Datavideo HDR-80/90 Control Protocol
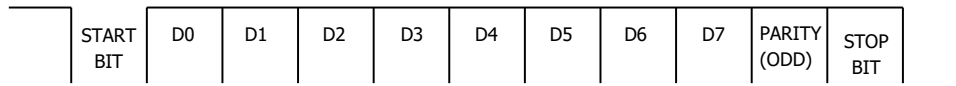
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1. Interface Overview

1.1. Serial Port

- Conforming to EIA RS-422A/RS-232
- Full duplex communications channel is utilized.
- Data is transmitted asynchronously, bit serial, word serial with data exchange between devices.
- Standard transmission rate on the interface bus is 38400 bits per seconds (bps)
- Odd parity
- The data word utilized by the interface system is as follows :

START BIT	D0	D1	D2	D3	D4	D5	D6	D7	PARITY (ODD)	STOP BIT

1 Start bit + 8 Data bits + 1 Parity bit + 1 Stop bit. Odd Parity

ODD parity: The total of "1"s in D0+D1+ . . . D7+PARITY equals an odd number.

1.2. DVIP

- Datavideo IP control protocol
- Ethernet connection (RJ-45)
- TCP Server Port : 5002
- Embedding the control command into TCP packet
- More information, please refer : "Datavideo Ethernet Control Operation Guide"

2. Command Block Format

The data communication is composed of the **CMD-1/DATA COUNT** byte, the **CMD-2** byte, optional **DATA** bytes and the **CHECKSUM** byte. Commands are transmitted in order from the MSB (Most Significant Byte) to the LSB (Least Significant Byte). This means that when using the examples in this manual, the order in which the bytes are read is the same order in which they are transmitted. When the **DATA COUNT** Nibble is 0, no **DATA** bytes are transmitted or required (the **CMD-1/DATA COUNT** byte, **CMD-2** byte and **CHECKSUM** byte are still transmitted). When the **DATA COUNT** nibble is not 0, the number of **DATA** bytes transmitted must correspond with the **DATA COUNT**. These bytes are inserted between the **CMD-2** byte and **CHECKSUM** byte.

2.1. COMMAND BLOCK FORMAT

The data communication between the controller and the device is performed as follows:

Name	CMD-1	Data Count	CMD-2	Data 0~15 (per Data Count)	Checksum
	b7 ~ b4	b3 ~ b0			
Size	1 Byte		1 Byte	0 ~ 15 Byte(s)	1 Byte

2.2. COMMAND CONTENTS

CMD-1:

This is the first (Most Significant) nibble of the first byte of the command. The DATA COUNT (below)fills the lower (Least Significant) nibble. It (**CMD-1**) indicates the command or return group to which the command

DATA COUNT:

This is the second (Least Significant) nibble of the first byte of the command. The upper (Most Significant) Nibble is filled by the **CMD-1** (above). It indicates the number of data bytes (0-15) that are required to beinserted between the **CMD-2** byte and the **CHECKSUM** byte.

CMD-2:

Designates the exact command within the section specified by **CMD-1**.

DATA 0...15:

If the command requires extended data, the **DATA COUNT** will be set to between 1 and 15 (a 0 indicatesthat no extra data is required). These bytes will be placed here.

CHECKSUM:

This byte is used to check the data for communication errors. To calculate the checksum, each byte of thecommand (**CMD-1**+**DATA COUNT**, **CMD-2**, and any **DATA BYTES**) are added together. The leastsignificant 8 bits (1 byte) are then truncated to create a 1-byte checksum.

> *I.e.: The command "61.0C.03" becomes*
> *MSB   LSB*
> *0110   0001   (=61)*
> *0000   1100   (=0C)*
> *+)   0000   0011   (=03)*
> *0111   0000   (=70)*
>
> *CHECKSUM = "70"*
> *Therefore, the complete command is "61.0C.03.70"*

3. Connector Pin Assignment

Interface: 9 pin D-Sub female

The RS-422 pin assignment of the Controller and HDR-80/90 is shown in the following table:

Signal Pin	Controller	HDR-80/90
1	Frame Ground	Frame Ground
2	Receive A(RX-)	Transmit A(TX-)
3	Transmit B(TX+)	Receive B(RX+)
4	Transmit Common	Receive Common
5	Spare	Spare
6	Receive Common	Transmit Common
7	Receive B(RX+)	Transmit B(TX+)
8	Transmit A(TX-)	Receive A(RX-)
9	Frame Ground	Frame Ground

The RS-232 pin assignment of the Controller and HDR-80/90 is shown in the following table:

Signal Pin	Controller	HDR-80/90
1	-	-
2	Receive (RX)	Transmit (TX)
3	Transmit (TX)	Receive (RX)
4	-	-
5	GND	GND
6	-	-
7	-	-
8	-	-
9	-	-

4. Communication Protocol

1) All communications between the CONTROLLER and the DEVICE will be under the direct supervision of the CONTROLLER.

   When the DEVICE (HDR-80/90) receives the COMMAND from CONTROLLER, the following COMMAND is returned.

   - **ACK**:   In case that the DEVICE receives a COMMAND not requiring data
   - **COMMAND**+**DATA**:   In case that the DEVICE receives a COMMAND requiring data
   - **NAK**+**ERROR DATA**:   In case that a communication error is detected or an undefined COMMAND is received

2) The CONTROLLER must not transmit additional COMMAND blocks to a DEVICE (HDR-80/90) prior to response to a previous COMMAND block.

3) The CONTROLLER must transmit of bytes in a COMMAND block for with intervals less than 10 milliseconds. If a DEVICE (HDR-80/90) detects an interruption of a byte in a COMMAND block that exceeds 10 milliseconds, it executes a TIME-OUT error sequence, voids the receiving COMMAND block, and transmit a NAK (TIME OUT).

4) When a DEVICE (HDR-80/90) receives a COMMAND block from the CONTROLLER, the DEVICE must transmit a response within 9 milliseconds. Therefore if the CONTROLLER cannot receive the appropriate response from the DEVICE within 10 milliseconds after transmitting the COMMAND block the CONTROLLER detects a communication error, and must execute an appropriate process.

5) When a DEVICE (HDR-80/90) detects a communication error, it must immediately transmit a NAK to the CONTROLLER. (The content of an error is shown on the COMMAND tables.) When the CONTROLLER receives a NAK, if must immediately stop transmission of the block. The DEVICE must not accept a subsequent command within 10 milliseconds after that (except NAK-UNKNOWN command) and must execute a necessary process.

   - **NAK Unknown Command** : 11h 12h 01h 24h
   - **NAK Checksum Error** : 11h 12h 04h 27h

5. Control Command
5.1. System Command

System Commands				
Command	**Code**	**Response**	**Vendor Unique**	**Note**
Local Disable	00h 0Ch	10h 01h		
Device Type Request	00h 11h	12h 11h 00h 02h 25h		
Local Enable	00h 1Dh	10h 01h		
Audio Source	02h F3h 04h XXh	10h 01h	x	XXh=00h Embedded XXh=01h XLR
ProRes Quality	02h F3h 0Bh XXh	10h 01h	x	XXh=00h Proxy XXh=01h LT XXh=02h 422 XXh=03h HQ
Video Input Mode	02h F3h 0Ch XXh	10h 01h	x	XXh=00h SDI x4 XXh=01h HDMI x1 and SDI x3 XXh=02h HDMI x2 and SDI x2
Timecode Mode	02h F3h 0Eh XXh	10h 01h	x	XXh=00h Record Run XXh=01h Free Run XXh=02h SDI Embedded XXh=03h LTC
GPI Mode	02h F3h 0Fh XXh	10h 01h	x	XXh=00h Edge XXh=01h Level
Genlock Enable/Disable	02h F3h 11h XXh	10h 01h	x	XXh=00h Disable XXh=01h Enable
Secure Stop	02h F3h 12h XXh	10h 01h	x	XXh=00h Disable XXh=01h Enable
Timecode Trigger Record	02h F3h 13h XXh	10h 01h	x	XXh=00h Disable XXh=01h Enable
Loop Play	02h F5h 08h XXh	10h 01h	x	XXh=00h Disable XXh=01h Enable
Select Primary Storage SSD	02h F3h 14h XXh	10h 01h	x	XXh=01h SSD1 XXh=02h SSD2
Set Output source channel	02h F3h 15h XXh	10h 01h	x	XXh=00h CH-1 XXh=01h CH-2 XXh=02h CH-3 XXh=03h CH-4
Format SSD	01h F8h XXh	10h 01h	x	XXh=01h SSD1 XXh=02h SSD2s

5.2. Transport Command

Transport Commands				
Command	**Code**	**Response**	**Vendor Unique**	**Note**
Stop	20h 00h	10h 01h		
Play	20h 01h	10h 01h		
Record	20h 02h	10h 01h		
Play Pause	20h 06h	10h 01h	x	
Fast Forward (x32)	20h 10h	10h 01h		
Fast Rewind (x32)	20h 20h	10h 01h		
Jog Forward	21h 11h XXh	10h 01h		See Note 1
Jog Reverse	21h 21h XXh	10h 01h		See Note 1
Var. Forward	21h 12h XXh	10h 01h		See Note 1
Var. Reverse	21h 22h XXh	10h 01h		See Note 1
Shuttle Forward	21h 13h XXh	10h 01h		See Note 1
Shuttle Reverse	21h 23h XXh	10h 01h		See Note 1
Frame Step Forward	20h 14h	10h 01h		
Frame Step Reverse	20h 24h	10h 01h		

Note 1

Jog/Shuttle/Var. Speed = $10^{(XXh\,/\,32\,-\,2)}$

e.g.

Speed	XXh
Pause/Still	0 (00h)
0.2x	42 (2Ah)
0.64x	58 (3Ah)
1.0x	64 (40h)
4x	84 (54h)
8x	93 (5Dh)
16x	103 (67h)

5.3. Sense Command

Sense Commands				
Command	**Code**	**Response**	**Vendor Unique**	**Note**
Current Time Sense	61h 0Ch 01h	74h 04h FFh SSh MMh HHh		LTC
	61h 0Ch 02h	74h 06h FFh SSh MMh HHh		VITC
	61h 0Ch 03h	74h 04h FFh SSh MMh HHh		LTC or VITC
	61h 0Ch 04h	74h 04h FFh SSh MMh HHh		Counter value
Current Status Sense	61h 20h 0Xh	7Xh 20h [X bytes data]		See Table 1
Current System Configuration Sense	60h 22h	78h 22h [8 bytes data]	x	See Table 2
Remain Time Sense	60h 2Bh	74h 2Bh FFh SSh MMh HHh		Remain record time for current selected SSD (in hex-decimal)
FW Version Sense	62h F2h 05h 00h	79h F2h 05h 00h [7 bytes FW version]		Byte 0 = SDK major Byte 1 = SDK minor Byte 2 = UI major Byte 3 = UI minor Byte 4-6 = reserved bytes
System Time Sense	60h F4h	73h F4h SSh MMh HHh	x	RTC (in decimal)

6. Sense Response Tables

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Table 1. Current Status Sense ACK Response Bit Map								
Byte 0	Busy		Cassette Out			Hardware Error		Local Enabled
Byte 1	Standby On		Stop	Eject	Rewind	Fast Forward	Record	Play
Byte 2	Servo Locked		Shuttle	Jog	Variable	Tape Reverse	Still	Cue Up Done
Byte 3								
Byte 4								
Byte 5								
Byte 6		Lamp Still	Lamp Forward	Lamp Reverse				
Byte 7								
Byte 8			Near End of Tape	End of Tape			System Alarm (System Error)	Record Inhibit
Byte 9	Function Abort							
Byte 10								
Byte 11					Output source channel		Current selected SSD number	
Byte 12	*Genlock locked		*Loading not done	*Format not done	*Delete not done		*SSD2 Mounted	*SSD1 Mounted

*Loading not done: media is busy on loading/mounting

Vendor Unique Status:
*Format not done, Delete not done, SSD Mounted, Current selected SSD number, and Genlock locked
*Output source channel: 0 = output video is from CH1 input in record mode
                                      1 = output video is from CH2 input in record mode
                                      2 = output video is from CH3 input in record mode
                                      3 = output video is from CH4 input in record mode

Table 2. System Configuration Sense ACK Response Bit Map

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Timecode Mode [bit 6 - bit 7]		PsF Mode [bit 4 - bit 5]		Video Input Mode [bit 2- bit 3]		ProRes Quality [bit 0 - bit 1]	
Byte 1			TC Rec Trigger Enable	Secure Stop Enable	Genlock Enable	Loop play Enable	GPI Trigger Mode	Audio Input Mode
Byte 2								
Byte 3								
Byte 4								
Byte 5								
Byte 6								
Byte 7								

ProRes Quality	0	Proxy
	1	LT
	2	422
	3	HQ
Video Input Mode	0	SDI x 4
	1	HDMI x 1 + SDI x 3
	2	HDMI x 2 + SDI x 2
PsF Mode	0	Disable
	1	PsF
	2	3:2 PullDown
Timecode Mode	0	Record Run
	1	Free Run
	2	Embedded
	3	External (LTC)
Audio Input Mode	0	Embedded
	1	XLR

GPI Trigger Mode	0	Edge
	1	Level
Loop Play Enable	0	Off
	1	On
Genlock Enable	0	Off
	1	On
Secure Stop Enable (Long stop key pressed)	0	Off
	1	On
TC Record Trigger Enable	0	Off
	1	On

Revision

Version	Description	Date
0.1	Initial Release	11-10-2021
0.2	Protocol update	12-02-2021
0.3	Protocol update	12-12-2021
0.4	Protocol update	12-14-2021
0.5	Protocol update	12-15-2021
0.6	Protocol update	12-17-2021
1.0	Protocol update	06-28-2022
1.1	Protocol update	07-12-2022
1.2	Description for DVIP/Ethernet control	12-05-2022