

# Sony 9-Pin Remote Protocol

This page is not my work. I came across it some years ago when working on a project to put a VT machine into record in the middle of the night. I found it very useful - so put a link on my website to the owners page. My web statistics soon reported it was the most used link. The original website disappeared some time ago, so I've taken the liberty of putting a copy of it here. My thanks to the author, who's name I never managed to record.

*This is not the official Sony 9-pin protocol. It is a summary for reference purposes only. To obtain the protocol document, contact Sony directly.*

*Updated 6/16/96. Fixed the Prog Speed formula. Added Tables. Added all group 20 descriptions, more info on status bits, and most of the group 40 commands.*

## Communication Format

The protocol is based on the EIA RS-422-A signal standard, usually at 38.4 kBit/s. The data are sent as 1 start bit + 8 data bits + 1 parity bit + 1 stop bit. Parity is odd: the bitwise sum of data bits 0 -7 and the parity bit is an odd number.

## Command Block Format

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

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

### CMD-1

Indicates the function and direction of the command, according to:

0	System control (Master->Slave)
1	Return for 0,2, or 4 of cmd-1 (Slave->Master)
2	Transport Control (Master->Slave)
4	Preset>Select control (Master->Slave)
6	Sense Request (Master->Slave)
7	Sense Return (Slave->Master)

### DATA COUNT

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

### CMD-2

Designates the command. Refer to the [command table](#) for definitions. Ex. **CMD-1=0** and **CMD-2=0C** means LOCAL DISABLE.

### DATA-1 to DATA-N

Data which correspond to those indicated by the command. Refer to the command table for data formats.

### CHECKSUM

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

## Communication Protocol

The protocol is initiated by the master. The slave should return a response within 9 msec. The response may be:

- NAK + Error Data: Undefined command or communication error
- COMMAND + Data: if Command requested data
- ACK: if Command did not request data

The master should not send another command until receiving a response from the slave device. The master must also insure that no more than 10 msec lapses between bytes in a command block. The master must immediately stop sending data when it receives a NAK + Error Data message. If the Error Data contains "Undefined Command" the master may immediately send another command, otherwise it must wait at least 10 msec before sending another command. When the master does not receive a response from the slave within the 10 msec timeout, it may assume that communications have ceased and take appropriate measures.

## Cabling

The pin assignments for the 9-pin cable are as follows:

Pin	Master	Slave
1	Ground	Ground
2	Rcv A	Xmit A
3	Xmit B	Rcv B
4	Xmit Common	Rcv Common
5	Spare	Spare
6	Rcv Common	Xmit Common
7	Rcv B	Xmit B
8	Xmit A	Rcv A
9	Ground	Ground

*Auth - this varies a lot: contact individual manufacturers for pinouts.*

## Command Table

This is the command table for the DVR-2000/2100. It is summarised here for reference purposes only. If you want to order it from Sony call the Kansas City supply center and hope you get someone who knows the part number for the recorder whose protocol you want to use.

	Command		Response
00 0C	<a href="#">Local Disable</a>	10 01	Ack
00 11	<a href="#">Device Type Request</a>	12 11	<a href="#">Device Type</a>
00 1D	<a href="#">Local Enable</a>	10 01	Ack
20 00	<a href="#">Stop</a>	10 01	Ack
20 01	<a href="#">Play</a>	10 01	Ack
20 02	<a href="#">Record</a>	10 01	Ack
20 04	<a href="#">Standby Off</a>	10 01	Ack
20 05	<a href="#">Standby On</a>	10 01	Ack
20 0F	<a href="#">Eject</a>	10 01	Ack
20 10	<a href="#">Fast Fwd</a>	10 01	Ack
2X 11	<a href="#">Jog Fwd</a>	10 01	Ack
2X 12	<a href="#">Var Fwd</a>	10 01	Ack
2X 13	<a href="#">Shuttle Fwd</a>	10 01	Ack
20 20	<a href="#">Rewind</a>	10 01	Ack
2X 21	<a href="#">Jog Rev</a>	10 01	Ack
2X 22	<a href="#">Var Rev</a>	10 01	Ack
2X 23	<a href="#">Shuttle Rev</a>	10 01	Ack
20 30	<a href="#">Preroll</a>	10 01	Ack

24 31	<a href="#">Cue up with Data</a>	10 01	Ack
20 34	<a href="#">Sync Play</a>	10 01	Ack
21 38	<a href="#">Prog Speed Play +</a>	10 01	Ack
21 39	<a href="#">Prog Speed Play -</a>	10 01	Ack
20 40	<a href="#">Preview</a>	10 01	Ack
20 41	<a href="#">Review</a>	10 01	Ack
20 42	<a href="#">Auto Edit</a>	10 01	Ack
20 43	<a href="#">Outpoint Preview</a>	10 01	Ack
2X 54	<a href="#">Anti-Clog Timer Disable</a>	10 01	Ack
2X 55	<a href="#">Anti-Clog Timer Enable</a>	10 01	Ack
20 60	<a href="#">Full EE Off</a>	10 01	Ack
20 61	<a href="#">Full EE On</a>	10 01	Ack
20 63	<a href="#">Select EE On</a>	10 01	Ack
20 64	<a href="#">Edit Off</a>	10 01	Ack
20 65	<a href="#">Edit On</a>	10 01	Ack
20 6A	<a href="#">Freeze Off</a>	10 01	Ack
20 6B	<a href="#">Freeze On</a>	10 01	Ack
44 00	<a href="#">Timer-1 Preset</a>	10 01	Ack
44 04	<a href="#">Time Code Preset</a>	10 01	Ack
44 05	<a href="#">User Bit Preset</a>	10 01	Ack
40 08	<a href="#">Timer-1 Reset</a>	10 01	Ack
40 10	<a href="#">In Entry</a>	10 01	Ack
40 11	<a href="#">Out Entry</a>	10 01	Ack
40 12	<a href="#">Audio In Entry</a>	10 01	Ack
40 13	<a href="#">Audio Out Entry</a>	10 01	Ack
44 14	<a href="#">In Data Preset</a>	10 01	Ack
44 15	<a href="#">Out Data Preset</a>	10 01	Ack
44 16	<a href="#">Audio In Data Preset</a>	10 01	Ack
44 17	<a href="#">Audio Out Data Preset</a>	10 01	Ack
40 18	<a href="#">In + Shift</a>	10 01	Ack
40 19	<a href="#">In - Shift</a>	10 01	Ack
40 1A	<a href="#">Out + Shift</a>	10 01	Ack
40 1B	<a href="#">Out - Shift</a>	10 01	Ack
40 1C	<a href="#">Audio In + Shift</a>	10 01	Ack
40 1D	<a href="#">Audio In - Shift</a>	10 01	Ack
40 1E	<a href="#">Audio Out + Shift</a>	10 01	Ack
40 1F	<a href="#">Audio Out - Shift</a>	10 01	Ack
40 20	<a href="#">In Flag Reset</a>	10 01	Ack
40 21	<a href="#">Out Flag Reset</a>	10 01	Ack
40 22	<a href="#">Audio In Flag Reset</a>	10 01	Ack
40 23	<a href="#">Audio Out Flag Reset</a>	10 01	Ack
40 24	<a href="#">In Recall</a>	10 01	Ack

40 25	<a href="#">Out Recall</a>	10 01	Ack
40 26	<a href="#">Audio In Recall</a>	10 01	Ack
40 27	<a href="#">Audio Out Recall</a>	10 01	Ack
40 2D	<a href="#">Lost Lock Reset</a>	10 01	Ack
4X 30	<a href="#">Edit Preset</a>	10 01	Ack
44 31	<a href="#">Preroll time preset</a>	10 01	Ack
41 32	<a href="#">Tape/Auto Select</a>	10 01	Ack
41 33	<a href="#">Servo Ref Select</a>	10 01	Ack
41 34	<a href="#">Head Select</a>	10 01	Ack
41 35	<a href="#">Color Frame select</a>	10 01	Ack
41 36	<a href="#">Timer Mode Select</a>	10 01	Ack
41 37	<a href="#">Input Check</a>	10 01	Ack
41 3A	<a href="#">Edit Field Select</a>	10 01	Ack
41 3B	<a href="#">Freeze Mode Select</a>	10 01	Ack
4X 3E	<a href="#">Record Inhibit</a>	10 01	Ack
40 40	<a href="#">Auto Mode Off</a>	10 01	Ack
40 41	<a href="#">Auto Mode On</a>	10 01	Ack
40 42	<a href="#">Spot Erase Off</a>	10 01	Ack
40 43	<a href="#">Spot Erase On</a>	10 01	Ack
40 44	<a href="#">Audio Split Off</a>	10 01	Ack
40 45	<a href="#">Audio Split On</a>	10 01	Ack
4X 98	<a href="#">Output H Phase</a>	10 01	Ack
4X 9B	<a href="#">Output Video Phase</a>	10 01	Ack
4X A0	<a href="#">Audio Input Level</a>	10 01	Ack
4X A1	<a href="#">Audio Output Level</a>	10 01	Ack
4X A2	<a href="#">Audio Adv Level</a>	10 01	Ack
4X A8	<a href="#">Audio Output Phase</a>	10 01	Ack
4X A9	<a href="#">Audio Adv Out Phase</a>	10 01	Ack
4X AA	<a href="#">Cross Fade Time Preset</a>	10 01	Ack
4X B8	<a href="#">Local Key Map</a>	10 01	Ack
42 F8	<a href="#">Still Off time</a>	10 01	Ack
42 FA	<a href="#">Stby Off time</a>	10 01	Ack
61 0A	<a href="#">TC Gen Sense</a>	74 08	<a href="#">Gen Time Data</a>
		79 09	<a href="#">Gen User Bits Data</a>
		74 00	<a href="#">Timer-1 Data</a>
		74 01	<a href="#">Timer-2 Data</a>
		74 04	<a href="#">LTC Time Data</a>
		74 05	<a href="#">User Bits (LTC) Data</a>
61 0C	<a href="#">Current Time Sense</a>	74 06	<a href="#">VITC Time Data</a>
		74 07	<a href="#">User Bits (VITC) Data</a>
		74 14	<a href="#">Corrected LTC Time Data</a>
		74 15	<a href="#">Hold User Bits (LTC) Data</a>

		74 16	<a href="#">Hold VITC Time Data</a>
		74 17	<a href="#">Hold User Bits (VITC) Data</a>
60 10	<a href="#">In Data Sense</a>	74 10	<a href="#">In Data</a>
60 11	<a href="#">Out Data Sense</a>	74 11	<a href="#">Out Data</a>
60 12	<a href="#">Audio In Data Sense</a>	74 12	<a href="#">Audio In Data</a>
60 13	<a href="#">Audio Out Data Sense</a>	74 13	<a href="#">Audio Out Data</a>
61 20	<a href="#">Status Sense</a>	7X 20	<a href="#">Status Data</a>
61 21	<a href="#">Extended VTR Status</a>	7X 21	<a href="#">Extended Status Data</a>
62 23	<a href="#">Signal Control Sense</a>	7X 23	<a href="#">Signal Control Data</a>
6X 28	<a href="#">Local Key Map Sense</a>	7X 28	<a href="#">Local Key Map</a>
61 2A	<a href="#">Head Meter Sense</a>	7X 2A	<a href="#">Head Meter Data</a>
60 2B	<a href="#">Remaining Time Sense</a>	76 2B	<a href="#">Remaining Time</a>
60 2E	<a href="#">Cmd Speed Sense</a>	7X 2E	<a href="#">Cmd Speed Data</a>
61 30	<a href="#">Edit Preset Sense</a>	7X 30	<a href="#">Edit Preset Status</a>
60 31	<a href="#">Preroll Time Sense</a>	74 31	<a href="#">Preroll Time</a>
60 36	<a href="#">Timer Mode Sense</a>	71 36	<a href="#">Timer Mode Status</a>
60 3E	<a href="#">Record Inhibit Sense</a>	72 3E	<a href="#">Record Inhibit Status</a>
60 52	<a href="#">DA Inp Emph Sense</a>	71 52	<a href="#">DA Input Emphasis Data</a>
60 53	<a href="#">DA PB Emph Sense</a>	71 53	<a href="#">DA Playback Emphasis Data</a>
60 58	<a href="#">DA Samp. Freq. Sense</a>	71 58	<a href="#">DA Sampling Frequency Data</a>
61 AA	<a href="#">Cross Fade Time Sense</a>	7X AA	<a href="#">Cross Fade Time Data</a>

## Command Formats

### 00 0C Local Disable

Disables operation of the slave device from its control panel.

### 00 11 Device Type Request

Slave Responds with

### 12 11 Device Type

message, with 2 bytes of data:

Model	Data
BVU-800	10 00
BVW-10	2X 00
BVW-11	2X 02
BVW-15	2X 03
BVW-35	2X 10
BVW-40	2X 01
BVW-50	2X 30
BVW-60	2X 20
BVW-65	2X 21
BVW-95	2X 22
BVW-96	2X 23
BVW-70	2X 24
BVW-75	2X 25

BVW-D75	2X 46
BVW-9000	2X 47
PVW-2600	2X 40
PVW-2800	2X 41
BVW-35PM	20 18
BVW-65PM	20 29
BVW-95PM	20 2A
BVW-75PM	20 2D
BVW-85P	21 26
BVW-70S	21 2C
BVW-75S	21 2D
WBR-700	21 2D
DVR-2000	3X 10
DVR-2100	3X 11

Where X=0 for NTSC/PAL-M (525) models and 1 for PAL/SECAM models.

#### 00 1D Local Enable

Enable operation of slave device from local panel according to the local enable map set by the "4X B8" [Local Key Map](#) command.

#### 10 01 ACK

Slave Sends this when it receives a command from Master.

#### 11 12 NAK

When a communication error is detected, the slave sends this command with a "1" in the following position indicating the appropriate error condition:

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

#### 20 00 Stop

Slave stops current motion.

#### 20 01 Play

Slave Starts to play from current location. When the "Sync play" mode is selected from the System menu on the slave, "Play" has the same effect as 20.34 ["Sync Play"](#).

#### 20 02 Record

Slave begins recording. Exactly what happens depends on Auto Mode, record lockout, and edit presets.

#### 20 04 Standby Off

Turns off standby mode. For VTR, this causes the machine to unthread in stop. Affects EE/Tape selection.  
Available only in Stop mode.

#### 20 05 Standby On

Turns on standby mode. For VTR, this causes the machine to stay threaded when in stop. Affects EE/Tape selection.

#### 20 0F Eject

When this command is received, the slave will eject the tape.

#### 20.10 Fast Fwd

When this command is received, the slave device will run in fast forward mode. The speed depends on the VTR; for the DVR2000 series it is 50 x play speed.

#### 2X.11 Jog Forward

#### 2X.12 Var Forward

#### 2X.13 Shuttle Forward

When these commands are received the slave device will move forward with the speed indicated by DATA-1 and DATA-2.

When only DATA-1 is given, the speed will be given by

Tape Speed =  $10^{((N/32)-2)} \times$  play speed.

where N is the value of DATA-1. Some sample values are:

Speed	Speed Data
0.1	32 (20H)
1.0	64 (40H)
2.9	79 (4FH)
48.7	118 (76H)

When a more precise speed value is required, then DATA-2 will be added. The speed formula for this case is

Tape Speed =  $10^{((N/32)-2)} + N'/256 * (10^{((N+1)/32)-2}) - 10^{((N/32)-2)}$

where N is the value of DATA-1 and N' is the value of DATA-2.

*auth - in more standard terms, the formula says that DATA-2 is used to linearly interpolate between the value given by N and that of N+1.*

The maximum jog speed is set in the System:System menu. The maximum Var speed is 3X play speed. The maximum shuttle speed is 50X play speed.

*auth - There is considerable controversy over the minimum speed. For a speed value of 0, the above formula with only DATA-1 gives  $10^{-2}$ , or .01 x play speed. The standard states that when a speed between 0 and the minimum is given, the slave moves at minimum speed. In fact, many editors and control systems intend a "Shuttle 0" command (21 13 00) to pause the device and have it stop without disengaging. Devices which fail to do so will creep about 1 frame/second in this situation.*

## 20 20 Rewind

When it receives this command, the slave runs in reverse at maximum speed: on the DVR2000, this is 50xplay speed.

## 2X 21 Jog Rev

## 2X 22 Var Rev

## 2X 23 Shuttle Rev

When receiving one of the above commands, the slave will start running in accordance with the speed data defined by DATA-1 and DATA-2. For the maximum and minimum speed see the 2X.12 [Shuttle Fwd](#) command.

## 20 30 Preroll

When this command is received the slave will search to the preroll position defined as the value obtained by subtracting the preroll time set by the 44.31 [Preroll Time Preset](#) command from the IN POINT data stored in the IN ENTRY memory by the 40.10 [In Entry](#) command.

## 24 31 Cue Up With Data

Cues the slave to the indicated time. Time is formatted as follows:

data-1	data-2	data-3	data-4
Frame     Seconds     minutes     hours			
10 1     10 1     10 1     10 1			

*auth - this is how time is represented in all commands and responses using a time code. The numbers indicate that the 10s value is stored in the high nibble and the 1s value in the low nibble. This is not to be confused with the 80-bit SMPTE timecode which is present in the analogue timecode track on tape, or with the VITC timecode.*

## 20 34 Sync Play

Prerolls the slave for the preset preroll time, then enters play mode.

## 21 38 Prog Speed Play +

## 21 39 Prog Speed Play -

These commands play back the slave device in steps of 0.1% within the range of +/- 25.5% of play speed. DATA-1 contains an 8-bit speed value. The deviation from nominal play speed is

Deviation(%) =  $0.1 \times$  speed value

## 20 40 Preview

## 20 41 Review

### 20 42 Auto Edit

When one of these commands is received the slave goes into the indicated mode.

*This is all the spec states here. What actually happens is determined by the edit presets, in and out point selections, and ee/tape settings. Basically, all three set the device to the preroll position, and run at play speed up to the in point. In Preview, the slave switches to EE mode at the in point, and out at the out point, simulating the edit without disturbing the recording media. In review, the slave simply continues to play at the in point and rolls to the outpoint. In Auto Edit, the channels indicated by the edit presets are put into record at the in point and the recording proceeds to the out point.*

### 20 43 Outpoint Preview

Sends transport to preset out point if insert mode is preset.

### 2X 54 Anti-Clog Timer Disable

Disables the anti-clog timer. This timer is responsible for unthreading the tape upon timeout to save wear on the heads. If a system disables this timer, it should take responsibility for head wear avoidance itself.

### 2X 55 Anti-Clog Timer Enable

Enables anti-clog timer.

### 20 60 Full EE Off

Clears all channels from EE mode regardless of EDIT PRESET channels assigned by the [41.30 EDIT PRESET](#) command. It takes the slave 5 frames to perform this operation after it receives the command.

### 20 61 Full EE On

Sets all channels to EE mode regardless of EDIT PRESET channels assigned by the [41.30 EDIT PRESET](#) command. It takes the slave 5 frames to perform this operation after it receives the command.

### 20 63 Select EE On

This command sets only the preset channels assigned by the [41.30 Edit Preset](#) command to EE mode. The EE mode is cleared by the [20.64 Edit Off](#) command. It takes the slave 5 frames to perform this operation after receiving the command.

### 20 64 Edit Off

This command will stop recording without affecting the state of motion of the device. Any channels in record will come out in response to this command, after 5 frames of delay. This command also clears the Manual Edit Record mode and the Select EE mode.

### 20 65 Edit On

This command is used to actually initiate recording. When the device is playing, and the edit presets set by the 4X 30 [Edit Preset](#) command are in place, the preset channels will enter record a fixed delay after this command is received. The slave will enter Edit Rec mode at this point. It takes the slave 5 frames to enter Edit Rec after receiving this command.

### 20 6A Freeze Off

This command un-freezes the output of the device.

### 20 6A Freeze On

This command freezes the output of the device. There is usually a 2-5 frame delay associated with the actual freeze.

### 44 00 Timer-1 Preset

Sets the Timer-1 value to the time code indicated by DATA-1 through DATA-4. For the time format see the [24.31 Cue Up With Data](#) command.

### 44 04 Time Code Preset

Sets the Time Code Generator value to the time code indicated by DATA-1 through DATA-4. The data format is as per the [24.31 Cue Up With Data](#) command, with two additional bits to indicate Color Frame and Drop Frame mode as follows:

Data-1 Bit 7	CF	Data-1 Bit 6	DF
0	Off	0	Off
1	On	1	On

### 44 05 User Bit Preset

This command presets the value given by DATA-1 through DATA-4 to the User Bits of the Time Code Generator

DATA-1		DATA-2		DATA-3		DATA-4	
MSD	LSD	MSD	LSD	MSD	LSD	MSD	LSD
Bin Grp 2	Bin Grp 1	Bin Grp 4	Bin Grp 3	Bin Grp 6	Bin Grp 5	Bin Grp 8	Bin Grp 7

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**40 08 Timer-1 Reset**

Clears Tape timer 1 to 0

**40 10 In Entry**

Sets the video in point to the value displayed on the slave. This is the value of the selected tape timer.

**40 11 Out Entry**

Sets the video out point to the value displayed on the slave. This is the value of the selected tape timer.

**40 12 Audio In Entry**

Sets the audio in point to the value displayed on the slave. This is the value of the selected tape timer.

**40 13 Audio Out Entry**

Sets the audio out point to the value displayed on the slave. This is the value of the selected tape timer.

**44 14 In Data Preset**

Set the Video In Point to the value indicated by DATA-1 thru DATA-4. The time format is as per the [24.31 Cue Up With Data](#) command.

**44 15 Out Data Preset**

Set the Video Out Point to the value indicated by DATA-1 thru DATA-4. The time format is as per the [24.31 Cue Up With Data](#) command.

**44 16 Audio In Data Preset**

Set the Audio In Point to the value indicated by DATA-1 thru DATA-4. The time format is as per the [24.31 Cue Up With Data](#) command.

**44 17 Audio Out Data Preset**

Set the Audio Out Point to the value indicated by DATA-1 thru DATA-4. The time format is as per the [24.31 Cue Up With Data](#) command.

**40 18 In + Shift**

Increments the Video in point by one frame.

**40 19 In - Shift**

Decrements the Video in point by one frame.

**40 1A Out + Shift**

Increments the Video out point by one frame.

**40 1B Out - Shift**

Decrements the Video out point by one frame.

**40 1C Audio In + Shift**

Increments the Audio in point by one frame.

**40 1D Audio In - Shift**

Decrements the Audio in point by one frame.

**40 1E Audio Out + Shift**

Increments the Audio out point by one frame.

**40 1F Audio Out - Shift**

Decrements the Audio out point by one frame.

**40 20 In Flag Reset****40 21 Out Flag Reset****40 22 Audio In Flag Reset****40 23 Audio Out Flag Reset**

Turn off the In Entry, Out Entry Audio In, and Audio Out lamps.

*auth - do these have any effect on the status bits?*

**40 24 In Recall****40 25 Out Recall****40 26 Audio In Recall****40 27 Audio Out Recall**

Turn on the In Entry, Out Entry Audio In, and Audio Out lamps.

**40 2D Lost Lock Reset**

Resets ( sets to 0 ) the [Data-8/Bit-6](#) Lost Lock bit in the [7X.20 status data](#). The LOST LOCK status will be set when the servo is unlocked in the Play, Rec, or Edit mode.

**4X 30 Edit Preset**

This command is used for selecting the edit mode and selection of preset audio and video channels. These values are used by the Edit On and Edit Off commands.

Byte	7	6	5	4	3	2	1	0
DATA-	X	Insert	Assemble	Video	X	TC	A2	A1

1:						(Cue)	(Cue)	
DATA-2:	X	X	X	X	DA4	DA3	DA2	DA1

when the 41.30 command is used, the audio channels are set as per the table in the Edit:Setup menu. When the 42.30 command is used and Bit1 or Bit0 of Data-1 are "1", the Cue channel is selected.

#### 41 31 Preroll time preset

Presets the preroll time given by DATA-1 thru DATA-4. Only the seconds digit int DATA-2 is used, and must be in the range of 0-59. The time format is as per the [24.31 Cue Up With Data](#) command.

#### 41 32 Tape/Auto Select

the Tape/EE mode is selected by DATA-1 as follows:

Data-1 Mode	
00	Auto ( Tape/EE )
01	Tape
FF	Follows the mode set in the STATE MAP on the SYSTEM menu in Local.

#### 41 33 Servo Ref Select

Selects the SERVO REFERENCE signal according to DATA-1:

DATA-1 State	
00	Auto
01	External
02	Input
FF	Follows the mode set in REFERENCE on the SYSTEM:SYSTEM menu in Local.

#### 41 34 Head Select

*auth - this command is not implemented by the DVR2000, but many other systems use it to select playback/record heads. On the DVR2000 the selection is automatic.*

#### 41 35 Color Frame select

Sets the COLOR FRAME mode of the servo system according to DATA-1:

DATA-1 State	
01	2 Field
02	4 Field
03	8 Field
FF	Follows the mode set in LOCK FIELD on the SYSTEM:SYSTEM menu in Local.

#### 41 36 Timer Mode Select

Selects the TIMER system used in AUTO mode, and for display of the IN ENTRY, OUT ENTRY, IN PRESET, OUT PRESET, PREROLL, and CUE UP WITH DATA, etc. according to DATA-1:

DATA-1 Mode	
00	TIME CODE
01	TIMER-1
02	TIMER-2
FF	Follows the mode set in F6:CRNT TM on the HOME menu in Local.

#### 41 37 Input Check

Switches the INPUT CHECK mode on/off as per DATA-1:

DATA-1 Mode	
00	INPUT CHECK off
01	INPUT signals sent out VIDEO and MONITOR AUDIO OUTPUT connectors.

#### 41 3A Edit Field Select

Assigns the field on which to start the EDIT as per DATA-1:

DATA-1 Mode	
00	Field1/Field2: The edit will start on the field the command was received on
01	Field 1
02	Field 2
FF	Follows the mode set in F4:TIMING on the EDIT SETUP menu in Local.

The following commands use the field selection:

- [20.60 Full EE Off](#)
- [20.61 Full EE On](#)
- [20.63 Select EE On](#)
- [20.64 Edit Off](#)
- [20.65 Edit On](#)
- [4X.30 Edit Preset](#)

#### 41 3B Freeze Mode Select

Assigns the contents of the freeze picture to be field or frame as per DATA-1:

DATA-1 Mode

-----	
00	Field-1 or Field-2 ( not fixed )
01	Field 1
10	Field 2
11	Frame

#### 4X 3E Record Inhibit

#### 40 40 Auto Mode Off

#### 40 41 Auto Mode On

These commands switch the AUTO mode off and on.

#### 40 42 Spot Erase Off

#### 40 43 Spot Erase On

These commands switch the spot erase mode off and on.

#### 40 44 Audio Split Off

#### 40 45 Audio Split On

These commands switch the audio split mode off and on.

#### 4X 98 Output H Phase

Sets the output Horizontal phase. The 40.98 command sets the H Phase to 0, whereas the 41.98 command sets the H phase according to

$$H\ Phase = DATA\_1 * 148\ nsec$$

where DATA\_1 is interpreted as a twos complement binary number in the range of -127 to 127.

#### 4X 9B Output Video Phase

Sets the output sync phase. The 40.9B command sets the output sync phase to 0 whereas the 41.9B command sets the output sync phase according to

$$Sync\ Phase = DATA\_1 * 74\ nsec$$

where DATA\_1 is interpreted as a twos complement binary number in the range of -127 to 127.

#### 4X A0 Audio Input Level

Controls the audio input level. The control mode is assigned by bit 7 of DATA-1, , and the channel to be controlled is assigned by bit 6 to bit 0 of DATA-1. When the 41 A0 command is received, the audio input levels of the channels assigned by DATA-1 will be set to their reference levels. When CMDLEN is not 1, the level data will be composed of two bytes per *assigned* channel in the order DA1, DA2, DA3, DA4, CUE. The DATA-1 bits look like:

Bit	7	6	5	4	3	2	1	0
Value	Mode	X	X	Cue	DA4	DA3	DA2	DA1

For Example, when the DATA-1 is 0x11, the command looks like:

DATA-1	DATA-2	DATA-3	DATA-4	DATA-5
11	DA1 LSB	DA1 MSB	CUE LSB	CUE MSB

The level data are interpreted as per the formula:

$$\text{Input Level} = 20 \log [(\text{Level Data})/(4000h)] (\text{dB})$$

Which gives coverage over the range of +12dB to -infinity.

#### 4X A1 Audio Output Level

Controls the audio output level. When the 41 A1 command is received, the audio output level of the channels selected in DATA-1 will be set to the reference level. Otherwise, it operates as per the [4X.A0 Audio input level](#) command.

#### 4X A2 Audio Adv Level

Controls the audio advance level. When the 41 A2 *fixed doc error here* command is received, the audio advance level of the channels selected by DATA-1 will be set to the reference level. Otherwise, it operates as per the [4X.A0 Audio input level](#) command.

#### 4X A8 Audio Output Phase

Sets the audio output phase. The 42.A8 command determines the audio output phase according to the 16-bit value encoded with the low byte in DATA-1 and the high byte in DATA-2. The values are interpreted as 2s complement binary, and currently have a range of +/- 80 samples. When the 40.A8 command is received, the slave will set the audio output phase to its nominal value.

#### 4X A9 Audio Adv Out Phase

Sets the Advance audio output phase. The 42.A9 command determines the audio advance phase according to the 16-bit value encoded with the low byte in DATA-1 and the high byte in DATA-2. The values are interpreted as 2s complement binary, and currently have a range of +0/-50 samples. the 40.A9 will set the audio advance phase to its nominal value.

#### 4X AA Cross Fade Time Preset

#### 4X B8 Local Key Map

When the slave receives the 00.1D Local Enable command, the control panel may be used according to the local key map that was set by this command. When the slave receives the 00.0C Local Disable command all the keys, buttons, and adjustment controls on the control panel are disabled. The Eject button can always be used. If the slave receives the 41.B8 command, the local key map is preset by the block level in accordance with DATA-1. IF it receives the 4X.B8 command ( X > 2 ) The local key map is preset by the Switch level.

Block Level switches:

---

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Tracking Control	Monitor Control	Audio Control	Video Control	Transport Control	Control	Control	Control

"1": This function will be enabled when in remote

"0": This function will be disabled in remote.

When DATA-2 or more are added, control data with two bytes per each block assigned by DATA-1 are added following DATA-1.

At present the transport switches are defined as follows:

---

Bit	7	6	5	4	3	2	1	0
1st Byte	Execute	Preroll	Search		Rec	Play	Stop	Standby
2nd Byte						Var	Jog	Shuttle

None of the other blocks have any switches assigned, but rather operate as follows:

Video Control: Video phase and Sync phase can be adjusted on the system menu in remote mode.

Audio Control: Audio levels and output phase can be adjusted on the Audio:DA out menu in remote mode.

Monitor Control: the wfm monitor output selection on the system:wfm monitor menu and the monitor level adjustments and monitor out selection on the system:audio monitor menu can be adjusted in remote mode.

Tracking Control: Tracking adjustments in the system:tracking menu can be made in remote mode.

#### 42 F8 Still Off time

#### 42 FA Standby Off time

#### 61 0A TC Gen Sense

#### 60 10 In Data Sense

**60 11 Out Data Sense****60 12 Audio In Data Sense****60 13 Audio Out Data Sense****61 0C Current Time Sense**

Requests the TIME DATA or USER BITS. Slave responds as per DATA-1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
VITC	LTC	TIMER 2	TIMER 1	VITC	LTC		
UB	UB				TIME	TIME	

That is to say that the response follows the bit set in DATA-1 as per the following table

Request	Response
DATA-1=01 LTC TIME	<a href="#">74.04: LTC TIME DATA</a>
	<a href="#">74.14: CORRECTED LTC TIME DATA</a>
DATA-1=02 VITC TIME	<a href="#">74.06: VITC TIME DATA</a>
	<a href="#">74.16: HOLD VITC TIME DATA</a>
DATA-1=04 TIMER-1	<a href="#">74.00: TIMER-1 DATA</a>
DATA-1=08 TIMER-2	<a href="#">74.01: TIMER-2 DATA</a>
DATA-1=10 LTC UB	<a href="#">74.05: UB (LTC) DATA</a>
	<a href="#">74.15: HOLD UB (LTC) DATA</a>
DATA-1=20 VITC UB	<a href="#">74.07: UB (VITC) DATA</a>
	<a href="#">74.17: HOLD UB (VITC) DATA</a>

Now, when requesting timecode, the results depend on the tape speed because at very low speeds ( less than .25 play speed ) it may not be possible to recover timecode. However, if VITC is present, that may be used instead. To automate this decision process, Sony has provided the special 61.0C.03 command which will return the best source of time code as per the table below. Note that when both LTC and VITC are not good you get back the 74.14 corrected LTC data. In this case, the time is actually the last good LTC time corrected by the tape timer.

**Tape speed > .25**

LTC Status	VITC Status	Return Data	Return code
OK	OK	LTC	<a href="#">74.04 XX XX XX XX</a>
NG	OK	VITC	<a href="#">74.06 XX XX XX XX</a>
OK	NG	LTC	<a href="#">74.04 XX XX XX XX</a>
NG	NG	LTC(*)	<a href="#">74.14 XX XX XX XX</a>

**Tape speed < .25**

LTC Status	VITC Status	Return Data	Return code
OK	OK	VITC	<a href="#">74.06 XX XX XX XX</a>
NG	OK	VITC	<a href="#">74.06 XX XX XX XX</a>
OK	NG	LTC	<a href="#">74.04 XX XX XX XX</a>
NG	NG	LTC(*)	<a href="#">74.14 XX XX XX XX</a>

**61 20 Status Sense**

When the slave receives a 61.20 Status Sense command, it will respond with a [74 20 Status Data](#) response. The starting byte number and number of bytes requested are encoded in DATA-1, with the starting reg in the high nibble (bits 7-4) and the requested byte count in the low nibble ( bits 3-0 ).

**61 21 Extended VTR Status****62 23 Signal Control Sense****6X 28 Local Key Map Sense****61 2A Head Meter Sense**

**60 2B Remaining Time Sense****60 2E Cmd Speed Sense****61 30 Edit Preset Sense****60 31 Preroll Time Sense****60 36 Timer Mode Sense****60 3E Record Inhibit Sense****60 52 DA Inp Emph Sense****60 53 DA PB Emph Sense****60 58 DA Samp. Freq. Sense****61 AA Cross Fade Time Sense****74 00 Timer-1 Data**

DATA-1 thru DATA-4 contain the timer-1 data formatted as per the [24.31 Cue up with data](#) command

**74 01 Timer-2 Data**

DATA-1 thru DATA-4 contain the timer-2 data formatted as per the [24.31 Cue up with data](#) command

**74 04 LTC Time Data**

DATA-1 thru DATA-4 contain the LTC data formatted as per the [24.31 Cue up with data](#) command

**74 05 User Bits (LTC) Data**

DATA-1 thru DATA-4 contain the LTC User bits data formatted at per the [44.05 User Bit Preset](#) command.

**74 06 VITC Time Data**

DATA-1 thru DATA-4 contain the VITC data formatted as per the [24.31 Cue up with data](#) command

**74 07 User Bits (VITC) Data**

DATA-1 thru DATA-4 contain the VITC User bits data formatted at per the [44.05 User Bit Preset](#) command.

**74 08 Gen Time Data**

DATA-1 thru DATA-4 contain the Time code generator data formatted as per the [24.31 Cue up with data](#) command

**79 09 Gen User Bits Data**

DATA-1 thru DATA-4 contain the Time code generator User bits data formatted at per the [44.05 User Bit Preset](#) command.

**74 10 In Data****74 11 Out Data****74 12 Audio In Data****74 13 Audio Out Data****74 14 Corrected LTC Time Data****74 15 Hold User Bits (LTC) Data****74 16 Hold VITC Time Data****74 17 Hold User Bits (VITC) Data****74 20 Status Data**

When the slave receives a 61.20 Status Sense command, the following data will be sent back in response according to the request:

Byte No.	7	6	5	4	3	2	1	0
0	X	X	Tape Out	Servo Ref Missing	X	X	X	Local
1	Standby	X	Stop	Eject	Rewind	Fast Fwd	Record	Play
2	Servo Lock	TSO Mode	Shuttle	Jog	Var	Tape Dir	Still	Cue Up
3	Auto Mode	Freeze On	X	CF Mode	A Out	A In	Out	In
4	Select EE	Full EE	X	Edit	Review	Auto Edit	Preview	Preroll
5	X	Insert	Assemble	Video	A4	A3	A2	A1
6	X	Lamp Still	Lamp Fwd	Lamp Rev	Srch LED 8	Srch LED 4	Srch LED 2	Srch LED 1
7	X	X	Aud Split	Sync Act	X	Spot Erase	X	In/Out
8	Buzzer	Lost lock	Near EOT	EOT	CF Lock	Svo Alarm	Sys Alarm	Rec Inhib

9	Fnc	X	X	X	X	X	X
	Abort						

### Description of Bits:

Data 0:

- Bit 5: Tape Unthreaded (Cassette Out) When the tape is threaded, this is 0. When it is completely unthreaded this is 1. When threading or unthreading, who knows what it is.
- Bit 4: Servo Ref Missing When servo reference is absent this is 1.
- Bit 0: Local When remote operation is inhibited by the "remote/local" switch on the panel this is 1.

Data 1:

- Bit 7: Standby When the tape is threaded and the scanner is locked but the tape is stopped, this is 1.
- Bit 5: Stop When the machine is in full stop, this is 1. The thread state depends on the tape/ee and standby settings.
- Bit 4: Eject When the tape is ejecting this is 1.
- Bit 3: Rewind When the machine is in fast reverse this is 1.
- Bit 2: Fast Fwd When the machine is in fast forward this is 1.
- Bit 1: Record This bit goes from 0 to 1 some number of frames after the machine starts recording. For the DVR2000 we measured 5 frames. Others have varying delays on the record status.
- Bit 0: Play This bit goes from 0 to 1 some number of frames after the machine starts playing. For the DVR2000 we measured 5 frames. Others have varying delays on the play status.

Data 2:

- Bit 7: Servo Lock 1 indicates servos are locked. This is a necessary condition for an edit to occur correctly.
- Bit 6: TSO Mode Bit is 1 in tape speed override: in this mode, audio and video are still locked though speed is off play speed by +/- up to 15%.
- Bit 5: Shuttle
- Bit 4: Jog
- Bit 3: Var
- Bit 2: Tape Dir
- Bit 1: Still
- Bit 0: Cue Up

Data 3:

- Bit 7: Auto Mode
- Bit 6: Freeze On
- Bit 4: CF Mode
- Bit 3: A Out
- Bit 2: A In
- Bit 1: Out
- Bit 0: In

Data 4:

- Bit 7: Select EE
- Bit 6: Full EE
- Bit 4: Edit
- Bit 3: Review
- Bit 2: Auto Edit
- Bit 1: Preview
- Bit 0: Preroll

Data 5:

- Bit 6: Insert
- Bit 5: Assemble
- Bit 4: Video
- Bit 3: A4
- Bit 2: A3
- Bit 1: A2
- Bit 0: A1

Data 6:

- Bit 6: Lamp Still
- Bit 5: Lamp Fwd
- Bit 4: Lamp Rev
- Bit 3: Srch LED 8
- Bit 2: Srch LED 4
- Bit 1: Srch LED 2
- Bit 0: Srch LED 1

Data 7:

- Bit 5: Aud Split
- Bit 4: Sync Act
- Bit 2: Spot Erase
- Bit 0: In/Out

Data 8:

- Bit 7: Buzzer
- Bit 6: Lost lock This bit is controlled by the [Lost Lock Reset](#) command. It is set when the servos are unlocked in the PLAY, REC, or EDIT modes.
- Bit 5: Near EOT
- Bit 4: EOT
- Bit 3: CF Lock
- Bit 2: Svo Alarm
- Bit 1: Sys Alarm
- Bit 0: Rec Inhib

Data 9:

- Bit 7: Fnc Abort

*auth - here's a code snippet for you c-heads.*

```
char *StatusBitStrings[][][8] =
{
    // Data 0
    {"",",",",,"Unthread",",,"Svo Ref",",,
     "","","",",,"Local",",",},

    // Data 1
    {"Standby",",",",,"Stop",",,"Eject",",,
     "Rewind",",,"Fast Fwd",",,"Record",",,"Play",",},

    // Data 2
    {"Servo Lock",",,"TSO Mode",",,"Shuttle",",,"Jog",",,
     "Variable",",,"Tape Rev",",,"Still",",,"Cue",",},

    // Data 3
    {"Auto Mode",",,"Freeze On",",,"",",,"CF Mode",",
     "A Out",",,"A In",",,"Out",",,"In",",},

    // Data 4
    {"Select EE",",,"Full EE",",,"",",,"Edit",",
     "Review",",,"Auto Edit",",,"Preview",",,"Preroll",",},

    // Data 5
    {"",",,"Insert",",,"Assemble",",,"Video",",
     "A4",",,"A3",",,"A2",",,"A1",",},

    // Data 6
    {"",",,"Lamp Still",",,"Lamp Fwd",",,"Lamp Rev",",,
```

```

    "Srch LED 8","Srch LED 4","Srch LED 2","Srch LED 1"},  

    // Data 7  

    {"      ","      ",",Aud Split ","Sync Act  ",  

     "      ","Spot Erase","      ","In/Out    "},  

    // Data 8  

    {"Buzzer  ","Lost lock  ","Near EOT  ","EOT      ",  

     "CF Lock ","Svo Alarm  ","Sys Alarm  ","Rec Inhib "},  

    // Data 9  

    {"Fnc Abort  ","      ","      ","      ","      ",  

     "      ","      ","      ","      ","      "},  

};


```

---

The Status bits communicate much about the progress of a motion command. The precise timing of each signal varies almost from machine to machine, and many edit controllers expect certain timing behaviour of these signals. Herein lie many of the problems associated with edit controllers, edit timing, and just plain wacky transport behaviour.

**7X 21 Extended Status Data**

**7X 23 Signal Control Data**

**7X 28 Local Key Map**

**7X 2A Head Meter Data**

**76 2B Remaining Time**

**7X 2E Cmd Speed Data**

**7X 30 Edit Preset Status**

**74 31 Preroll Time**

**71 36 Timer Mode Status**

**72 3E Record Inhibit Status**

**71 52 DA Input Emphasis Data**

**71 53 DA Playback Emphasis Data**

**71 58 DA Sampling Frequency Data**

**7X AA Cross Fade Time Data**

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