PORT STATUS extended option for status fields 2 and 3
- Modified 3X.06 POSITION REQUEST description to make it clearer
- Added 3X.10 SYSTEM STATUS extended option for status fields 1 and 2
- Modified 3X.16 ID REQUEST response options to remove ambiguity and to add optional byte to specify handle specifying node

16: Revised 10/19/99

- Modified RETURN DATA Bit Map in ID REQUEST (3X.16) box so Video Type section references Video Type Definition.

15: Revised 10/7/98

- Added 3X.05 Command Queue Full and Network Error to Port Error Status
- Added optional Tape ID to 0X.14 Delete From Archive command

14: Revised 1/29/98

- Added 5X optional Macros and related commands
- Added 3X.16 Optional byte and bits in ID Request
- Added 3X.10 Notes on Largest Contiguous Block in System Status
- Added 8X, AX, BX, DX Variable Length ID commands
- Added optional data in 1X.07 command, define data type
- Added a Variable Play bit in the Port Status 3X.05
- Change Command Execution timing requirements
- Added Video Type Bit in ID Request and Port Status
- Added 5X.66 Prepare ID To Play command
- Added 5X.67 Close ID From Play command
- Added Optional data to 10.01 Play command
- Added Optional data to 2X.24 Cue command

13: Revised 3/28/97

- Modify 2X.27 GET FROM ARCHIVE command supporting detail
- Modify 2X.2A SEND TO ARCHIVE command supporting detail
- Modify 2X.50 rename MOVE FILE to COPY FILE TO command
- Modify 2X.51 rename DELETE FILE to DELETE FILE FROM command
- Add 2X.52 add ABORT COPY FILE TO command

12: Revised 2/25/97

- Modify 3X.05 PORT STATUS command supporting detail

11: Revised 2/24/97

- Modify 2X.27 GET FROM ARCHIVE command supporting detail
- Modify 2X.2A SEND TO ARCHIVE command supporting detail
- Add 1X.0A EE MODE command

10: Revised 2/21/97

- Modify 3X.16 ID REQUEST command supporting detail
- Modify 3X.10 SYSTEM STATUS REQUEST supporting detail

9: Revised 8/30/96

- Added Note on Ids
- Reserved commands for manufacturer compatibility 0X.12, 2X.36, 2X.3B,
- 2X.3C, 2X.3D, 2X.3E, 2X.3F, 2x.43, 2x.44, 2X.45, 2X.C2, 3X.23
- Added 2X.2E SYSTEM DELETE ID
- Added 2X.1D RENAME command
- Added 2X.43 DISK PREROLL command
- Added 3X.25 MULTIPLE PORT STATUS request
- Modify 2X.23 RECORD INIT command supporting detail
- Added 2X.50, 2X.51 MOVE FILE, DELETE FILE commands

8: Revised 2/22/96

- Added 3X.25 MULTIPLE PORT STATUS request
- Added 2X.1D RENAME command
- Added 2X.43 DISK PREROLL command

7: Revised 2/22/95

- Added 3X.15 LIST ID'S ADDED TO ARCHIVE request
- Added ID's Added to archive bit in Status 2 of Port Status 3X.05
- Added System Rebooted bit in Status 3C of Port Status 3X.05
- Added Port Idle Error Bit in Status 3C of Port Status 3X.05
- Added Port Not Playing Error Bit in Status 3C of Port Status 3X.05
- Added ID Not Transferred Error Bit in Status 3B of Port Status 3X.05

- Added ID Transferred Error Bit in Status 3B of Port Status 3X.05
- Added more description of Error bits and causes in Port Status 3X.05
- Changed requirements in RECORD INIT command
- Changed requirements in LIST ID'S ADDED, LIST ID'S DELETED
- Added optional and required command keys in the command table
- Added new fields and bit definitions to SYSTEM STATUS REQUEST
- Added SELECT LOGICAL DRIVE command 2X.2D
- Added RECORD INIT WITH DATA command 2X.2C
- Defined data in COMPRESSION SETTINGS REQUEST 3X.17
- Added requirements to SORT command 2X.20
- Added requirements to ACK and NAK
- Added requirements to Local Enable 0X.0D
- Added Remote Control Disable bit in SYSTEM STATUS 3X.10

6: Revised 12/01/94

- Merged buffer commands into main body
- Change 2X.27 Get from Main to Get From Archive
- Delete 2X.28 Delete from Buffer
- Change 2X.29 Buffer Clear to Clear
- Change 2X.2A Send to Main to Send to Archive
- Delete 3X.20 Buffer Status Req.; Use System Status Request
- Delete 3X.22 Buffer ID Info; Use ID Request
- Change 3X.16 ID Request Bit Map Response

5: Revised 11/15/94

- Add 0X.15 Protect ID
- Add 0X.16 Unprotect ID
- Add 0X.14 Delete from Archive
- Add 2X.1E Preset Standard Time
- Add 2X.1F New Copy
- Add 2X.2B % To Signal Full
- Change H. Phase Adjust to H. Pos. Adjust
- Change Device Type request from 0X.11 to 3X.08
- Add command type 4 Deferred commands
- Add Standard Time to system status
- Change cue/init definition
- Add Appendix Hardware Buffer Protocol

4: Revised 8/8/94

- 2X.23 Change RECORD CUE to RECORD INIT
- 2X.24 Correct the number of data bytes

- 2X.25 Change PLAY CUE WITH DATA to CUE WITH DATA
- 3X.10 Correct typo BLACK TO BLOCK.

  Note: The largest contiguous block is the largest recordable block and in most cases is the same as TOTAL TIME REMAINING.

3: Revised 6/27/94

- Change 3X.11 BC=2
- Change 3X.18 BC=2
- Change 3X.19 BC=2
- 3X.05 Moved ID's added and deleted to port status
- Removed GPI enable from port status
- 3X.06 Replaced bit map with command byte
- 3X.18 Added 'in subsequent transmissions'
- 3X.11 Removed sort byte
- 3X.18 Removed sort byte
- 3X.19 Removed sort byte
- Added SORT MODE command 2X.20

2: Revised 5/13/94

- Change 1X.07 BC=3
- Change 1X.08 BC=5
- Delete 2X.20
- Change 2X.23 Name=Record Init
- Change 2X.24 Name=Cue
- Change 2X.25 Name=Cue with Data
- Change 2X.31 BC=6
- Change 2X.34 Name=Audio In Level
- Delete 2X.35
- Added 2X.35 Audio Out Level command
- Change 2X.3A BC=4, Name=Record Mode
- Change 3X.06 BC (returned)=7
- Change 3X.18 BC=3
- Change 3X.19 BC=3
- Change requirements of 0X.11
- Change requirements of 1X.00
- Change requirements of 3X.05
- Added 3X.01 OPEN PORT command

1: Revised 2/1/94

- Add CUE WITH DATA command 2X.25
- Added RECORD MODE command 2X.3A

- Change requirements of 2X.24 Play Cue
- Change requirements of 2X.25 Play Cue with Data
- Added PRESET command 2X.3A

Electrical and Mechanical Specifications

Note: Although a bit serial mechanism is suggested other data transport systems may be implemented providing levels 5 and 6 are not violated.

Communications Signal

- Asynchronous bit serial, word serial
- Conforms to EIA RS-422A
- Full duplex communications channel
- Transfer rate: 38.4 kb/s

Bit Configuration

- 1 start bit (space)
- 8 data bits
- 1 parity bit (odd)
- 1 stop bit (mark)
- Byte time = .286 msec.

Connection (9 Pin D-subminiature)

PIN	CONTROLLING DEVICE	CONTROLLED DEVICE
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 below.
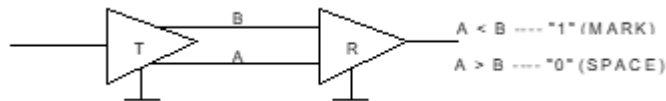
Session Specification

Data communications between the CONTROLLING DEVICE and the CONTROLLED DEVICE is performed in accordance with the following format. The command message is comprised of a sequence between 2 and 256 bytes.

STX	BC	TYPE/UA	CMD-2	DATA-1	DATA-2	DATA-N	CHECKSUM

        CMD-1

- STX : Start of Text Code (02h)
- Byte 1. Byte Count (BC): Indicates the number of bytes between the byte count and the checksum.
- Byte 2. Command 1 : Command 1 consists of a command type nibble and unit address nibble.
- Command Type (4 bits)
  - 0 :SYSTEM COMMAND
  - 1 :IMMEDIATE COMMAND
  - 2 :PRESET/SELECT COMMAND
  - 3 :SENSE REQUEST
  - 4 :DEFERRED (TIMELINE) COMMAND
  - 5 :MACRO COMMAND
  - 6 :NOT DEFINED
  - 7 :NOT DEFINED
  - 8 :VARIABLE ID LENGTH SYSTEM COMMAND
  - 9 :VARIABLE ID LENGTH IMMEDIATE COMMAND (none defined currently)
  - A :VARIABLE ID LENGTH PRESET/SELECT COMMAND
  - B :VARIABLE ID LENGTH SENSE REQUEST
  - C :NOT DEFINED
  - D :VARIABLE ID LENGTH MACRO COMMAND
  - E :NOT DEFINED
  - F :ARCHIVE COMMAND (separate protocol)
- Unit Address (4 bits): Defines the address of a sub-system within the device. The base unit is 0.
- Byte 3. Command 2 : This byte is the command code, it identifies the syntax of the data which follows (if any). A bit map may be added to some command blocks. In the bit map, data corresponding to the designated bit is accessed. The data corresponding to bit map data 1 is added after the map. Data is added sequentially from the low order bit of the map data (figure 3).

The response to command types 0, 1, and 2 is ACK (04h) or NAK (05h). The response to command type 3 will set the most significant bit of the command to a 1, e.g. the response to command 29 is A9. The command codes form a unique device dialect.

Checksum: The 2's complement of the least significant byte of the sum of all command and data bytes from the first command byte to immediately before the checksum.

Examples of command types 1, 2, and 3 are shown below.

Immediate Command

Command Code: 01

Name: Play

Function: Causes the controlled device to enter field lock real time playback state.

Data Format:

01

CMD-
2

Data Configuration:

02	02	10	01	EF

| STX | BC | CMD-1 | CMD-2 | CS |

Return:ACK (04h)

NAK (05h)

Preset/Select Command

Command Code: 39

Name: Select Input

Function: Selects the input format

Data Format:

39	*

CMD-   MODE

2

* Mode Byte:

01h Off (Black w sync)

02h Composite

04h S-Video

08h YUV

10h D1

Data Configuration:

02	03	2X	39	*	

STX	BC	CMD-1	CMD-2	MODE	CS

Return:

ACK (04)

NAK (05)

Sense Request

Command Code: 05

Name: Port Status Request

Function: Requests the port status. The requested data can be designated using a bit map.

Data Format:

05	*

CMD-2   BIT

PSTAT 8	PSTAT 7	PSTAT 6	PSTAT 5	PSTAT 4	PSTAT 3	PSTAT 2	PSTAT 1

* BIT

Data Configuration:

02	03	3X	05	*	

STX	BC	CMD-1	CMD-2	BIT MAP	CS

RETURN:

Command Code: 85

Name: Port Status Return

Function: Sends back port status

Data Format:

85	*1	STATUS DATA

CMD-2	BIT MAP

Data Configuration:

02		3X	85	*1	*2	
STX	BC	CMD-1	CMD-2	BIT MAP	DATA	CS

*1 Same as command 10

*2 See data map

Deferred (Timeline) Command

Any immediate command (type 1) may be delayed for execution at a later time. Command type 4 indicates the commands that follow are to be executed at the time indicated. The time is in BCD and the deferred command has the following format:

02	06	4X	XX	FF	SS	MM	HH	XX
STX	BC	TYPE/UA	CMD	FRAME	SEC	MIN	HOUR	CHKSUM

The time is set using the preset command PRESET STANDARD TIME. The time is read in SYSTEM STATUS 5.

Command Execution

1. To avoid ambiguity in the time at which a type 1 command is executed by the controlled device the following rules apply to execution time.

   ▪ A fixed latency in frames must be established on the PLAY, RECORD, EE MODE, FREEZE, UNFREEZE, STILL, CONTINUE, and PRESET STANDARD TIME commands under all system conditions. No other commands are considered 'frame accurate commands'. These are the only commands required to be frame accurate to produce a broadcast quality feed. They must have an accurate execution time to assure the required frame of video is either recorded, or played and switched on air.

- ▪ A 'frame accurate command' received in its entirety by the end of field 1 will be executed at the beginning of the next frame (or N frames after). A message received in its entirety ending in field 2 will be executed at the beginning of the frame after the next frame (or N+1 frames after).
2. The controlled device will begin its response no more than 6 msec. after the receipt of a completed message from the controlling device. The next command may be a 'frame accurate command, such as play. Delaying a 'frame accurate command' because the controller is waiting for the previous response will cause a delayed playout.
3. The controlling device will not send the next command before receiving the response from the controlled device.
4. The controlling device will not request status in the same frame in which a command is sent.
5. The controlling device will detect time out if no reply is received within 100 msec. of sending a message to the controlled device and then request status.
6. For commands that require extensive time (multiple frames) to complete; the controlled device should provide a command queue to avoid missing commands. The disk system may assert the busy bit in port status any time it cannot accept type 0, 2, 3, or 4 commands. This busy status condition will not effect the receipt or execution of Type 1 (immediate control) commands.

Commands for 50p Timing

To schedule frame accurate commands using VDCP, there will be a toggled bit in the frame byte of the BCD timecode commands.

Field Bit (Used for Selecting Second Field in 50p)	Drop Frame Bit	BCD Frame
0 = First frame	0 = Drop Frame not used	6 bits indicating 25p fields
1 = Second frame	1 = Drop Frame used	6 bits indicating 25p fields

Example:

	Field Bit	DF	BCD Frame	Full 8 Bit Timecode Command
Frame 0	0	0	000000	0000 0000
Frame 1	1	0	000000	1000 0000
Frame 2	0	0	000001	0000 0001
Frame 3	1	0	000001	1000 0001
Frame 4	0	0	000010	0000 0010
...				
Frame 46	0	0	100011	0010 0011
Frame 47	1	0	100011	1010 0011
Frame 48	0	0	100100	0010 0100
Frame 49	1	0	100100	1010 0100

IDs

The protocol is ID based. All audio/video material is referenced or accessed by an ID. The ID must be unique to a given piece of material in the system at all times. The video disk system must be a 'black box' to the controller. It records, and plays back without the controller knowing how or where the audio/video material is encoded, decoded, and stored.

Fixed 8 character IDs:

In major commands 0X, 2X, 3X, and 5X IDs are 8 characters and are to be padded with ASCII spaces (code 20hex) when the ID is less than 8 characters. 8 characters are always to be sent for an ID, and any character not used must be set to a space.

Variable length IDs:

In major commands 8X, AX, BX and DX IDs are not padded with any additional characters beyond the visible ID characters. All IDs are sent as a length byte followed by that number of characters (only visible ASCII characters allowed). All 8X, AX, BX, DX commands are identical to the corresponding 0X, 2X, 3X, 5X command except the 8-character padded ID is replaced with this ID encoding. There are no 1X or 4X commands with IDs, so 9X and CX will not be implemented. The implementation of variable length ID major commands is optional, but all disk systems that implement them should accept all commands equivalent to the 0X, 2X, 3X, 5X commands they implement. Controllers may use all one type of ID encoding major command, or mix them as long as the commands do not conflict.

Commands and replies should not exceed 100 bytes to limit the serial data transmission time and maintain frame accurate commands. On commands involving multiple IDs (ID List, Next, IDs Added…) no more than 80 bytes of ID data should be sent. For example, if each ID was 25 characters, only three IDs should be sent in reply to a List Type Command. This also implies 40 one character IDs (One byte for the ID, one byte for the length of the ID) are the maximum number of IDs that may be sent in a list type reply.

Macros

Commands that require an undefined time to execute may be given MACRO numbers in the range 1..65535. The controlled disk must keep track of macro commands, and inform the controller of the result when they are complete. Optionally, 5X.61 and 5X.62 can provide status and verification of all macros in progress, and 5X.60 provides the ability to abort macros if possible. 5X commands (except 5X.60, 5X.61 and 5X.62.) are macro commands

Macro Complete Returns:

Macro Complete Returns are from a controlled device and are identical to the macro status return 5X.62. Macro Complete Returns are substituted in place of normal port status returns soon after the macro completes successfully or fails for any reason. The Completion State and Code values are listed below under Macro Status Return 5X.62. These completion returns will not be requested by the controller explicitly, but will be substituted in place of normal Port Status Requests. After the controller

ACKs the Macro Complete Return, the controller and controlled disk both remove the macro number from activity and that macro number may be reused in the future.
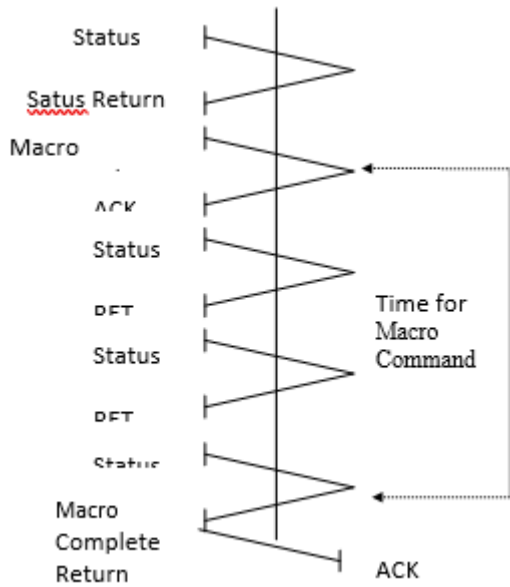
DEVICE MESSAGE FLOW
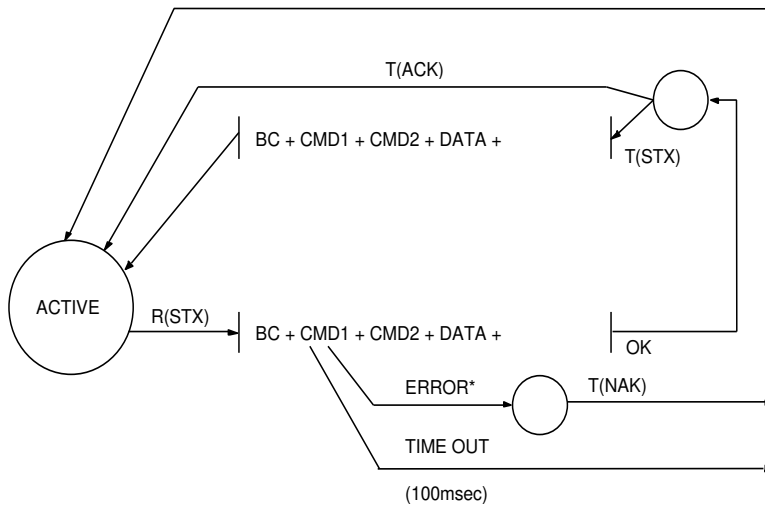
*ERROR

- FRAMING ERROR
- PARITY ERROR
- OVERRUN ERROR
- CHECKSUM

Video Disk Command Table

(All numbers are in hexadecimal)

COMMAND FROM CONTROLLER   RETURN FROM CONTROLLED DISK SYSTEM

B.C	CMD-1	CMD-2	CODE	NAME	B.C.	CMD-1	CMD-2	NAME
02	0X	0C	-Opt	Local Disable			04	ACK
02	0X	0D	-Opt	Local Enable			04	ACK
0A	0X / 8X	14	+Opt	Delete From Archive			04	ACK
0A	0X / 8X	15	+Opt	Delete Protect ID			04	ACK
0A	0X / 8X	16	+Opt	UnDelete Protect ID			04	ACK
B.C.	**CMD-1**	**CMD-2**	**CODE**	**NAME**	**B.C.**	**CMD-1**	**CMD-2**	**NAME**
02	1X	00	-Req	Stop			04	ACK
02	1X	01	-Req	Play			04	ACK
02	1X	02	-Req	Record			04	ACK
02	1X	03	-Opt	Freeze			04	ACK
02	1X	04	-Opt	Still			04	ACK
02	1X	05	-Opt	Step			04	ACK
02	1X	06	-Opt	Continue			04	ACK
03	1X	07	-Opt	Jog			04	ACK
05	1X	08	-Opt	Vari. Play			04	ACK
02	1X	09	-Opt	Unfreeze			04	ACK
03	1X	0A	-Opt	EE Mode			04	ACK
B.C.	**CMD-1**	**CMD-2**	**CODE**	**NAME**	**B.C.**	**CMD-1**	**CMD-2**	**NAME**
12	2X / AX	1D	+Opt	Rename ID			04	ACK
07	2X	1E	+Opt	Preset Std. Time			04	ACK
1A	2X / AX	1F	+Opt	New Copy			04	ACK
03	2X	20	+Opt	Sort Mode			04	ACK
03	2X	21	-Req	Close Port			04	ACK
03	2X	22	Req	Select Port			04	ACK
0E	2X / AX	23	-Req	Record Init			04	ACK
0A	2X / AX	24	-Req	Play Cue			04	ACK
12	2X / AX	25	-Opt	Cue with Data			04	ACK
0A	2X / AX	26	+Req	Delete ID			04	ACK

0A	2X / AX	27	+Opt	Get From Archive			04	ACK
02	2X	29	+Opt	Clear			04	ACK
0A	2X / AX	2A	+Opt	Send to Archive			04	ACK
03	2X	2B	+Opt	% to Signal Full			04	ACK
12	2X / AX	2C	-Opt	Record Init with Data			04	ACK
03	2X	2D	-Opt	Select Logical Drive			04	ACK
0A	2X / AX	2E	-Opt	System Delete ID			04	ACK
02	2X	30	-Opt	Preset			04	ACK
06	2X	31	-Opt	Vid. Compr. Rate			04	ACK
03	2X	32	-Opt	Aud. Sample Rate			04	ACK
03	2X	33	-Opt	Aud, Comp. Rate			04	ACK
04	2X	34	-Opt	Audio IN Level			04	ACK
04	2X	35	-Opt	Audio OUT Level			04	ACK
06	2X	37	-Opt	Vid. Compr. Param.			04	ACK
03	2X	38	-Opt	Select Output			04	ACK
03	2X	39	-Opt	Select Input			04	ACK
04	2X	3A	-Opt	Record Mode			04	ACK
04	2X	41	-Opt	SC Adjust			04	ACK
04	2X	42	-Opt	H. Pos. Adjust			04	ACK
04	2X	43	-Opt	Disk Preroll			04	ACK
0C+	2X / AX	50	-Opt	Copy File To			04	ACK
0B+	2X / AX	51	-Opt	Delete File From			04	ACK
0B+	2X / AX	52	-Opt	Abort Copy File To			04	ACK
04	2X	67	-Opt	ASI PID Select			04	ACK
B.C.	**CMD-1**	**CMD-2**	**CODE**	**NAME**	**B.C.**	**CMD-1**	**CMD-2**	**NAME**
04	3X	01	Req	Open Port	03	3X	81	Grant/ Denied
02	3X / BX	02	+Req	Next	XX	3X	82	List of ID's
02	3X / BX	03	+Opt	Last	XX	3X	83	Last Response
03	3X	05	+Req	Port Status Request	XX	3X	85	State Status
03	3X	06	-Opt	Position Request	07	3X	86	Position
02	3X / BX	07	-Opt	Active ID Request	11	3X	87	Active ID

02	3X	08	+Opt	Device Type Request	XX	3X	88	Device Type
03	3X	10	+Req	Syst. Status Request	XX	3X	90	System Status
02	3X / BX	11	+Req	ID List	XX	3X	91	List of ID's
0A	3X / BX	14	+Opt	ID Size Request	06	3X	94	ID Size
02	3X / BX	15	+Opt	ID's Added to Arch.	XX	3X	95	List ID's Trans.
0A	3X / BX	16	+Req	ID Request	03	3X	96	ID Presence
03	3X	17	-Opt	Compr. Settings Request	XX	3X	97	Compr. Settings
02	3X / BX	18	+Req	ID's Added List	XX	3X	98	List ID's Added
02	3X / BX	19	+Req	ID's Deleted List	XX	3X	99	List ID's Deleted
04	3X	25	-Opt	Multi Port Status Request	XX	3X	A5	State Status
04	3X	67	-Opt	ASI Program Number Request				
03	5X	60	+Opt	Abort Macro#			04	ACK
02	5X	61	+Opt	Active Macro List	XX	5X	E1	Active Macro(s)
03	5X	62	+Opt	Macro Status	XX	5X	E2	Macro Return
0C+	5X / DX	63	+Opt	Copy File To			04	ACK
0A	5X / DX	64	+Opt	Get From Archive			04	ACK
0A	5X / DX	65	+Opt	Send to Archive			04	ACK
0A+	5X / DX	66	-Opt	Prepare ID To Play			04	ACK
0A	5X / DX	67	-Opt	Close ID From Play			04	ACK

B.C. = Byte Count of command or reply, or command or reply length.

Legend for Code Column

Req = Required command for a controller application to function

Opt = Optional command, and is not needed for a controller application to function, but may augment the controllers functions if implemented. Note that these commands should be replied with and ACK if not implemented in a disk system so no error message is generated and error handling performed by the controller, but the Not Supported bit in Error Status 3A of the PORT STATUS REQUEST should be set.

+ = If implemented, command is based on a communications port, not a signal port. It must function even if no signal port is open or selected.

- = If implemented, command is based on a signal port, not a communications port. It can only function if a signal port is open and selected.

In those cases where there are two possible values for the CMD-1 code, the alternatives are to distinguish between the command format for fixed eight-character IDs and that for variable length IDs. Please refer to the description of IDs in Section 2 of this manual for more information.

The following commands are reserved to maintain manufacturer compatibility with existing systems: 0X.12, 2X.28, 2X.36, 2X.3B, 2X.3C, 2X.3D, 2X.3E, 2X.3F, 2X.43, 2X.44, 2X.45, 2X.70, 2X.71, 2X.C2, 3X.20, 3X.21, 3X.22, 3X.23, 3X.24, 3X.60, 3X.78, 3X.79, 3X.7A, 3X.7B, 3X.7C, 3X.7D, 3X.7E, 3X.7F, FX.XX (archive commands).

Command Description

General

Unless otherwise specified, in the bit maps, a bit set (1) is true. The LSB is the 'right'' bit and the MSB the 'left' bit. All numbers are in hexadecimal. All time values are in frames, seconds, minutes, hours in BCD with the frames sent first and hours sent last.

04 : ACK

When the CONTROLLED DEVICE receives a command from the CONTROLLING DEVICE the CONTROLLED DEVICE will return the command as acknowledgment. All commands defined in this protocol should be ACKed, (except when a message or status reply is sent back to the controller instead) even if not implemented by the disk. When a command that has not been implemented is received and ACKed, the Not Supported bit in Status 3A of the PORT STATUS request should be set.

05 : NAK

When the CONTROLLED DEVICE has detected any of the errors below or does not recognize the command as one from this protocol, it will send back this reply as negative acknowledgment to the CONTROLLING DEVICE. Depending on the nature of the error, one of the RETURN DATA-1 bits will be set. NAK will always return 2 bytes.

RETURN DATA-1

BIT-7	BIT-6	BIT-5	BIT-4	BIT-3	BIT-2	BIT-1	BIT-0
TIME OUT	FRAMING ERROR	OVERRUN ERROR	PARITY ERROR		CHECKSUM ERROR		UNDEFINED ERROR

Undefined Error:

The command received could not be interpreted as one from this protocol. - Command Ignored.

Checksum Error:

The checksum of the data received (as calculated by the disk system per this protocol) does not match the checksum that was sent in the last byte of the command - *Command Ignored.*

Parity Error, Overrun Error, Framing Error:

Per RS-422 definition or communications definition (generally detected by communications hardware). - *Disk system flushes input buffer and waits for new message.*

Time Out:

When more than 10 milliseconds has past since last byte was received and the number of bytes required by the byte count has not been received, or if only one byte has been received. - *Disk system flushes the input buffer and waits for a new message.*

System Commands

0X.0C : LOCAL DISABLE

If the CONTROLLED DEVICE receives this command, all operations on its control panel except REMOTE/LOCAL selection will be disabled.

0X.0D : LOCAL ENABLE

If the CONTROLLED DEVICE receives this command, control panel operations of the CONTROLLED DEVICE will be enabled. Both remote control and panel control operations may occur unless the control panel REMOTE/LOCAL selection is set to LOCAL. *See SYSTEM STATUS, Status 3 for the Remote Control Disable (LOCAL) status bit.*

0X.14 : DELETE FROM ARCHIVE

This command removes the ID from archive storage. It does not remove the ID from the video disk if it exists there. The DELETE FROM ARCHIVE command functions whether or not the ID is on the video disk.

SEND DATA 1 to SEND DATA 8 contain the ID to be deleted from archive.

SEND DATA 9 is an optional flag to indicate a TAPE ID is to follow, and its length in bytes.

SEND DATA 10 to SEND DATA 10+((SEND DATA 9) -1) is an optional parameter, which is the TAPE ID from which to delete the ID. This data is only available if SEND DATA 9 exists and is greater than zero. The number of bytes to read is indicated in SEND DATA 9.

0X.15 : DELETE PROTECT ID

This command prevents an ID from being deleted by an ID DELETE command. An UNPROTECT command must be used to enable DELETE ID once the ID is protected. The PROTECT ID command has no effect on the ID being played or copied.

SEND DATA 1 to SEND DATA 8 contain the ID to be protected.

0X.16 : UNDELETE PROTECT ID

This command is the opposite of Protect ID and allows the ID to be deleted but does not delete the ID by itself. This command has no effect on the ID being played or copied.

SEND DATA 1 to SEND DATA 8 contains the ID to be unprotected.

Immediate Commands

1X.00 : STOP

The STOP command will return the selected port to the IDLE state.

The STOP command can be issued to a port in any state. When in IDLE, the port will output black. Any material that is playing out, CUED or cueing is aborted. No action will result if the STOP command is received when no material is PLAYing. If the port was in the RECORD state, then the system will stop recording at the next REF interval. A partial recording will have occurred and the internal database for the length of the material will be updated to reflect this reduced length. The part of the material received is kept stored on the disk and is available for play.

1X.01 : PLAY

The PLAY command causes the specified ID to play out.

SEND DATA 1 is the optional Prepared File Handle, which must be included if *and only if* the Prepare ID To Play command was issued for this ID. If SEND DATA 1 is included, it indicates which Prepared File Handle to play. If the port status contains CUE/INIT DONE, then the PLAY command causes the ID specified by the preceding CUE command to start being played out of the selected port. If the system is currently playing a spot and the next spot is already cued when a PLAY command is received, then the current spot will be aborted and replaced by the new spot.

It is recommended that the port should remain in PLAY and continuously output the last frame of video (audio mute) of the ID if the media in play reaches the end of the ID and a STOP or another PLAY command has not been received. This prevents drops to black if a few frame gaps are in between playing of IDs and permits easy verification of the last frame of video after an ID is recorded onto the disk. In all other cases, the disk should output black.

An example of a normal command sequence to play 4 spots is:

1. PLAY CUE or CUE WITH DATA (Spot 1)

   PLAY (Spot 1 starts playing)
2. PLAY CUE or CUE WITH DATA (Spot 2) (This is sent right after Spot 1 starts playing)

   PLAY (Spot 1 ends, Spot 2 start playing on next frame)
3. PLAY CUE or CUE WITH DATA (Spot 3) (This is sent right after Spot 2 starts playing)

   PLAY (Spot 2 ends, Spot 3 start playing on next frame)
4. PLAY CUE or CUE WITH DATA (Spot 4) (This is sent right after Spot 3 starts playing)

   PLAY (Spot 3 ends, Spot 4 start playing on next frame)
5. STOP (Spot 4 ends, Disk is Idle)

If this disk was to play out the next commercial pod and the program material was played out by another device, the PLAY CUE or CUE WITH DATA command would be sent for the first spot in the next commercial pod right after the PLAY command for Spot 4. The STOP command would not be sent. This sequence would keep the disk cued for the next spot at all times.

1X.02 : RECORD

Issuing the RECORD command will cause the system to begin recording on the next REF interval. It will also clear the CUE/INIT and cueing bits in the port status.

The RECORD command may only be issued when the port has been prepared for recording with a RECORD INIT. If a RECORD INIT command had not been issued prior to the RECORD command, an error will result (not in cue/init state) and the port will remain in its former state. If CUE/ INIT DONE, the system will then record for the LENGTH specified in the RECORD CUE command. At the end of the record interval, the port will leave the record state and return to the IDLE state.

An example of a command sequence that is used to record new material into the disk system is:

• RECORD INIT or RECORD INIT WITH DATA (Spot 1)
• RECORD (Starts recording Spot 1)
• STOP (Ends recording of Spot 1)

If the port status contains CUE/INIT DONE, then the RECORD command causes the ID specified by the preceding RECORD INIT command to start recording. An Input Port is the only Port that can add to the contents of the disk system. All recording is done through Input ports.

Recording material into the system requires the sequence RECORD INIT, RECORD. At any point in time the port can be in one of three states: IDLE, INIT or RECORD. If back to back recording is permitted, then the command sequence may be extended as in the PLAY example above.

It is recommended to output the input signal on the corresponding output port (i.e. E.E. to output port 1 if recording on input port 1) if it is not currently selected by a different port.

1X.03 : FREEZE

The FREEZE command causes the system to TAKE a single frame from the incoming video stream (input port only).

A typical sequence using FREEZE would be to issue FREEZE when the desired signal input is present and the input port is in idle. This gates off the input signal retaining the last video frame as the port's input. Next a RECORD INIT is issued, (which specifies ID and duration), then a RECORD and after the duration elapses, a STOP is issued. The STOP command acts like an UNFREEZE command at any time. Alternately an UNFREEZE can be issued any time, before or during record to return to normal signal input.

1X.04 : STILL

The STILL command causes the currently playing ID to pause.

The last frame played prior to receiving the STILL command will continue being displayed. The output port must be in PLAY, or in the CUED state or an error will be logged. Play of the current ID is resumed by a CONTINUE command.

1X.05 : STEP

The STEP command causes the currently playing and paused ID in STILL state or in a play state to advance to the next frame and STILL. The output port must be in a PLAY, CUED, or STILL state or an error will be logged. This is equivalent to JOG with +1 data.

1X.06 : CONTINUE

The CONTINUE command causes the ID currently in the STILL state or a PLAY STATE to exit that state and continue playing. The output port must be in a PLAY, CUED, or STILL state or an error will be logged.

1X.07 : JOG

The JOG command causes the controlled device to move the specified number of frames forward or backward with respect to its current position. The output port must be in a PLAY, CUED, or STILL state or an error will be logged.

SEND DATA-1 can be either one or four bytes.

- **A one byte field:** contains an 8 bit signed number (2's compliment) indicating the range from +128 to -128 frames.
- **A four byte field:** contains a 32 bit signed number (2's compliment) indicating the range from +2592000 to –2592000 frames. The four byte field is large enough to 'jump' to any relative position in a video file up to 24 hours in length. MSB is sent first.

1X.08 : VARI. PLAY

When the VARIABLE PLAY command is received the controlled device will start running in accordance with the speed and direction data defined in SEND DATA-1, SEND DATA-2, and SEND DATA-3. The output port must be in a PLAY, CUED, or STILL state or an error will be logged. The port state will then be in PLAY.

SEND DATA-1, SEND DATA-2, and SEND DATA-3 contain a 24 bit signed binary 2's complement number that represents the direction and speed at which the output signal port should play.

Scale:

> 000000h = still
> 010000h = std play speed forward
> 7F0000h = approximately 127 times std. play speed forward
> FF0000h = standard play speed reverse
> 800000h = 128 times std. play speed reverse

1X.09 : UNFREEZE

The UNFREEZE command causes the system to return to standard input.

1X.0A : EE MODE

SEND DATA 1 specifies the EE MODE to put the output in.

When SEND DATA 1 is zero: the output should be put in the EE OFF mode. EE OFF specifies that the input signal is not routed through to the output.

When SEND DATA 1 is a value of one: the output should be put in the EE ON mode. EE ON specifies the input signal is always routed through to the output.

When SEND DATA 1 is a value of two: the output should be put in the EE AUTO mode. EE AUTO specifies the input signal is routed through to the output when the video port is not in play mode, and the playing material is routed through to the output when the video port is in play mode. This is an immediate command that takes effect on the current or selected video port only.

Preset/Select Commands

2X.1D : RENAME ID

This command renames an ID in the video disk from the Original ID to the New ID.

The Original ID will no longer exist once the command is executed. Video data does not need to be changed. The disk must put the Original ID in the ID's Delete List, and the New ID in the ID's Added List. It must also set both the ID's Added and ID's Deleted in the port status data.

The data format is; SEND DATA 1 to SEND DATA 8 the Original ID, SEND DATA 9 to SEND DATA 16 New ID.

The disk may set the busy bit, (bit 6 Byte 1 in PORT STATUS 1) begin the operation, and clear the busy bit when the operation is complete. All busy bit rules apply (see STATUS DATA).

2X.1E : PRESET STANDARD TIME

Sets the standard time used by the reference timer for deferred commands.

When the PRESET STANDARD TIME command is received, the standard time specified starts at the next field one and is incremented by vertical frame reference. The time mode shall be specified in SEND DATA 1, 00h DF, 01h non-drop. 02h PAL. SEND DATA 2 to SEND DATA 5 is the time in BCD as follows: frames, seconds, minutes, hours in BCD. Standard time may be queried with the SYSTEM STATUS REQUEST Status 5.

2X.1F : NEW COPY

This command creates a new ID in the video disk from an existing ID.

How this command is implemented in the video disk is device dependent. Ideally no copy of media data will result. A new ID would be entered into the disk's ID table with pointers to the existing media data. Alternately a direct data copy could be done so media quality would not be lost in the encode and decode processes, but this takes more time and storage space

If the first two methods cannot be performed, then a full copy of the media could be executed. In any implementation the NEW COPY command must have no effect on the original ID. It may be played or deleted as if no NEW COPY was implemented. The new copy is independent of the original file. It may be played or deleted as if created with the record command. Multiple new copies (including overlapping media data) of and ID may be made. When the original file is deleted, any media data not associated with a valid ID should be released and the disk space available for use.

The original purpose of this command is to allow a recorded program to be segmented into smaller spots that would then be played out with breaks in between, or as individual completed spots.

The data format is; SEND DATA 1 to SEND DATA 8 the original ID, SEND DATA 9 to SEND DATA 16 new ID, SEND DATA 17 to SEND DATA 20 offset to start the new copy within the original ID, and SEND DATA 21 to SEND DATA 24 duration of the new ID. If the offset and duration exceeds the original file length, the new file will start at the file offset and go to the end of the original file.

The disk may set the busy bit (bit 6 Byte 1 in PORT STATUS 1) and begin the operation. The disk may also clear the busy bit when the operation is complete.

Note: All busy bit rules apply (see STATUS DATA).

SB100	Original Media ID

*	SB1	*	SB2	*	SB3	*	New Media IDs

2X.20 : SORT MODE

The SORT MODE command is used to set a particular sort order.

SEND DATA 1 contains the sort order. A 0 requests the ID's be returned in alphabetic order and a 1 requests that the ID's be returned in FIFO order (oldest items listed first, newest items listed last). The default mode must be FIFO upon disk system power up, and must be the mode used if this command is not implemented. This is because a controller can always sort an ID list into alphabetical order, but there is no other way for a controller to determine the oldest spots on the disk for automatically deleting the oldest items that are not needed.

The disk may set the busy bit (bit 6 Byte 1 in PORT STATUS 1) begin the sort and clear the busy bit when the sort is complete.

Note: All busy bit rules apply (see STATUS DATA).

2X.21 : CLOSE PORT

The CLOSE command is used to break communication to a Signal (audio/video) Port connection established by a preceding OPEN command. PORT is a number representing the available video ports as in OPEN.

SEND DATA 1 contains an 8 bit signed number representing PORT.

2X.22 : SELECT PORT

The SELECT PORT command selects a Signal Port from the signal ports that are currently opened by this communications port.

All subsequent commands arriving at the associated RS-422 port will be routed to the assigned Signal Port until another SELECT PORT command is received. Only one signal port may be selected by a single communications port at any time. A CLOSE, or SELECT PORT command following, breaks or closes this selection. PORT is a number representing the available I/O signal ports.

SEND DATA 1 contains an 8 bit signed number representing PORT.

2X.23 : RECORD INIT

Issuing the RECORD INIT command with a Video Input Port selected causes the system to prepare for recording.

The RECORD INIT command consists of the command itself followed by an ID, followed by a LENGTH. The ID is an 8 character identifier. The LENGTH is the duration of record in FRAMES SECONDS MINUTES HOURS (BCD) format. The RECORD INIT command may be issued when the signal port is recording, if the disk system supports back to back records. In this case every frame of video is recorded.

Upon the next RECORD command the disk will direct all video data starting on the next frame to the new ID or file name (this feature is required for a video disk to perform a delay box function using a single input port). If the disk system does not support back to back recording and the port is not in the IDLE state when a RECORD INIT command is received, an error is logged and the port remains in its prior state. The disk system should check if the ID is unique.

- **If the ID is not unique:** then an error is logged in the ID Already Exists bit in PORT STATUS byte 3C, and the port is left in the IDLE state.
- **If the ID is unique:** then the port is put into the CUE/INIT state while initializing. When initialized and the port is ready to receive a RECORD command then the CUE/INIT DONE bit is set in the port status. The CUE/INIT bit may or may not be cleared, but both must be cleared when a record or stop command is received.

The requirement for the disk to verify that there is enough disk space to record a clip is not needed. The controller can obtain the available space through the SYSTEM STATUS REQUEST and make that decision. As the recording occurs, the controller may delete items to keep disk space available for the current record.

If an output port is selected, an error is generated. An error condition will result in the appropriate bit being set in the port status error byte. When the media file for the ID is available for play out from the disk (this may be as soon as recording has started, or when recording is complete), the ID must be put into the ID ADDED LIST for all communications ports. This includes the port that issued the record command. This action will also cause the ID'S ADDED bit to be set in the Status 2 byte of the PORT STATUS for all communications ports.

SEND DATA 1 to SEND DATA 8 contain the ID, SEND DATA 9 to 12 contain the desired length in BCD.

2X.24 : PLAY CUE

The PLAY CUE command causes the selected port to prepare to play the specified ID.

The video disk should accept the PLAY CUE command while playing another ID, cueing the new ID so that it may get a play command any time during the play of the current ID or after the current ID is played out. If the disk is cueing or currently in the cued state, then the previous ID that is cueing or cued should be aborted, and the new ID cued for play out. If the disk is idle when a cue command is received, it should cue the ID for play out and wait for a PLAY command. If the ID is not found, then an error occurs and the status returns to its previous state. When the command is received and validated that the disk can cue, the CUE/INIT bit in the port status is set. When the cueing process is complete and the ID is available to play the CUE/INIT DONE bit in the port status should be set.

The PLAY command may only be sent when the CUE/INIT DONE bit is set or and error will be logged for the PLAY command. When the PLAY command is received, the material will begin playing on the next video reference interval. If another CUE command is received prior to receiving a PLAY command, the previous CUE will be aborted and CUE process will begin for the new ID. The cueing bit may be cleared or left active once cued, but both CUE/INIT and CUE/INIT DONE bits must be cleared when a PLAY or

STOP command is received. The port must be a signal output port or an error is logged and the port will remain in its previous state.

It is recommended that once the CUE/INIT DONE bit is set (the disk is cued), and the disk is not playing a previous ID, that the disk blacks until a PLAY, STOP, or CUE command is received. This prevents any incorrect video picture from being played to air if there is a video disk/switcher-timing mismatch. If still video is output, and the switcher switches the video disk to air a few frames early or late then undesired frames will be seen. Outputting black video will hide this defect. For previewing purposes, it is desirable to see the first frame of video of a clip that is cued. This could be accomplished either through a user configurable setting in the video disk on a video port by video port basis (just set on preview ports). This could also be accomplished by allowing the customer to send the STILL command when in the CUE DONE state which would cause the video disk to display the first frame of video.

SEND DATA 1 to SEND DATA 8 contain the ID to be cued for Play. SEND DATA 9 is the optional Prepared File Handle data. SEND DATA 9 must be included if *and only if* the Prepare ID To Play command was issued for this ID. If SEND DATA 9 is included it indicates which Prepared File Handle to cue. Note that a prepared file may or may not have the optional Duration and Start Of Message data included.

2X.25 : CUE WITH DATA

This command is similar to the CUE command but allows play out of just a part of the ID.

SEND DATA 1 to SEND DATA 8 contains the ID, SEND DATA 9 to 12 contains the start position within the ID (play out start) and SEND DATA 13 to SEND DATA 16 contains the duration (play out duration). This command is not permitted on files that have been prepared with the PREPARE TO PLAY ID command.

Example: Fred1--2235070000300600

ID BYTE 0	DATA 2 (46H)	
ID BYTE 1	DATA 3 (52H)	
ID BYTE 2	DATA 4 (45H)	
ID BYTE 3	DATA 5 (44H)	
ID BYTE 4	DATA 6 (31H)	
ID BYTE 5	DATA 7 (20H)	
ID BYTE 6	DATA 8 (20H)	
ID BYTE 7	DATA 9 (20H)	
FRAME X10	FRAME X1	DATA 10 (22H)

SEC X10	SEC X1	DATA 11 (35H)
MIN X10	MIN X1	DATA 12 (07H)
HR X10	HR X1	DATA 13 (00H)
FRAME X10	FRAME X1	DATA 14 (00H)
SEC X10	SEC X1	DATA 15 (30H)
MIN X10	MIN X1	DATA 16 (06H)
HR X10	HR X1	DATA 17 (00H)

2X.26 : DELETE

The ID DELETE command is used to remove material from the disk system

If the ID is in the Get From Archive List still to be transferred to the disk, it should be removed from the Get From Archive List. When the media file for the ID is deleted from the disk, the ID must be put in the ID'S DELETED LIST for all communications (including the port that issued the delete command). This will cause the ID'S DELETED bit to be set in the Status 2 byte of the PORT STATUS for all communications ports.

SEND DATA 1-8 contain the ID name to be deleted.

Upon receipt of an ID DELETE command, the system will check if the ID is present in the system. If the ID is not found, then an error will be logged (the 'ID Not Found' bit being set in the PORT STATUS error byte 3B).

If the ID is present the system will check to see if the ID is currently active on any signal port.

If the ID is active on a signal port, an error will be logged in the Port Playing/Active bit of PORT STATUS byte 3C. If the ID is not active on a signal port, the system will check so see if the ID has been delete protected.

If the ID is delete protected, an error will be logged in the ID Delete Protected error bit in PORT STATUS byte 3B, and the ID is not deleted, otherwise the ID will be deleted from the system.

2X.27 : GET FROM ARCHIVE

Issuing the GET FROM ARCHIVE command causes the disk to place the ID on the Get From Archive List and to transfer material to the selected disk. The GET FROM ARCHIVE command is only valid on a system that has an archive sub-system. The command can be issued with the system in any state.

Sequential GET FROM ARCHIVE commands are added to a Get From Archive List. The disk must queue up successive GET FROM ARCHIVE commands and process them one at a time as its time permits.

The GET FROM ARCHIVE command consists of the GET FROM ARCHIVE command itself followed by and ID and an optional TAPE ID. The ID is an 8 character identifier. The TAPE ID, if present, will have its length byte first followed by the number of characters specified in the length byte. When the GET FROM ARCHIVE command is received, the system checks if the ID is present in the archive system. If it is not present, an error is logged and nothing is added to the Get

From Archive List. Otherwise the ID is added to the Get From Archive List.

Material can be added to the disk receiving the material until it is full. If the disk becomes too full for the next media transfer, the 'disk full' bit (bit 5 in the first port status error byte) should be set. When space becomes available the next ID should be transferred. Setting the % to signal full to an appropriate value will prevent delays in transferring. When the ID has completed transfer into the Disk, the ID should be added to the ID's Added List for every communications port on the disk. This will also set the ID's Added bit in the PORT STATUS for every communications port

If an Archive transfer fails the disk must set the ID NOT TRANSFERRED FROM ARCHIVE error bit in the Port Status, and add the ID that failed to transfer to the IDs DELETED LIST. In this way the controller will know that the ID will not be transferred in.

SEND DATA 1 to SEND DATA 8 contain the ID name to be copied from archive to disk.

SEND DATA 9 is an optional flag to indicate a TAPE ID is to follow, and its length in bytes.

SEND DATA 10 to SEND DATA 10+((SEND DATA 9) -1) is an optional parameter, which is the TAPE ID from which to get the ID. This data is only available if SEND DATA 9 exists and is greater than zero. The number of bytes to read is indicated in SEND DATA 9.

2X.29 : CLEAR

The purpose of the CLEAR command is to remove all files that are currently on the disk and clear the 'get from archive list'

The CLEAR command can only be issued with the selected port in the IDLE state. An error condition will result in the appropriate bit being set in the port status error bytes. This command should only be used manually for maintenance. The Clear command should not be issued by an automation controller.

2X.2A : SEND TO ARCHIVE

The SEND TO ARCHIVE command causes the disk to place the ID on the 'send to archive list' and initiate the transfer of the media file to its associated archive. SEND DATA 1-8 contains the ID name. This command is only valid on a system that has an archive sub-system.

Copying of the media file should be done in the background without disturbing any other operations, e.g. recording the next spot. The disk must queue up the SEND TO ARCHIVE requests and process them one at a time as processing time permits. SEND TO ARCHIVE does not remove the media file from the

disk or affect the file in any way. If the archive is full an error is logged. If SEND DATA 9 exists and is non zero, the following number of bytes specified by SEND DATA 9 are read as the TAPE ID.

If the TAPE ID does not exist, the archive system should create the TAPE ID if it can. If the TAPE ID does not exist and the archive can not create it, an error is logged and the ID is not sent to the archive. When the ID has successfully transferred into the archive, the ID must be added to the IDs ADDED TO ARCHIVE LIST and the IDs ADDED TO ARCHIVE BIT set in the Port Status

If an Archive transfer fails the disk must set the ID NOT TRANSFERRED TO ARCHIVE error bit in the Port Status. The controller will know the ID was not transferred to the archive since the ID will not be added to the IDs ADDED TO ARCHIVE LIST.

SEND DATA 1 to SEND DATA 8 contain the ID name to be copied from disk to archive.

SEND DATA 9 is an optional flag to indicate a TAPE ID is to follow, and its length in bytes.

SEND DATA 10 to SEND DATA 10+((SEND DATA 9) - 1) is an optional parameter which is the TAPE ID to which to copy the ID. This data is only available if SEND DATA 9 exists and is greater than zero. The number of bytes to read is indicated in SEND DATA 9.

2X.2B : % TO SIGNAL FULL

The %TO SIGNAL FULL command alerts operator to % of disk space available.

SEND DATA 1 is a number between 0 and 100 that represents the % of disk space still available when the full flag bit should set in the system status 3 DISK STATUS request. This should be set between 1 and 10 % for normal operation. The automation software will try to delete an unused media file as long as the disk full bit is set. By keeping the size of the disk space empty, (slightly greater that the longest normal spot put into the disk), then the disk full error will rarely occur when a record init command is issued. This maintains system efficiency and disk space utilization.

2X.2C : RECORD INIT WITH DATA

The RECORD INIT WITH DATA command has all the features and requirements of the RECORD INIT command with the following changes:

The ID may already exist on the disk (e.g. this command permits a dub over of a section of the ID).

If the ID exists on the disk, the dub over starts at the start position given in SEND DATA 9 to 12, and has the duration given in SEND DATA 13 to 16.

If the ID does not exits in the disk, a new media file is recorded for the ID and if the disk keeps timecode internally, the start position given in SEND DATA 9 to 12 should be the timecode of the first frame of video.

SEND DATA 1 to SEND DATA 8 contain the ID, SEND DATA 9 to 12 contain the desired start position within the ID, SEND DATA 13 to 16 contain the desired length in BCD.

2X.2D : SELECT LOGICAL DRIVE

This command is used to specify partitioning in disk systems that have more than one logical disk drive. In this case, the system may be partitioned to use all of, or just one of the logical partitions.

Normally it is desirable to treat all disks in the system as one big drive so only one copy of any media file needs to exist in the system and any signal port may access it for play. But there are cases in whih it is desirable to separate the available drives into logical units and be able to specify if the drive is available to any given port or an ID search order for the drives available to the signal port. Examples of this are to prevent certain users from accessing certain files or to have portable drives that are moved from a preparation disk system to a play back disk system, where there is no guarantee that a given ID is not on both (the fixed and portable disks) logical drives available to the signal.

When searching for an ID, the first match will be used for the operation and no other logical drives will be searched. For an example: an on air play back disk system has one fixed logical disk unit, and two portable logical units that are prepared on another disk system off line. The fixed logical disk is assigned to be partition #1, and the two portable logical disk units are assigned to be partition #2 and #3. When all three logical disk units are connected to the on air play back system, the command data of 01000010 binary will cause portable unit #2 to be searched first, the portable unit #3 second, and the fixed partition #1 last. Command data of 10000001 will cause only the fixed partition #1 to be searched for ID'S.

SEND DATA 1 is a number that selects which logical disk drive to use or to search first.

- **Bit 7** is set to a 1 only when the logical drive specified is to be searched for ID'S.
- **Bit 7** is set to a 0 when all logical drives are to be searched for ID'S and the drive specified is always searched first.
- **Bit 6** is set to a 1 to search the remaining logical drives in descending numeric order when Bit 7 is set to 0.
- **Bit 6** is set to 0 to search the remaining logical drives in ascending numeric order when Bit 7 is set to 0.
- **Bit 4 to Bit 0** is the logical drive specified to only search, or search first as set by Bit 7.

When Bit 7 is set to a 1 for all subsequent ID requests, ID Lists and all other commands that specify an ID to operate on, all logical units in the system are searched. All other drives are searched in numeric order.

2X.2E SYSTEM DELETE ID

The SYSTEM DELETE ID command is used to remove material from the disk system and all other disk systems on its network, or any other disk systems that it communicates with. This command is to be used in situations where several disk systems may communicate with one another and transfer files between them.

The disk system that receives this command must broadcast it on its network or communication channel to other disk systems it communicates to. All other disk systems that receive the command must act on it in the same way. When a piece of material is no longer needed, it must be removed from *all* disk systems in the network. Removing the material from all of the systems will ensure that only the newest version of an ID will be used on any disk in the system. In a typical configuration there may be one or more disks that material is dubbed into originally that are considered the library disk(s).

There would also be one or more playout disks on the network that would transfer the needed files from the library disks in advance of when they need to play them. The controller of the playout disks would use the GET FROM ARCHIVE command to inform the playout disk to transfer the ID's it needs from other disks on the network. The controller of the playout disk would also use 2X.26 DELETE ID to

remove ID's only from the playout disk when it needs to make room for additional material. The SYSTEM DELETE ID command would only be used by the controller who dubs material into the library disks and manages the deletion of the library material. This command only acts on disk systems, and should not delete an ID from an Archive storage device. Deleting material from an Archive storage device can only be done through 0X.14 Delete From Archive.

Upon receipt of a SYSTEM DELETE ID command, the system will check if the ID is present in the system. If it is not, then an error will be logged (the 'ID Not Found' bit being set in the PORT STATUS error byte 3B). If the ID is present, the system will to see if the ID is currently active on any signal port. If the ID is currently active, an error will be logged in the Port Playing/Active bit of PORT STATUS byte 3C.

If the ID is not currently active, the system will check to see if the ID has been delete protected. If the ID is delete protected, an error will be logged in the ID Delete Protected error bit in PORT STATUS byte 3B, and the ID is not deleted; otherwise, the ID will be deleted from the system. If the ID is in the Get From Archive List still to be transferred to the disk it should be removed from the Get From Archive List. When the media file for the ID is deleted from the disk, the ID must be put in the ID'S DELETED LIST for all communication ports (including the port that issued the delete command). This action will cause the ID'S DELETED bit to be set in the Status 2 byte of the PORT STATUS for all communication ports.

SEND DATA 1-8 contain the ID name to be deleted.

2X.30 : PRESET

The effect of the PRESET command is to return all of the selected port configuration parameters to the manufacturers default state. The PRESET command can be issued to a port in any state.

2X.31 : VIDEO COMPRESSION RATE

SEND DATA 1 to SEND DATA 4 contains a 32 bit unsigned number representing RATE in bits/sec. (Device Dependent)

2X.32 : AUDIO SAMPLE RATE

Issuing the AUDIO SAMPLE RATE command selects the rate at which audio input will be encoded when recording. For example, rate 1 = 48 kHz.

SEND DATA 1 contains a bit map specifying the RATE. (Device Dependent)

2X.33 : AUDIO COMPRESSION RATE

Issuing the AUDIO COMPRESSION RATE command selects the bit rate to which each audio channel will be compressed when recording. For example, rate 1 = 96 Kb/s. (Device Dependent)

SEND DATA 1 contains a bit map specifying the RATE. (Device Dependent)

2X.34 : AUDIO IN LEVEL

Issuing the LEVEL command selects the audio LEVEL for the input audio record signal.

SEND DATA 1 and SEND 2 contain the LEVEL value. (Device Dependent)

2X.35 : AUDIO OUT LEVEL

Issuing the LEVEL command selects the audio LEVEL for the output signal.

SEND DATA 1 and SEND DATA 2 contains the LEVEL value. (Device Dependent)

2X.37 : VIDEO COMPRESSION PARAMETERS

Issuing the COMPRESSION PARAMETERS command selects the compression parameters for recording and encoding video.

SEND DATA 1 to SEND DATA 4 contain the compression parameters for the video. (Device Dependent)

2X.38 : SELECT OUTPUT

Issuing the SELECT OUTPUT command selects which output format and connector will be used for the output port selected. MODE is defined as 0. (OFF) 1 (Composite), 2 (S-VIDEO), 3 (YUV), 4 (D1).

SEND DATA 1 contains a bit map specifying the output MODE.

SEND DATA 1 Bit map for SELECT OUTPUT

			D1	YUV	S-VIDEO	COMPOSITE	OFF

2X.39 : SELECT INPUT

Issuing the SELECT INPUT command selects which input format and connector will be used for encoding from the input port selected. MODE is defined as 0 (OFF), 1 (Composite), 2 (S-VIDEO), 3 (YUV), 4 (D1). OFF provides BLACK with sync. An error condition will result in the appropriate bit being set in the port status error byte(s).

SEND DATA 1 contains a bit map specifying the input MODE.

SEND DATA 1 Bit map for SELECT INPUT

			D1	YUV	S-VIDEO	COMPOSITE	OFF

2X.3A : RECORD MODE

Issuing the RECORD MODE command selects which 'tracks' will be recorded when the record command is issued. MODE is defined as Bit 0 (VIDEO), Bit 1 (AUDIO 1), Bit 2 (AUDIO 2), Bit 3 (AUDIO 3), Bit 4 (AUDIO 4), etc.

SEND DATA 1 & SEND DATA 2 contains a bit map specifying the record mode.

SEND DATA 1, 2 Bit map for RECORD MODE

A7	A6	A5	A4	A3	A2	A1	V
A15	A14	A13	A12	A11	A10	A9	A8

2X.41 : SUBCARRIER ADJUST

SEND DATA 1 and SEND DATA 2 indicate the Subcarrier phase. (Device Dependent)

2X.42 : HORIZONTAL SYNC TIMING

SEND DATA 1 and SEND DATA 2 indicate the H timing. (Device Dependent)

2X.43 : DISK PREROLL

The DISK PREROLL command allows the controlling device to specify to the controlled disk system that it should always begin the play or record function a set time after receiving the command.

The Disk Preroll is designated as the time that a disk system should delay the operation after a PLAY or RECORD command. The disk should use the value in the command until changed by another Disk Preroll command. The default should be zero, unless otherwise specified in the disk manufactures specifications. A value of zero is interpreted as: Start The Function on the frame after receiving a Play or Record command. Most devices have a fixed latency time to process commands consistently. This command allows the controlling device to specify a value that the device can handle and maintain frame accuracy under all conditions, or a greater value.

SEND DATA 1 is the preroll frames, SEND DATA 2 is the preroll seconds in decimal.

2X.50 : COPY FILE TO

This command will cause the disk systems to transfer the video file identified by the ID to be copied from the source disk system to the destination disk system(s).

This command should only be implemented on systems where files are to be transferred between multiple video disks and/or archive systems that may be linked together on a network. The Source and Destination are a byte for each of the disk systems for the action. Multiple destination disk systems may be specified in SEND DATA 3 by placing a one byte address for each disk identifier and the command length byte will be set accordingly.

The disk systems are responsible for the complete file transfer when they have available time and bandwidth to perform the transfer. Since requests may come in faster than they can be performed, the disk system must accept requests at any time and queue up file transfer requests as they come in.

When the file transfer is complete, the destination system(s) should indicate that the ID has been added by the IDs ADDED bit in the Port Status, and add the ID to its ID's ADDED LIST. If the command can not be performed then the ID NOT TRANSFERRED error bit in the Port Status should be set. If the ID does not exist then the ID NOT FOUND bit should be set. If the ID exists in all of the destination disks then the ID ALREADY EXISTS bit should be set. The video disk system that receives this command may or may not be one of the source or destination video disks.

SEND DATA 1 is the ID, SEND DATA 2 is the source, SEND DATA 3 is the Destination(s).

2X.51 : DELETE FILE FROM

This command will cause the disk system to delete the video file identified by the ID from the destination disk system(s).

This command should only be implemented on systems where multiple video disks and/or archive systems may be linked together on a network where files are to be transferred between them. The Destination is a byte for each of the disk system(s) for the action. Multiple destination disk systems may be specified in SEND DATA 3 by placing a one byte address for each disk identifier and the command length byte will be set accordingly.

The disk systems are responsible for the complete file removal when they have available time. The disk system must accept requests at any time and queue up delete requests, as requests may come in faster than they can be performed. When the file removal is complete, the destination system(s) should indicate that the ID has been deleted by the ID's DELETED bit in the Port Status, and add the ID to its ID's DELETED LIST. If the command can not be performed then the CUE OR OPERATION FAILED error bit in the Port Status should be set. If the ID does not exist then the ID NOT FOUND bit should be set. The video disk system that receives this command may or may not be one of the source or destination video disks.

SEND DATA 1 is the ID, SEND DATA 2 is the Destination.

2X.52 : ABORT COPY FILE TO

This command will cause the disk systems to ABORT the transfer of a video file that was identified by the ID to be copied from the source disk system to the destination disk system(s) that was previously sent.

This command should only be implemented on systems where multiple video disks and/or archive systems may be linked together on a network where files are to be transferred between them. The Source and Destination are a byte for each of the disk systems for the action. The ID, source and destination must match the original command to abort a previous copy command. Multiple destination disk systems may be specified in SEND DATA 3 by placing a one byte address for each disk identifier. The command length byte will be set accordingly.

The disk system must accept requests at any time. If the command can not be performed then the CUE OR OPERATION FAILED error bit (or another more appropriate error bit) in the Port Status should be set. The video disk system that receives this command may or may not be one of the source or destination video disks.

SEND DATA 1 is the ID, SEND DATA 2 is the source, SEND DATA 3 is the Destination.

2x.67 ASI PID Select

This command will change the Program Number within the ASI stream. By default, the video file server will start with this PID set to 0. The valid range of ID's are 0..65535.

SEND DATA 1 contains the high-order byte, and SEND DATA 2 contains the low-order byte. When the encoder port is initialized, the PID value is set to 0 (zero) by default. This will cause the encoder to recorder the first entry in the Program Association Table (PAT).

Note that this command is executed upon receipt of the next Cue command. If the port is currently in RECORD, the command will be deferred until the next Cue command is issued. In the case of an encoder that supports back-to-back recording, the disk must manage the timing of the execution of this command. If the encoder port does not support back-to-back encodes, then the command will be sent while the port is in the Idle state, prior to the Cue command.

Sense Requests

3X.01 : OPEN PORT

The Signal Ports consist of audio and video channels as configured by the device. Any signal port can be controlled from any RS-422 control port with the following Port assignment commands; OPEN, CLOSE and SELECT. Only one communications port can have a given signal port open at a given time. The system commands are organized with reference to the Signal Port that they effect. The ports consist of SIP (Signal Input Ports, range –1 to -127) and SOP (Signal Output Ports range 1 to 127).

SEND DATA 1 contains an 8 bit signed magnitude number representing PORT. PORT 0 is not used. SEND DATA-2 contains the port security mode; either 1 for locked mode, or 0 for unlocked mode.

PORT is a signed number representing the available signal ports, for example: -1(SIP1), 1(SOP1), 2(SOP2). This PORT number is also used with the PORT SELECT and CLOSE commands

RETURN DATA 1:

- An OPEN request (in either mode) for an unopened (available) signal port: will result in a 1 (port granted) being returned in RETURN DATA-1.
- An OPEN request (in either mode) for an opened and LOCKED signal port: will result in a 0 (port denied) being returned in RETURN DATA-1.
- An OPEN request (in either mode) for a port that has been opened in the UNLOCKED mode: will result in a 1 (port granted) being returned to the requesting communications port and the PORT BUSY bit being set in the port status until the port is reset to its idle state. The original communications port will have the INVALID PORT bit set in the port error status.

An example of a normal command sequence, start up of a controller, re-initializing port communications, or establishing a session with a signal port:

- OPEN XX (Opens port XX, may be an input or an output port)
- SELECT XX (Selects the port just opened)
- (performs play back or recording for just a few seconds, or many months)
- CLOSE XX (Closes the port opened above)

This cycle may be repeated many times every few minutes (such as when recording items into the disk system for preview), or may last many months (such as on-air play out while other ports are used to record new items into the disk and do disk media management.

3X.02 : NEXT

The NEXT command is used to transfer any remaining IDs in groups of up to ten. It has the same format as LIST commands and NEXT is called repeatedly until all IDs have been transferred. See the LIST command 3X.11 for more details

3X.03 : LAST

The Last command returns the last response to a request query, which was previously sent by the controlled device. If there has been no response (e.g. after boot up) a 0 will be returned in RETURN DATA 1.

3X.05 : PORT STATUS

The Port Status command returns to the controller the status bytes specified for the selected video port, preceded by the bit map.

DATA 1/RETURN DATA 1 contains a bit map specifying which status should be returned.

DATA 1/RETURN DATA 1 - Bit map for PORT STATUS

	EXTENDED PS2	EXTENDED PS3	PORT STATUS 5	PORT STATUS 4	PORT STATUS 3	PORT STATUS 2	PORT STATUS 1

The EXTENDED PS2 and EXTENDED PS3 bits are set true/false to cause the PORT STATUS 2 and PORT STATUS 3 bits to select respectively the extended/short options of the Port Status 2 and 3 fields**.** The port status items available and their contents are shown in the Figures below:

Status 1 - State and Flag Status

CUE/INIT-DONE	PORT BUSY	VARIABLE PLAY	JOG	STILL	PLAY OR RECORD	CUE/INIT	IDLE
PORT ID							

Status 2 Short Option - Port HW\Media Status

AUDIO OVERLOAD	NO AUDIO INPUT	NO VIDEO INPUT	NO REF INPUT	ID'S ADDED TO ARCH.	ID'S DELETED	ID'S ADDED	PORT DOWN

Status 2 Extended Option - Port HW\Media Status

AUDIO OVERLOAD	NO AUDIO INPUT	NO VIDEO INPUT	NO REF INPUT	ID'S ADDED TO ARCH.	ID'S DELETED	ID'S ADDED	PORT DOWN
							NO TIMECODE INPUT

Status 3 Short Option - Port Error Status

NOT SUPPORTED	CMD WHILE BUSY	DISK FULL	COMMAND QUEUE FULL	WRONG PORT TYPE	INVALID PORT	ILLEGAL VALUE	SYSTEM ERROR
ID DELETE PROTECTED	ID NOT TRANSFERRED TO ARCHIVE	ID NOT TRANSFERRED FROM ARCHIVE	ID STILL PLAYING	ID STILL RECORDING	ID ALREADY EXISTS	ID NOT FOUND	INVALID ID
SYSTEM REBOOTED	NETWORK ERROR	CUE OR OPERATION FAILED	PORT NOT ACTIVE	PORT PLAYING /ACTIVE	PORT NOT IDLE	CUE NOT DONE	NOT IN CUE/ INIT

NOT SUPPORTED	CMD WHILE BUSY	DISK FULL	COMMAND QUEUE FULL	WRONG PORT TYPE	INVALID PORT	ILLEGAL VALUE	SYSTEM ERROR
							STATE

Status 3 Extended Option - Port Error Status

NOT SUPPORTED	CMD WHILE BUSY	DISK FULL	COMMAND QUEUE FULL	WRONG PORT TYPE	INVALID PORT	ILLEGAL VALUE	SYSTEM ERROR
ID DELETE PROTECTED	ID NOT TRANSFERRED TO ARCHIVE	ID NOT TRANSFERRED FROM ARCHIVE	ID STILL PLAYING	ID STILL RECORDING	ID ALREADY EXISTS	ID NOT FOUND	INVALID ID
SYSTEM REBOOTED	NETWORK ERROR	CUE OR OPERATION FAILED	PORT NOT ACTIVE	PORT PLAYING /ACTIVE	PORT NOT IDLE	CUE NOT DONE	NOT IN CUE/ INIT STATE

Status 4 - Port Settings

			D1	YUV	S-VIDEO	COMPOSITE	OFF

Status 5 – Video Compression Types Supported

NUMBER OF VIDEO TYPES THIS PORT SUPPORTS THAT ARE LISTED FOLLOWING THIS BYTE
TYPE X
TYPE Y
TYPE Z

Port Status Data Description

Status 1 - State and Flag Status

Byte 1, Bit 0: IDLE - The system is in the IDLE state. The output is black and there is no signal port activity.

Byte 1, Bit 1: CUE/INIT - The system is in the cue or record init state (cueing or initializing).

Byte 1, Bit 2: PLAY/RECORD - The system is in the play or record state.

Byte 1, Bit 3: STILL - The system is in the Still state.

Byte 1, Bit 4: JOG - The system is in the jog state.

Byte 1, Bit 5: VARIABLE PLAY – Can be set in addition to the PLAY/RECORD bit, but can not be set alone.

Byte 1 Bit 6: PORT BUSY - The system is in the busy state and can only accept immediate commands and status requests: STOP, PLAY, RECORD, STILL, STEP, CONTINUE, PORT STATUS, SYSTEM STATUS.

Byte 1 Bit 7: CUE/INIT-DONE - The play cue or record init has been completed. The signal port can now accept a PLAY or RECORD command.

Byte 2 Bits 0-7: PORT ID - The port ID currently selected. If the port returned is not the port that the controller last selected, than the controller needs to (1) close the incorrect port being returned (if not zero) and (2) open and select the needed port and reinitialize it.

Status 2 - Port Hardware\Media Status

Byte 1, Bit 0: The selected port is inoperative

Byte 1, Bit 1: New ID's have been added to the disk system by recording or transferring from an archive system, and the controller of the port has not yet asked for that list of the ID's

Byte 1, Bit 2: ID's have been deleted from the disk and the controller of the port has not yet asked for that list of ID's

Byte 1, Bit 3: New ID's have been added to an archive system connected to the disk system and the controller of the port has not yet asked for that list of the ID's

Byte 1, Bit 4: The system has no input reference

Byte 1, Bit 5: The port has no video input (input port only).

Byte 1, Bit 6: The port has no audio input (input port only).

Byte 1, Bit 7: The audio level in is beyond limit (input port only).

Extended option:

Byte 2, Bit 0: The input does not have timecode (input port only).

Status 3 - Port Error Status

All of the error bits are to be set for the appropriate port when they occur. All bits should be cleared as soon as the Port Status is read by the controller. Thus the controller will see a bit set only once for each occurrence of the condition.

Byte 1, Bit 0: The system has detected a functional error.

Byte 1, Bit 1: The system has received a command with an illegal value, e.g. NEW COPY, SORT MODE, CLOSE PORT, SELECT PORT, RECORD INIT, % TO SIGNAL FULL, VIDEO COMPRESSION RATE, AUDIO SAMPLE RATE, AUDIO COMPRESSION RATE, AUDIO IN LEVEL, AUDIO OUT LEVEL, SELECT OUTPUT, SELECT INPUT, RECORD MODE, SC ADJUST, HORIZONTAL POSITION ADJUST, OPEN PORT. - Command Ignored

Byte 1, Bit 2: The communications port has selected a signal port that it may not open because the port is already open and locked or it is an invalid port number.

- Signal port commands will not be executed.

Byte 1, Bit 3: The controlling device has issued a command not applicable to the open port , e.g. RECORD, RECORD INIT, FREEZE, UNFREEZE to a signal output port or PLAY CUE, CUE WITH DATA, PLAY, STILL STEP CONTINUE JOG, VARIABLE PLAY to a signal input port. - Command Ignored

Byte 1, Bit 4: The disk can not process the command because it has too many commands pending.

Byte 1, Bit 5: The disk is unable to store any more audio/video data, e.g. RECORD INIT when not enough storage space to record for duration specified in RECORD INIT command. - Command Ignored.

Byte 1, Bit 6: A command, other than an Immediate Command was issued while the busy bit was set. - Command Ignored.

Byte 1, Bit 7: A command was issued that is not supported by the device. Any optional command. - Command Ignored.

Byte 2, Bit 0: An invalid ID was specified in a command with an ID parameter, e.g. PLAY CUE, CUE WITH DATA, NEW COPY, DELETE, GET FROM ARCHIVE, SEND TO ARCHIVE, DELETE FROM ARCHIVE, DELETE PROTECT, UNDELETE PROTECT, ID SIZE REQUEST. - Command Ignored.

Byte 2, Bit 1: The ID was not found, e.g. PLAY CUE, CUE WITH DATA, NEW COPY, DELETE, GET FROM ARCHIVE, SEND TO ARCHIVE, DELETE FROM ARCHIVE, DELETE PROTECT, UNDELETE PROTECT, ID SIZE REQUEST. - Command ignored.

Byte 2, Bit 2: An ID specified in RECORD INIT was already in the system. - Command ignored.

Byte 2, Bit 3: A command was issued for an ID while that ID was still recording that cannot be performed until that ID is done recording, i.e. PLAY CUE, CUE WITH DATA, DELETE PROTECT ID, NEW COPY, DELETE, SEND TO ARCHIVE, GET FROM ARCHIVE, ID SIZE REQUEST. - Command ignored.

Byte 2, Bit 4: A DELETE command was issued while the ID was playing. - Command Ignored.

Byte 2, Bit 5: A PLAY CUE or CUE WITH DATA command was issued before ID has been transferred from Archive. - Command ignored.

Byte 2, Bit 6: A GET FROM ARCHIVE command was issued for an ID that is already in the disk. - Command ignored.

Byte 2, Bit 7: A DELETE command was issued for an ID that is delete protected. - Command ignored.

Byte 3, Bit 0: A command was issued that required the system to be in the cue state (cueing state - no commands require the disk to be in this state currently).

Byte 3, Bit 1: A command was issued that required the system to be in the cue/init done state, e.g. PLAY, RECORD, JOG, VARIABLE PLAY, STEP, CONTINUE, FREEZE, UNFREEZE. - Command ignored.

Byte 3, Bit 2: A command was issued that required the system to be in the idle state, e.g. RECORD INIT in some disks. - Command ignored.

Byte 3, Bit 3: A command was issued that required the signal port to not be in the play state. (No command required, not to be in the play state at this time.)

Byte 3, Bit 4: A command was issued that required the signal port to be playing, recording, or active (not idle), e.g. STILL, STEP, CONTINUE, JOG, VARIABLE PLAY, POSITION REQUEST, ACTIVE ID REQUEST, PLAY, RECORD, FREEZE, UNFREEZE, STOP. - Command ignored.

Byte 3, Bit 5: A CUE command or other command that has been ACKed and started failed for some unknown reason. - Command will not be executed properly.

Byte 3, Bit 6: - Indicates a file transfer was not done because of a network error.

Byte 3, Bit 7: Indicates the disk system was rebooted. The controller needs to do a PORT OPEN and SELECT command and any other start up command sequence.

Note: The error bits should be cleared after the port status is read by the controlling device.

Status 4 - Port Settings

One or more bits (if multiple outputs are active) should be set to a 1 to indicate the format of the active ports.

Status 5 – Video Compression Type

Video type definition

Video Type	Definition
0	Default: Video Types not supported. Assume all files may be played on any port.
1	JPEG
2	MPEG Type 420
3	MPEG Type 422
4	Not Defined
5	Not Defined
6	Not Defined
7	Not Defined

The Video Type only needs to be supported if a video disk can have more than one format of video files on it and can not play any file type on any playout port. These bytes must be supported on both the Port Status Request and the ID Request so the controller can determine if a particular video port can play a particular ID. If the first byte of status 5 is zero, it indicates that this feature is not supported. A positive valve in the first byte indicates how many bytes follow the first byte. One byte for each video type supported by the port is required. For example, if the port supports MPEG 420 and MPEG 422 video types, the data for status 5 would be 2, 2, 3.

3X.06 : POSITION REQUEST

The POSITION REQUEST query returns the current position 'timecode' or time remaining within the ID which is currently playing on the selected port.

The selected port must be in PLAY, RECORD, CUED, OR STILL state or an error will be logged. An error condition will result in the appropriate bit being set in the port status error bytes. The POSITION/TIME returned is in RETURN DATA 2-5 in FRAMES, SEC, MIN, HOURS BCD format is preceded by RETURN DATA 1 the time type.

SEND DATA 1/RETURN DATA 1 contains the time type to be returned. A 0 requests the time remaining, a 1 requests the (SOM-based) time code of the current frame position, and a 2 requests the (zero-based) time code of the current frame expressed as an offset from the start of the ID.

3X.07 : ACTIVE ID REQUEST

This command returns information to the controller about whether a queried port is active (an active port is one that is either recording, playing, cued or cueing), and what the active ID is. This query does not affect the output of the system.

The format returns the active status in RETURN DATA 1 and the ID in RETURN DATA 2-9. In RETURN DATA 1, a one indicates that the port is active and 0 indicates that the port is not active. The ID is an eight-character identifier. If the port is not currently active, then only a 0 is returned.

3X.08 : DEVICE TYPE REQUEST

The DEVICE TYPE REQUEST command is used to request the specifications of the Controlled Device.

The response to this command is a 16-byte (maximum) data message advising of the specifications of the CONTROLLED DEVICE. The first N bytes will be the manufacturer ID followed by a colon ':'

3X.10 : SYSTEM STATUS REQUEST

This command returns to the controller information about the MAIN storage system.

SEND DATA 1/RETURN DATA 1 contains a bit map specifying which status should be returned.

	EXTENDED SS1 & SS2	SYSTEM STATUS 6	SYSTEM STATUS 5	SYSTEM STATUS 4	SYSTEM STATUS 3	SYSTEM STATUS 2	SYSTEM STATUS 1

The EXTENDED SS1 & SS2 bit is set true/false to cause the SYSTEM STATUS 1 and SYSTEM STATUS 2 bits to select the extended/short options respectively of the System Status 1 and 2 fields.

System Status 1 Short Option - STORAGE TIME REMAINING

TOTAL TIME REMAINING

FRAMES X 10	FRAMES X 1
SECONDS X 10	SECONDS X 1
MINUTES X 10	MINUTES X 1
HOURS X 10	HOURS X 1

LARGEST CONTIGUOUS BLOCK

FRAMES X 10	FRAMES X 1

SECONDS X 10	SECONDS X 1
MINUTES X 10	MINUTES X 1
HOURS X 10	HOURS X 1

System Status 1 Extended Option - STORAGE TIME REMAINING

TOTAL TIME REMAINING

FRAMES X 10	FRAMES X 1
SECONDS X 10	SECONDS X 1
MINUTES X 10	MINUTES X 1
HOURS X 10	HOURS X 1
HOURS X 1000	HOURS X 100
HOURS X 100000	HOURS X 10000

LARGEST CONTIGUOUS BLOCK

FRAMES X 10	FRAMES X 1
SECONDS X 10	SECONDS X 1
MINUTES X 10	MINUTES X 1
HOURS X 10	HOURS X 1
HOURS X 1000	HOURS X 100
HOURS X 100000	HOURS X 10000

System Status 2 Short Option - NUMBER OF IDs STORED

NUMBER OF ID'S STORED - MS BYTE
NUMBER OF ID'S STORED - LS BYTE

System Status 2 Extended Option - NUMBER OF IDs STORED

| NUMBER OF ID'S STORED - MS BYTE |
| NUMBER OF ID'S STORED (BYTE 2) |
| NUMBER OF ID'S STORED (BYTE 3) |
| NUMBER OF ID'S STORED - LS BYTE |

System Status 3 - DISK STATUS

				REMOTE CONTROL DISABLED	DISK DOWN	SYSTEM DOWN	DISK FULL

System Status 4 - SUBSYSTEM STATUS (User defined)

					ARCHIVE FULL	ARCHIVE AVAILABLE
			SYSTEM OFFLINE STORAGE FULL	LOCAL OFFLINE STORAGE FULL	SYSTEM OFFLINE STORAGE AVAILABLE	LOCAL OFFLINE STORAGE AVAILABLE

System Status 5 - STANDARD TIME

FRAMES X 10	FRAMES X 1
SECONDS X 10	SECONDS X 1
MINUTES X 10	MINUTES X 1
HOURS X 10	HOURS X 1

System Status 6 - SIGNAL FULL LEVEL

| % TO SIGNAL FULL LEVEL% TO SIGNAL FULL LEVEL |

The Total Time Remaining

The Total Time Remaining is an estimate of the amount of video data that could be stored on the available disk space without consideration of fragmentation or partitions.

The Largest Contiguous Block is the amount of time the largest single recording would currently succeed for. These times are best estimates based on default or current compression settings and typical video streams. They are not precise, but should be a reasonable enough estimate to allow a controller to detect when the amount of space on the video disk has fallen below a threshold, and something should be deleted to allow enough room to continue recording.

Total Time Remaining and Largest Contiguous Block will be the same value if the disk system has no partition or fragmentation issues that prevent a recording from using all available disk space. The use of disk partitions is not recommended, as the controller can not efficiently manage disk space allocation unless the free space of each partition was given across the protocol (this is not done due to the open nature of the number of partitions).

If a disk system has multiple partitions and video files may not span partitions, the Largest Contiguous Block must be reported as the value of the partition that currently has the smallest size/Largest Contiguous Block. This is to guarantee that the controller will delete enough material to make space for the recording to continue until that partition has space for recording to continue. Since the controller does not know what partition a video file is on, many files may be deleted from other partitions to make space to allow recording to continue on a different partition. This makes partitions inefficient for disk space use, unless the controller knows which file is on which partition, and what the Largest Contiguous Block is for each partition. This protocol only supports a disk system with a single storage partition efficiently.

3X.11 : ID LIST

This command returns a list of all IDs currently stored on the system to the controller. The format will return the number of IDs remaining to be transmitted in subsequent transmissions in RETURN DATA 1 and RETURN DATA 2 (RETURN DATA 1 MSB, RETURN DATA 2 LSB), followed by ten 8 byte IDs in RETURN DATA 3 to RETURN DATA 82.

The NEXT command is used to transfer any remaining IDs in groups of up to ten. NEXT is called repeatedly until all IDs have been transferred.

3X.14 : ID SIZE REQUEST

This command returns the duration of the specified ID to the controller. The format returns the frames in RETURN DATA 1, seconds in RETURN DATA 2, minutes in RETURN DATA 3 and hours in RETURN DATA 4, in BCD.

SEND DATA 1-8 contains the ID name.

3X.15 : LIST ID'S ADDED TO ARCHIVE

This command returns to the controller a list of the IDs that have been added to an archive system since the last LIST ID'S ADDED TO ARCHIVE request, or the unreported ID's from before the last ID'S ADDED TO ARCHIVE request if not all were read.

This list is kept for each communications port that has a signal port open, even if it is not selected. This request allows a controller to view information about items that it may need that were added to an archive system by another disk system.

Note: even the communications port of the disk that added the item to the archive should get the item in its list.

The data format will return the number of IDs remaining to be transmitted in subsequent transmissions in RETURN DATA 1 and RETURN DATA 2 (RETURN DATA 1 MSB, RETURN DATA 2 LSB), followed by ten 8 byte IDs in RETURN DATA 3 to RETURN DATA 82.

A list of ID'S ADDED TO ARCHIVE must be kept for each communications port that has access to the disk which in turn has access to the archive. When an ID is completely transferred into the archive and can be transferred to the disk at any time, that ID must be entered into the list for each port. As a port sends each ID (in groups of ten) to its controller, it must remove that ID from the added list for that port. When any ID's are in the added list for that communications port the ID ADDED TO ARCHIVE bit will be set in the port status that is sent to that communications port.

The NEXT command is used to transfer any remaining IDs in groups of up to ten. NEXT is called repeatedly until all IDs have been transferred.

3X.16 : ID REQUEST

This command tells the controller whether the ID is currently in the 'get from archive list' for the selected port and whether the ID is currently in the disk and the ARCHIVE. This command allows the automation controller to ask if an ID it needs for future playout is in the DISK or ARCHIVE.

SEND DATA 1-8 contains the ID name.

SEND DATA 9 (optional byte) contains handle specifying the disk to be queried if it is a remote disk.

RETURN DATA 1 contains a bit map of the ID status (a 1 indicates true and zero (0) indicates false) and must contain at least two bytes.

RETURN DATA 2 byte used to be optional in previous versions of the protocol. This created an ambiguity; the return data was identical for the case where an ID did not exist and for the case where an ID was being recorded but was not ready to play. New implementations are required to use the NOT READY bits in RETURN DATA 2 to avoid this problem.

RETURN DATA 3 defines the Video Type(s) supported in the disk. See 'Video Type Definition' table below for details.

RETURN DATA 4 is used to return the disk handle. It is present only in cases where a remote disk was specified in SEND DATA 9.

RETURN DATA

QUERY PENDING	TRANSFER IN PROGRESS	IN OFFLINE STORAGE TRANSFER LIST	IN OFFLINE STORAGE	DELETE PROTECTED	IN ARCHIVE	IN ARCHIVE TRANSFER LIST	IN DISK
					NOT READY TO	NOT READY TO	NOT READY TO PLAY

					ARCHIVE	TRANSFER	
VIDEO TYPE (See VIDEO TYPE DEFINITION below)							
DISK HANDLE (optional byte)							

The In Disk Bit indicates the ID is on the video disk. If the In Disk Bit is only set after the ID is available to play or any other supported function, the Not Ready Bits are not required. If the In Disk bit is set or the ID is put in the IDs Added List when the ID is created on the video disk but before it can be cued for play out, then the appropriate Not Ready bits must be set.

The In Archive Transfer List Bit is set when the ID is in the queue of IDs to Get From Archive. Once the ID is transferred or fails to transfer, the bit is cleared.

The In Archive Bit indicates the ID is in a device connected to the video disk and the video disk can automatically get the ID when given a Get From Archive Command.

The Delete Protected Bit is set if the ID can not be deleted. An Undelete Protect ID command clears this bit. A Delete Protect ID command sets this Bit.

ARCHIVE

An archive is defined as any kind of device, or any number of devices that a video disk can perform a video file transfer of an ID from because of a GET FROM ARCHIVE command. If the ID is only in the ARCHIVE, the controller will send a command to copy the ID to the disk (GET FROM ARCHIVE COMMAND). Once the disk has received the GET FROM ARCHIVE command it should set the IN GET FROM ARCHIVE LIST bit for that ID. The disk should put

the ID in a queue or list of items to transfer to the disk from the archive in the background and perform the transfers as soon as it can without affecting on air playout.

OFFLINE STORAGE

An Offline Storage Device is defined as a particular kind of ARCHIVE. These bits are the same as the archive bits, but they are only for slow, offline storage devices like a tape storage device. They are not used for a networked video disk or other device capable of playing the video in real time. The two bits indicating offline storage are treated exactly as the two archive bits. When issuing a GET FROM ARCHIVE command, the controller can simply ignore these two bits as they are redundant. The purpose of these two bits is to allow a controller to display to an operator whether an ID in an ARCHIVE device is located in an OFFLINE STORAGE ARCHIVE type of device, or a REAL TIME VIDEO DEVICE such as a networked video disk.

The Transfer In Progress bit should be set only during the time the ID is being transferred (not a base band video recording) to or from an Archive, offline Storage device, or fibre channel copy to the disk. This bit should be reflected in all ports on the disk if they are receiving or sending the ID.

The QUERY PENDING bit may be set by the disk at anytime if it can not answer immediately all information about the ID such as ARCHIVE or OFFLINE STORAGE, or Not Ready Bits. A video disk should be designed to respond to all communications within 10 milliseconds of receiving a command.

If the contents of the archive system(s) is not in the video disk's local memory, or if the Ready Bit States are not immediately known and can take longer than 10 milliseconds to respond, the video disk should report back immediately all information that it does know (ID IN DISK, DELETE PROTECTED, IN GET FROM ARCHIVE LIST) and set the QUERY PENDING bit. The disk should then make a query into the archive system(s) to find the answer. The controller upon receiving a query pending has two choices – either (a) Queue up the ID request to try in a little while, or (b) Ask it again right after a port status request, continuing port status requests and the ID request until the QUERY PENDING bit is clear so it has a complete answer.

A disk should only set the QUERY PENDING bit if necessary. The disk system must be able to keep a list of many IDs that are in the archive system(s) (and which archive if more than one exists) so that the next time a controller asks about the ID, the response can be immediate.

The QUERY PENDING bit indicates that some of the other ID Request Return Bits have not been determined yet, and another ID REQUEST must be asked for to obtain the correct status of those bits. The ID Request reply bits may be set in any appropriate combination.

NOT READY bits in Byte 2 of RETURN DATA 1 indicate that, although the ID file may reside on the disk, it is not complete enough for the applicable action. This would be true during recording, or during a copy of the video file from a tape archive, a fiber channel network, or any other source. If a file does not complete successful creation, but does exist, these bits may be left on. These bits indicate to the controller that it is not safe to perform these functions on this ID despite the fact that the ID does exist in the disk. If the INDISK bit is not set, none of these bits need to be set as the controller will not try any of these functions on an ID that is not in the disk.

The Video Type only needs to be supported if a video disk can have more than one format of video files on it and can not play any file type on any playout port. This function must be supported on both the Port Status Request and the ID Request so the controller can determine if a particular video port can play a particular ID. The video file format of the ID is indicated by this byte if it is present and non zero.

Video Type Definition

Video Type	Definition
0	Default: Video Type not supported. Assume all files may be played on any port.
1	JPEG
2	MPEG Type 420
3	MPEG Type 422
4	Not Defined
5	Not Defined
6	Not Defined
7	Not Defined

3X.17 : COMPRESSION SETTINGS REQUEST

This command returns information about the selected port encoding parameters to the controller. The controller specifies in SEND DATA 1/RETURN DATA 1 which parameter information should be returned. For example, Compression Setting 1 returns video Compression rates.

SEND DATA 1/RETURN DATA 1 contains a bit map specifying which information should be returned.

SEND DATA 1/RETURN DATA 1 Bit map for COMPRESSION SETTINGS

Compres-sion Settings 8	Compres-sion Settings 7	Compres-sion Settings 6	Compres-sion Settings 5	Compres-sion Settings 4	Compres-sion Settings 3	Compres-sion Settings 2	Compres-sion Settings 1

COMPRESSION SETTINGS 1: VIDEO COMPRESSION

Bytes 1 to 4 are the Video Compression Rate. It is the echo of the data sent in the VIDEO COMPRESSION RATE command 2X.31

Bytes 5 to 8 are the Video Compression Parameters. It is the echo of the data sent in the VIDEO COMPRESSION PARAMETERS command 2X.37

VIDEO COMPRESSION

VIDEO COMPRESSION RATE 1
VIDEO COMPRESSION RATE 2
VIDEO COMPRESSION RATE 3
VIDEO COMPRESSION RATE 4
VIDEO COMPRESSION PARAMETER 1
VIDEO COMPRESSION PARAMETER 2
VIDEO COMPRESSION PARAMETER 3
VIDEO COMPRESSION PARAMETER 4

COMPRESSION SETTINGS 2: AUDIO SETTINGS

Byte 1 is the Audio Sample Rate. It is the echo of the data sent in the AUDIO SAMPLE RATE command 2X.32.

Byte 2 is the Audio Compression Rate. It is the echo of the data sent in the AUDIO COMPRESSION RATE command 2X.33.

Bytes 3 and 4 are the Audio Input Level. It is the echo of the data sent in the AUDIO IN LEVEL command 2X.34.

Bytes 5 and 6 are the Audio Output Level. It is the echo of the data sent in the AUDIO OUT LEVEL command 2X.35.

AUDIO SETTINGS

AUDIO SAMPLE RATE 1
AUDIO COMPRESSION RATE
AUDIO INPUT LEVEL 1
AUDIO INPUT LEVEL 2
AUDIO OUTPUT LEVEL 1
AUDIO OUTPUT LEVEL 2

COMPRESSION SETTINGS 3: PORT TYPE SELECTS

Byte 1 is the Select Output Port Video Type. It is the echo of the data sent in the SELECT OUTPUT command 2X.38.

Byte 2 is the Select Input Port Video Type. It is the echo of the data sent in SELECT INPUT command 2X.39.

PORT TYPE SELECTS

SELECT OUTPUT
SELECT INPUT

COMPRESSION SETTINGS 4: RECORD MODE

Bytes 1 and 2 are the Record Mode data. It is the echo of the data sent in the RECORD MODE command 2X.3A.

RECORD MODE

RECORD MODE 1
RECORD MODE 2

COMPRESSION SETTINGS 5 : SUBCARRIER ADJUST

Bytes 1 and 2 are the Subcarrier Adjust data. It is the echo of the data sent in the SUBCARRIER ADJUST command 2X.41.

SUBCARRIER ADJUST

SUBCARRIER ADJUST 1
SUBCARRIER ADJUST 2

COMPRESSION SETTINGS 6: HORIZONTAL SYNC ADJUST

Bytes 1 and 2 are the Horizontal Sync Timing data. It is the echo of the data sent in the HORIZONTAL SYNC ADJUST command 2X.42.

HORIZONTAL SYNC ADJUST

HORIZONTAL SYNC ADJUST 1
HORIZONTAL SYNC ADJUST 2

3X.18 : ID'S ADDED LIST

This request allows a controller to inquire about items that were added to the disk system by another signal port. The command returns to the controller a list of the IDs that have been added to the disk system since the last ID's ADDED request, or unreported ID's from before the last IDs ADDED request if not all were read. The list is kept for each active communications port.

Note: Even the communications port that added the item should get the item in its list.

The data format will return the number of IDs remaining to be transmitted in subsequent transmissions in RETURN DATA 1 and RETURN DATA 2 (DATA 1 MSB, DATA 2 LSB), followed by ten 8 byte IDs in RETURN DATA 3 to RETURN DATA 82.

A list of IDs ADDED must be kept for each port that has access to the disk. When an ID is completely recorded into the disk or transferred into the disk from an archive system and can be played at any time, that ID must be entered into the list for each communications port. When any IDs are in the added list for that communications port, the ID ADDED bit will be set in the port status sent to that communications port. If an ID LIST is performed, then all ID's may be removed from the added list for that communications port. As a communication port sends each ID (in-groups of ten) to its controller, it must remove that ID from the added list for that port.

Note: On disks that may play an ID once recording or transfer from an archive has started but not completed, then this action should take place as soon as the ID is available for PLAY CUE or CUE WITH DATA.

The NEXT command is used to transfer any remaining IDs in groups of up to ten. NEXT is called repeatedly until all IDs have been transferred.

3X.19 : ID'S DELETED LIST

This command returns to the controller a list of the IDs that have been deleted from the disk system since the last ID's DELETED request, or unreported ID's from before the last ID's DELETED request if not all were read. This list is kept for each active communications port. This request allows a controller to find out about items added to the disk system that it may need that were deleted by another signal port.

Note: even the communications port that deleted the item should get the item in its list.

The data format will return the number of IDs remaining to be transmitted in subsequent transmissions in RETURN DATA 1 and RETURN DATA 2 (RETURN DATA 1 MSB, RETURN DATA 2 LSB), followed by ten 8 byte IDs in RETURN DATA 3 to RETURN DATA 82. A list of ID'S DELETED must be kept for each

communications port that has access to the disk. When an ID is deleted from the disk and can not be played any more, that ID must be entered into the deleted list for each communications port. As a port sends each ID (in-groups of ten) to its controller, it must remove that ID from the deleted list for that port.

When an ID is in the deleted list the ID DELETED bit will be set in the port status that is sent to that communications port. If an ID LIST is performed by a communications port, then all ID's may be removed from the deleted list for that communications port.

The NEXT command is used to transfer any remaining IDs in groups of ten. NEXT is called repeatedly until all IDs have been transferred.

3X.25 : MULTIPLE PORT STATUS

This command returns to the controller the status bytes specified for the selected range of video ports.

SEND DATA 1/RETURN DATA 1 contains the port number specifying which port status should be returned first. SEND DATA 2/RETURN DATA 2 contains the number of ports that status should be returned for. This command is used in addition to 3X.05, Port Status, on systems that are controlling multiple video ports through a single communication port. It allows the controller to ask for the status of all ports it is controlling within a single frame, as long as the ports have contiguous port numbers. Refer to the descriptions of each byte/bit in the 3X.05 command for a detailed explanation of data.

When multiple video ports are to be controlled from a single communications port, 3X.25 must be implemented in addition to 3X.05. The time deferred play command (4X.01) must be implemented, and either the Preset Standard Time Command (2X.1E) must be implemented to set the disk system time, or the disk system and controller must both have a timecode reader board and load their time from a leader timecode generator. In a multi port environment, the controller will open all ports to be controlled.

The unit address in a command, or the select port command, may be used to direct a command to a port. When the unit address in a command is zero, the command should be issued to the currently selected port (from the last Port Select Command.) When the unit address is *not* zero, the command should be issued to the port number of the unit address.

The return data format contains the echo of SEND DATA 1/RETURN DATA 1 and SEND DATA 2/RETURN DATA 2, a fixed length data part for the media storage status, and a variable length part of the port status depending on how many ports status was requested for. The variable length part must be in order starting with the Start Port Number then increasing by one for the number of ports requested

The multi port status reply is shown in the Figures below:

SEND DATA 1/RETURN DATA 1 - START PORT NUMBER
SEND DATA 2/RETURN DATA 2 - NUMBER OF PORTS

Part 1 - Fixed Length Part (1 byte) - Storage Status

				IDs ADDED TO ARCH.	Ids DELETED	IDs ADDED	

Part 2 - Variable Length Part (5 bytes for each port) - Port Status:

Status 1 - State and Flag Status

CUE/INIT-DONE	PORT BUSY		JOG	STILL	PLAY OR RECORD	CUE/INIT	IDLE

Status 2 - Port HWMedia Status

AUDIO OVERLOAD	NO AUDIO INPUT	NO VIDEO INPUT	NO REF INPUT				PORT DOWN

Status 3 - Port Error Status

NOT SUPPORTED	CMD WHILE BUSY	DISK FULL		WRONG PORT TYPE	INVALID PORT	ILLEGAL VALUE	SYSTEM ERROR
ID DELETE PROTECTED	ID TRANSFER-RED	ID NOT TRANS-FERRED	ID STILL PLAYING	ID STILL RECORDING	ID ALREADY EXISTS	ID NOT FOUND	INVALID ID
SYSTEM REBOOTED		CUE OR OPERATION FAILED	PORT NOT ACTIVE	PORT PLAYING /ACTIVE	PORT NOT IDLE	CUE NOT DONE	NOT IN CUE/ INIT STATE

3x.67 ASI Program Number Request

This command returns the current Program Number selector within the ASI stream. The valid range of ID's are 0..65535.

RETURN DATA 1 contains the high-order byte, and RETURN DATA 2 contains the low-order byte. Return data is in the range of 0..65535

In the case of an encoder port that supports back-to-back record, a 2X.67 command may be queued for execution against a subsequent cue command. In this case, the 3X.67 will return the state of the PID select against the current recording operation.

Macro Commands

5X.60 : ABORT MACRO

The ABORT command will abort given macro. SEND DATA 1 is the two byte Macro Number that the controlled device is to abort. If SEND DATA 1 is zero, then all macros pending are to be aborted.

5X.61 : ACTIVE MACRO LIST

This command returns the Active Macro list. All pending macros are to be listed. RETURN DATA 1 to N is just a sequence of Macro Numbers (2 bytes each). No data is returned if no macros are pending, but the command must be echoed in the reply.

5X.62 : MACRO STATUS

The Macro Status Command allows the controller to ask the controlled device the status of any outstanding macro.

This reply (including the 5X.E2 echo) is also generated by the controlled disk and put in place of a response to a Port Status Request soon after the macro is complete or terminated (Marco Complete Returns). Marco Complete Returns should generate all return data supported by the controlled disk and indicate which data is present in the Return Data 1 Bit Map.

SEND DATA 1/RETURN DATA 1 is a bit map of the data that follows. RETURN DATA 2/SEND DATA 2 is the 2 byte Macro Number the status is requested for. RETURN DATA 3 is the 1 byte Current State of the macro. RETURN DATA 4 is the 4 byte Completion Code if the Macro is Complete. RETURN DATA 5 is a 2 byte echo of the original command. RETURN DATA 6 is an echo of the ID.

The status must be available until the controller ACKs the Macro Status, or Macro Return that reports that the Macro is Complete with the Completion Code. Once that return is ACKed, the macro is removed from activity or status and that macro number may be reused in the future.

SEND DATA 1/RETURN DATA 1: Bit map for Macro Status:

			ID Echo (8 bytes)	Command Echo (2 bytes)	Macro Completion Code (4 bytes)	Macro State (1 byte)	Macro Number (2 bytes)

RETURN DATA 3: Macro State:

		Aborted	Fail	Complete	In Progress	Pending	Unknown Macro

Macro Completion Code:

Byte 1: 0 = Success, non zero indicates failure.

- 1=Code listed below in next two bytes (Protocol Defined).
- 2=Next two bytes are device manufactures codes (Disk Manufacturer Defined).

Byte 2: Category of Error

- 1=Device not available
- 2=Hardware failure

- 3=Can not execute on give data.
- 4=Device not configured for request
- 5=Commanded to Cancel
- 6=Receiving Device
- 7=Sending Device
- 8. Communications Interface

Byte 3: Specific Error

Byte 4: 0 = Don't try again

- 1 = try again later, may succeed
- 2 = try again immediately, may succeed

ERROR	DESCRIPTION
0,0,0,0	Success
1,x,1,1	The system is in the process of initializing; please retry the command
1,x,2,1	The system is busy completing a previous request; please retry the command at a later time.
1,3,3,0	The specified file ID already exists in the archive software system.
1,x,4,0	Communication with the system software system has failed or operating system resources are not available to complete the request.
1,3,5,0	The specified file ID does not exist in the system.
1,3,6,0	Memory necessary to perform the request could not be obtained from the operating
1,4,7,0	The operation is not permitted because the call to set user ID has not been made by the client.
1,3,8,0	An invalid parameter was included in the request.
1,x,9,0	The write to or read from tape media failed; see the device driver log for details.
1,x,10,0	An appropriate tape to store the file data is not available or there are no drives available.

ERROR	DESCRIPTION
1,x,11,0	<Reserved>
1,x,12,0	<Reserved>
1,5,13,0	The operation has been aborted by request of the controller.
1,x,14,0	<Reserved>
1,4,15,0	All necessary services are not currently available to complete the request.
1,x,16,1	Communications between devices failed or busy.
1,x,17,1	Receiving device failed or busy.
1,x,18,1	Sending device failed or busy.
1,x,19,1	Higher priority task took resources.
1,x,20,1	Command succeeded to some destinations, but not to others. Check destinations or retry

The Unknown Macro Bit is set if the controller requests status for a macro number the disk does not have active.

The Pending Bit is set when the controller requests status for a macro number that has been received but the controlled disk has not yet started execution on it. The macro command would be in a buffer or queue waiting for other commands or tasks to complete before its turn to get executed.

The In Progress Bit is set while that macro number is actively being executed.

The Complete Bit is set after successful or partially successful completion of the macro number.

The Fail Bit is set if a macro fails to execute for any reason other than the controller sending an About Command for it.

The Abort Bit is set if the controller terminated the macro number through the About Command.

5X.63 : COPY FILE MACRO

The 5X.63 command is identical to the 2X.50 command except SEND DATA 1 is the 2 byte Macro number, and all other data follows it.

5X.64 : GET FROM ARCHIVE MACRO

The 5X.64 command is identical to the 2X.27 command except SEND DATA 1 is the 2 byte Macro number, and all other data follows it.

5X.65 : SEND TO ARCHIVE MACRO

The 5X.65 command is identical to the 2X.2A command except SEND DATA 1 is the 2 byte Macro number, and all other data follows it.

5X.66 : PREPARE ID TO PLAY

SEND DATA 1 and 2 are the two byte macro numbers, SEND DATA 3 to SEND DATA 10 contain the ID, SEND DATA 11 is the Prepared File Handle to associate with this preparation. SEND DATA 12 to 15 is optional and contains the start position within the ID (play out start) and SEND DATA 16 to SEND DATA 19 is optional and contains the duration (play out duration).

If either SEND DATA 12 to SEND DATA 15 or SEND DATA 16 to 19 is present then both are required. The controlled video disk will use the command length byte to determine if the optional data is present. Refer to the Play Cue With Data command for SEND DATA 12 to SEND DATA 19 definition (is SEND DATA 9 to 16 in Play Cue With Data).

Prepare ID To Play is similar to Play Cue or Play Cue With Data in that it opens a video file and gets the video file ready to play. The difference is that Play Cue makes the ID the next ID to play, whereas Prepare ID To Play does not indicate when the ID will play. It only indicates that it will be played soon. A following Play Cue command is required to tell the video disk which ID is to be played next.

The controlled video disk should open the file and ready it for play out, but it should not cue the file to play next. Once a file is prepared, the controlled video disk must receive a Play Cue command and set the Cue Done status bit before a Play command can be issued for the ID. The Play Cue and Play commands must have the Prepared File Handle that matches the one in this command or the Port Not Active Bit should be issued in the Port Status.

The Prepare ID To Play command is used to allow the disk to get several IDs ready to play out in the near future. This command is issued so that when the ID is given to a Cue command, it will take only a few video frames, instead of several seconds, to complete the cue command. This will allow the next N number of IDs to be prepared by the video disk so that several very short IDs could be played out back to back. With out this command being executed in advance, the Cue command would take longer to reach the Cue Done State and the minimum ID length that could play back to back would be larger.

A video disk that implements this command must publish the maximum number IDs that may be prepared at any given time. This includes the ID that is currently playing and the ID that it currently cued or cueing as these will normally have been prepared before going to their current state.

The Prepared File Handle is a byte whose value may be from one to the maximum number of video files that may be prepared at any given point in time. The Prepared File Handle allows the controller to prepare an ID more than once, allowing that ID is to be played multiple times. The Prepared File Handle allows an ID that is cued, to be decued (by another item being cued), then cued later without the video disk closing down the stream. The File Handle must be unique at any given point in time. A controller

should close the previous ID on a File Handle before it opens a different ID on that file handle. However, if a File Handle is open on a ID and the video disk receives a Prepare ID To Play for a different ID on that File Handle, then the current video file should be closed and the new ID prepared for that File Handle.

An ID that is prepared with this command must use the Play Cue and Play command sequence that includes the Prepared File Handle to play it out. The Prepare ID To Play does not effect the Port Status 1 (Port State and Status Flag) at all. Only the cue commands change the cue and cueing bits in the Port Status. The completion of the macro, will indicate whether the ID is prepared, or the prepare failed.

An ID that is being prepared may have the Play Cue issued before the Prepare command is complete. In this case the video disk should cue the ID once it is prepared.

5X.67 : CLOSE ID FROM PLAY

SEND DATA 1 and 2 are the two-byte macro number, SEND DATA 3 to SEND DATA 10 contains the ID.

Close ID From Play is the opposite as Prepare ID To Play. This command closes an open video file, even if it has been played, has not been played, or is being played. If the ID is playing when a Close ID From Play is received, the controlled video disk should stop play as if the end of the ID was reached, and close the video file. This command must be issued if an ID has been prepared otherwise the video file will remain prepared for cueing and will play out again.

APPENDIX 1

Use of the Protocol with Hardware Buffers

An archive storage system may be any system that can supply audio/video files to a disk system that the disk system can then play out. The archive storage system can be connected to the disk system via SCSI, a network, or any other interface. An archive system may be another video disk, a tape library system or any storage device. The only requirements for an archive storage system are:

- It can tell the disk if an ID is available in it
- It can transfer an item from archive to disk or disk to archive
- It is able to delete items from archive

Other functions of an archive may be an ID list of its contents.

The protocol may be used for systems that have one or more ARCHIVE storage systems (disk, tape, optical, etc.) and one or more smaller buffer disks to support independent outputs. Buffer disks may be an output only disk, thereby having a signal output port. All media is then added to the buffer disk by a GET FROM ARCHIVE command. If the buffer has an input signal port, then a SEND TO ARCHIVE command will initiate copying the media file from the buffer to the ARCHIVE.

When the disk that the automation is communicating with is a buffer disk, the automation controller treats it as any other disk, with some additions. When a play list is running it will command its buffer disk to GET FROM ARCHIVE all the media it finds within the lists look ahead that the disk reported was in the archive in the ID REQUEST command. The buffer disk must keep a 'get from ARCHIVE' list. The automation controller may send up to one thousand GET FROM ARCHIVE commands in a burst when a new list is being loaded, and it will take a while to transfer each media file. Normal continuous play will yield an empty 'get from ARCHIVE' list and an occasional, single GET FROM ARCHIVE command as the play list finishes a spot and a new spot comes within the lists look ahead.

The buffer disk should background transfer each media file in turn from its 'get from ARCHIVE' list until the list is empty. The buffer disk must send a request to its associated ARCHIVE to transfer a particular media file to it. This must occur in background so that it does not affect the play out from the buffer signal port. The automation system does not communicate with the ARCHIVE system for play out from a buffer disk. All buffer signal port commands are through the buffer disk communications port. The ID REQUEST enables the automation system to find out if the needed ID is on the ARCHIVE and can be retrieved for play out with a GET FROM ARCHIVE command.

A get from ARCHIVE command will cause the buffer disk to send a request to its associated ARCHIVE for the media file. A direct file transfer will result in no generation loss. The ID will then be made available from the buffer disk with minimum transfer time. When the file transfer is complete and the item may be cued for play, the item ID must be added into the ID ADDED LIST for every port. This action will notify them that the new item is available for play The disk manufacturer may implement a backup play scheme where if a file is not in the buffer disk but it is in the ARCHIVE. Upon cue and play of the ID, it is played out from the ARCHIVE system to the buffer signal port, or it may give an ID not found error upon cue if the ID is not in the buffer disk.

The disk manufacturer may offer one or more buffer disks associated with a given ARCHIVE. Each buffer disk should not have knowledge of any other buffer disk. The system may have more than one archive disk or system, but it must manage all available archive resources and respond to the controller as if it were a single source. An ARCHIVE should be able to support up to the maximum number of buffered disks offered, without automation specific knowledge or handling. The ARCHIVE system bandwidth must be capable of handling simultaneous requests from all supported buffer disks without constraints on an external control system or have internal transfer queues and rotate request from each buffer disk.

The CEAR command will not be used by an automation controller. It is only a testing aid or manual commands for diagnosis or new disk use. The automation controller will leave everything copied onto the buffer disk in place until the disk is full and it needs more space to add new required media. The automation controller will decide which ID is no longer needed on the buffer and send a DELETE command.

The DELETE command will remove the media from the buffer disk, but will not affect the media on the ARCHIVE. If the automation system needs that media again at a later time, it will send another GET FROM ARCHIVE command in advance of its need. The % TO SIGNAL FULL command is important in keeping a segment of the disk free all the times for automatically transferring the next file from the ARCHIVE disk. Without a reasonable amount of empty space readily available, almost every GET FROM ARCHIVE command will get a disk full error, requiring the operator to delete some material and retry the transfer. This process is inefficient and may cause system command bottlenecks.

A typical configuration with an archive may have a large video disk with many hours of storage where all items reside for their required lifetime. Several small buffer disks are used for previewing, editing, and playing to air. Another typical configuration with an archive may be a tape storage system connected to one or more video disks.