SONY

HD DIGITAL FRAME RECORDER

HDDF-500

SONY PARALLEL INTERFACE PROTOCOL

1st Edition

TABLE OF CONTENTS

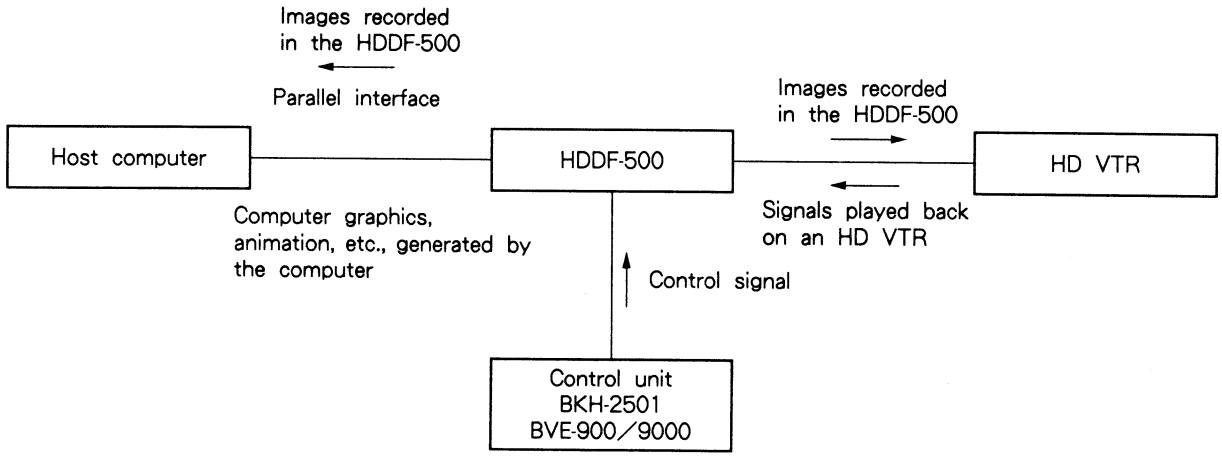
1. GENERAL DESCRIPTION

This manual contains the protocol for connecting the HDDF-500 Digital Frame Recorder to a Digital Equipment Corporation (DEC*) computer equipped with the DRV11-WA* interface for the Q-BUS* system, or the DR11-W * interface for the UNIBUS* system, via the parallel computer interface.

The parallel interface allows created images such as animations or computer-generated graphics to be transferred to the HDDF-500 for storage in memory.

In addition, the data stored in the memory of the HDDF-500 can be transferred to the host computer, and communication between the host computer and an HD VTR is also possible through the parallel computer interface. Data transfers over this interface are accomplished at a rate of 500 kilobytes per second.

SYSTEM CONFIGURATION



* DEC, DRV11-WA, Q-BUS, DR11-W and UNIBUS are trademarks of Digital Equipment Corporation.

2. INTERFACE SET UP

Q-BUS SYSTEMS

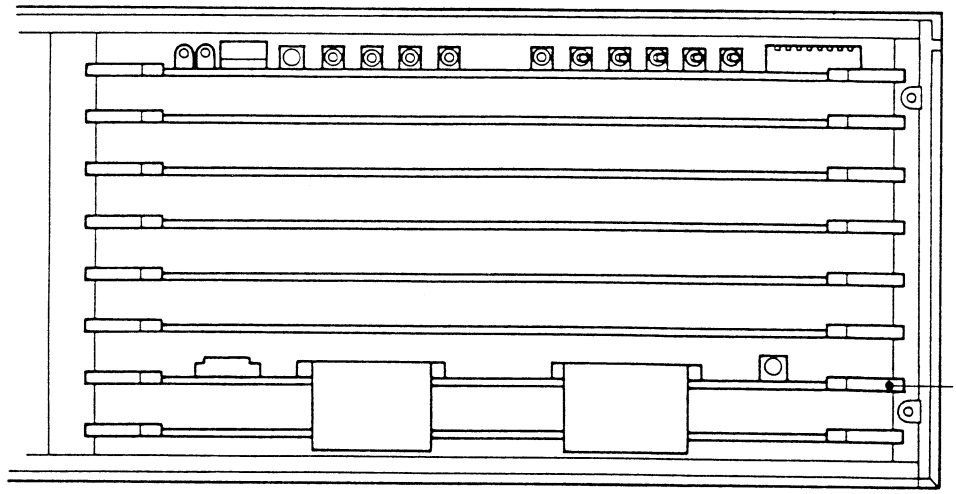
For Q-Bus systems, the DRV11-WA (Etch REV "E" or higher) is the appropriate interface card. The board should be configured with BURST MODE SELECT set to 4 Cycle Burst (W1 out, W2 in), LINK MODE SELECT set to Normal Mode (W3 in, W4 out), and INTERRUPT MODE SELECT should be set to Ready Interrupt (W5 out, W6 in).
Set the Bus Address and the Vector Address as appropriate for the host computer system (normally the base address is 772410 (octal), and the interrupt vector is 124 (octal). Switchpack E-50 should be 1010100001. Switchpack E-40 would be 0001010101 in a 22-bit address bus machine.

UNIBUS SYSTEMS

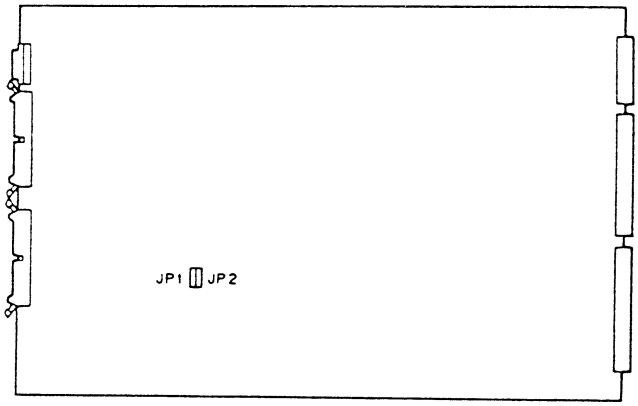
For UNIBUS systems, the DR11-W is the desired interface card. The set-up on switchpack E-105 should be S1 ON, S2 OFF, S3 0FF, S4 ON and S5 ON. Burst Mode Switch B1 should be set to 2 cycle, and the Bus Address and the Vector Address should be set as appropriate for the host system.

2-1. IF-249 BOARD JUMPER SETTINGS

Location of IF-249 Board



Jumper Locations



JP1, JP2: PARALLEL INTERFACE COMPUTER SEL jumpers

Applicable only when interfacing to a system connected to the COMPUTER PARALLEL INTERFACE connectors, J1 INPUT and J2 OUTPUT.

The jumpers are set according to the bus structure of the system being interfaced to.

JP1: SHORT (JP2; OPEN)
Install JP1 with Q-BUS system such as Digital Equipment Corporation (DEC) MICROVAX-11* , MICRO-PDP* , or LSI-11* .
JP2 is not installed. (DRV11-WA)

JP2: SHORT (JP1; OPEN)
Install JP2 with UNIBUS system such as DEC PDP-11* , or VAX* . JP1 is not installed. (DR11-W)

Factory setting: JP1: INSTALLED (JP2: NOT INSTALLED)

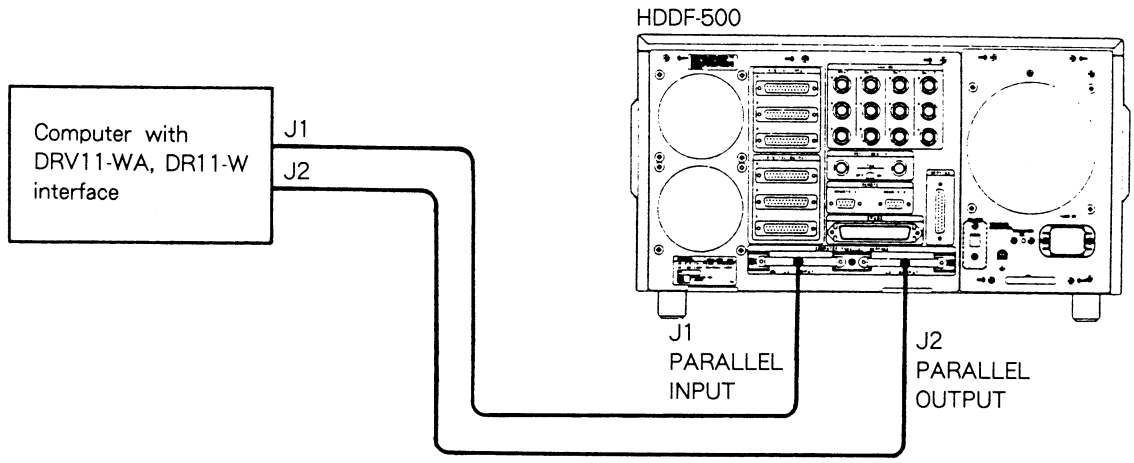
* MICROVAX-11, MICRO-PDP, LSI-11, PDP-11, and VAX are trademarks of the Digital Equipment Corporation.

3. GENERAL SPECIFICATIONS

3-1. CONNECTIONS

3-1-1. Computer Parallel Interface J1 INPUT/J2 OUTPUT Connectors

Connectors J1 and J2 are used to connect a computer having a DRV11-WA or a DR11-W interface as indicated below.



3-1-2. Computer Parallel Interface Connector Specifications

Requirements for external cables connected to J1 INPUT and J2 OUTPUT on the connector panel are shown below. This hardware (or equivalent) must be used* .

HDDF-500 Connectors		Matching Connector/Cables	
Used for	**Name**	**Name**	**Sony Part No.**
Computer parallel interface INPUT/OUTPUT	Ribbon 40-pin×2 male	Ribbon 40-pin×2 female FLAT CABLE ASSY	1-575-153-11

* Shielded cable is recommended to minimize radiation.
* The maximum length of the flat cable is 7.5 meters.

3-2. COMPUTER PARALLEL INTERFACE COMMUNICATION SIGNALS

The signals which connect the HDDF-500 with the host computer via the parallel interface are as follows:

3-2-1. J1 Input

PIN NO.	SIGNAL	SIGNAL DIR (* 2)
1	GND	G
2	CYCLE REQUEST	O
3	GND	G
4	INIT V2	(I)
5	GND	G
6	READY	I
7	GND	G
8	WC INC EN	O
9	SIGNAL CYCLE	O
10	STAT A	O
11	GND	G
12	INIT	(I)
13	GND	G
14	STAT B	O
15	GND	G
16	STAT C	O
17	GND	G
18	STAT C	O
19	GND	G
20	(* 1)END CYCLE(DR11-W)	(I)
21	GND	G
22	GND	G
23	GND	G
24	GND	G
25	DI 7	I
26	DI 8	I
27	DI 6	I
28	DI 9	I
29	DI 5	I
30	DI 10	I
31	DI 4	I
32	DI 11	I
33	DI 3	I
34	DI 12	I
35	DI 2	I
36	DI 13	I
37	DI 1	I
38	DI 14	I
39	DI 0	I
40	DI 15	I

(* 1) Connected to +5VB through 4.7 kΩ
(* 2) SIGNAL DIRECTION
I HOST → HDDF-500
(I) HOST → HDDF-500
BUT IGNORED BY HDDF-500
O HDDF-500 → HOST
G GND

Note: Signal names and protocol of parallel interface connectors should be obtained from applicable Digital Equipment Corporation documentation.

3-2-2. J2 Output

PIN NO.	SIGNAL	SIGNAL DIR (* 2)
1	GND	G
2	BUSY	I
3	GND	G
4	ATTN	O
5	GND	G
6	AOO	O
7	GND	G
8	BA INC	O
9	FNCT 3	I
10	FNCT 3	I
11	GND	G
12	CO	O
13	GND	G
14	FNCT 2	I
15	GND	G
16	C1	O
17	GND	G
18	FNCT 1	I
19	GND	G
20	(* 1)GO(DR11-W)	(I)
21	GND	G
22	GND	G
23	GND	G
24	GND	G
25	DO 7	O
26	DO 8	O
27	DO 6	O
28	DO 9	O
29	DO 5	O
30	DO 10	O
31	DO 4	O
32	DO 11	O
33	DO 3	O
34	DO 12	O
35	DO 2	O
36	DO 13	O
37	DO 1	O
38	DO 14	O
39	DO 0	O
40	DO 15	O

(* 1) Connected to +5VB through 4.7 kΩ

(* 2) SIGNAL DIRECTION

I HOST → HDDF-500

(I) HOST → HDDF-500
BUT IGNORED BY HDDF-500

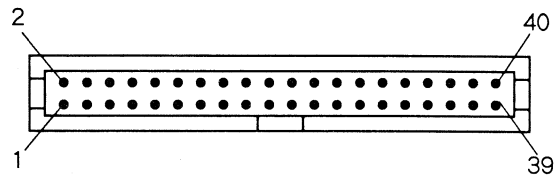
O HDDF-500 → HOST

G GND

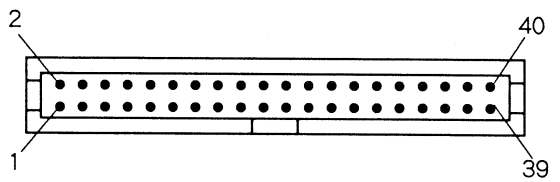
Note: Signal names and protocol of parallel interface connectors should be obtained from applicable Digital Equipment Corporation documentation.

Note: J1, pin 1 (indicated by arrow on chassis below connector), connects to J1, pin A, of the DR11/DRV11 interface board. J2 is connected in a similar fashion.

J1 INPUT



J2 OUTPUT

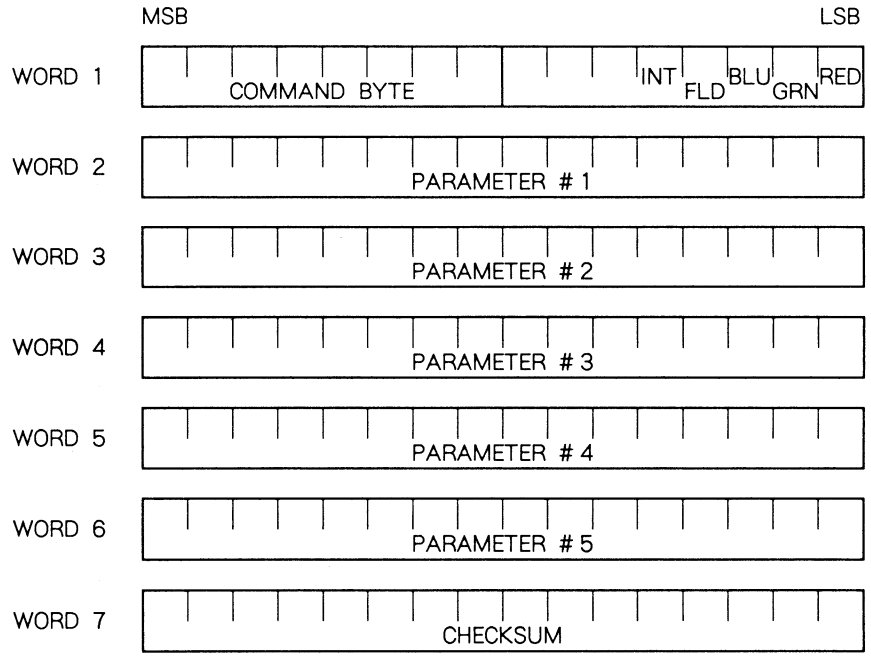


3-3. VIDEO DATA FORMAT

The video data is transferred in block format with no additional information included (block length, checksum, CRC, etc.). The format is one byte of luminance for each pixel. The least significant byte of each word is the first (leftmost) pixel.

4. COMMAND DESCRIPTION

4-1. COMMAND BLOCK



4-1-1. Detailed Description of Command Block

Command Byte

01H	Rectangular transfer	(specify diagonal corners)
02H	Aligned transfer	(specify line & column count)
87H	Capture current frame	(requires no other data)
88H	Select display frame	(requires frame number)

Int

0 Single field transfer
1 Interleaved

Fld-Starting field

0 First (Odd) field
1 Second (Even) field

Blu

1 Select blue channel

Grn

1 Select green channel

Red

1 Select red channel

Parameter #1

For Rectangular/Aligned transfer: Frame Number 0 - N* Video frame to access.
For Frame-Select:
In Frame mode: Frame Number 0 - N* Video frame to access.
In Field mode: Field Number 0 - N** Video field to access.

Parameter #2

Starting Line
0–519 Line number to begin transfer on.

Parameter #3

Starting Column
0–1888 Column to begin transfer on.
(MUST be multiple of 32).

Parameter #4

For Rectangular transfer: Line to end transfer on.
End line 0–519
For Aligned transfer: Number of lines to transfer
1–520 Non-interlaced mode
1–1040 interlaced mode

Parameter #5

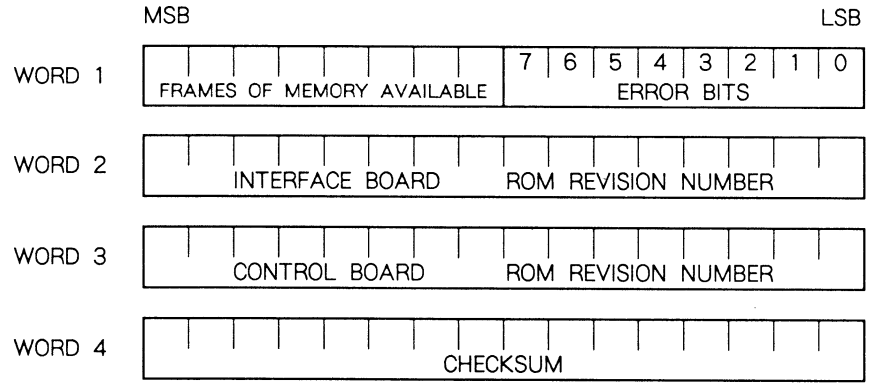
For Rectangular transfer: Column to end transfer on.
31–1919 (MUST be multiple of 32–1)
For Aligned transfer: Number of columns to transfer
32–1920 (MUST be multiple of 32)

Checksum

Arithmetic sum of first six words of message.

Note: (*) The maximum number of frames which can be made available depends on the number and types of boards inserted.
(**) The maximum number of fields which can be made available depends on the number and types of boards inserted.

4-2. STATUS BLOCK



4-2-1. Detailed Description of Status Block

Frames of Memory Available

Number of frames of video memory installed.

Error Bits

bit 0 DMA Interrupt Error
bit 1 Checksum Error
bit 2 SY-149/IF-249 Communications Error
bit 3 Unused
bit 4 Queue Error
bit 5 Command Error
bit 6 DMA Error
bit 7 SCSI/DR11/DRV11 Control Error

These ERROR bits are set on error condition and will remain set until the status is read.

ROM Revision Number

The Revision Number is returned as a hexadecimal number "AA.BC", where:

AA; Major revision level
B; Minor revision level
C; Patch level.

Checksum

Arithmetic sum of first three words of message.

4-2-2. Errors Handling

Any errors which occur on the HDDF-500 system are logically OR'ed and displayed in the LED display on the IF-249 board. This error status may also be read from the HDDF-500 with the READ STATUS request by the DEC system. The accumulated error status is cleared to zero when the status is read. If a fatal error (illegal command, checksum error, etc.) occurs in the command block, all following transfers are terminated with the ATTN. bit to the DEC system, until the status is read from the HDDF-500 with the READ STATUS command; however, if the error occurs in the data transfer, the current transfer and all successive transfers are terminated (with the ATTN. bit), and termination continues until the status is read with the READ STATUS command.

4-3. COMMUNICATION METHOD

Communication between HDDF-500 and the host computer is controlled by the block transmission (single cycle mode) of three types of data; commands, data and status, and by reset operation without the data transmision.
Type of transmission is decided by a combination of FNCT 1, FNCT 2 and FNCT 3 of the host computer as shown below.

FNCT 1	FNCT 2	FNCT 3	Mode
0	0	0	Write Command
1	0	0	Read Status
0	1	0	Write Data
1	1	0	Read Data
x	x	1	Reset

(X: Don't care)

FNCT 1, FNCT 2 and FNCT 3 are specified as follows.

FNCT 1 ; 1=READ, 0=WRITE
FNCT 2 ; 1=DATA, 0=COMMAND
FNCT 3 ; 1=RESET *

* If the SYSTEM RESET switch (S1) on IF-249 board is pressed, the HDDF-500 is reinitialized. Information stored in video memory may be lost.

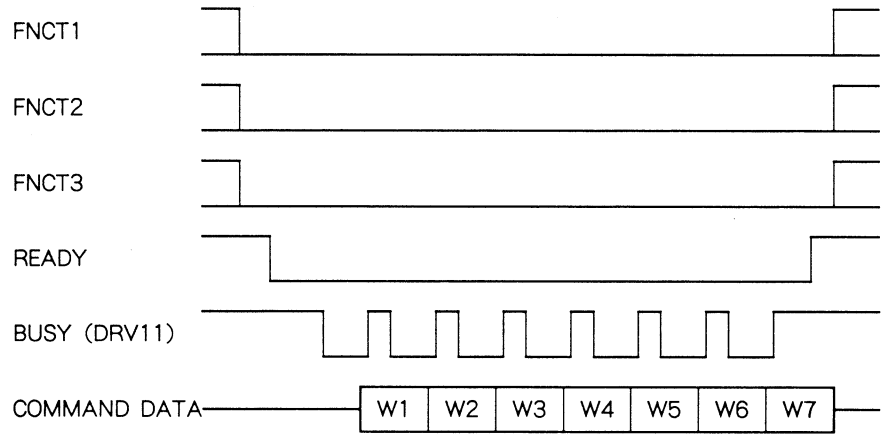
The state of HDDF-500 is informed to the host computer by STAT A, STAT B and STAT C.

STAT C	STAT B	STAT A	ERROR
1	0	0	Checksum error
0	1	0	Command error
1	1	0	FATAL error(DMA error, etc)
*	*	1	RESET active

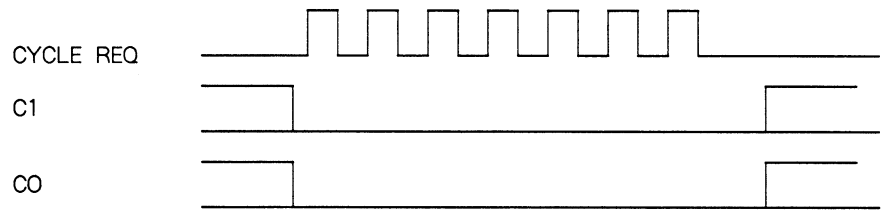
In summary, the READ STATUS request MUST be issued after any fatal error (transfer terminated by the ATTENTION bit).

WRITE COMMAND TIMMING

- **HOST → HDDF-500**

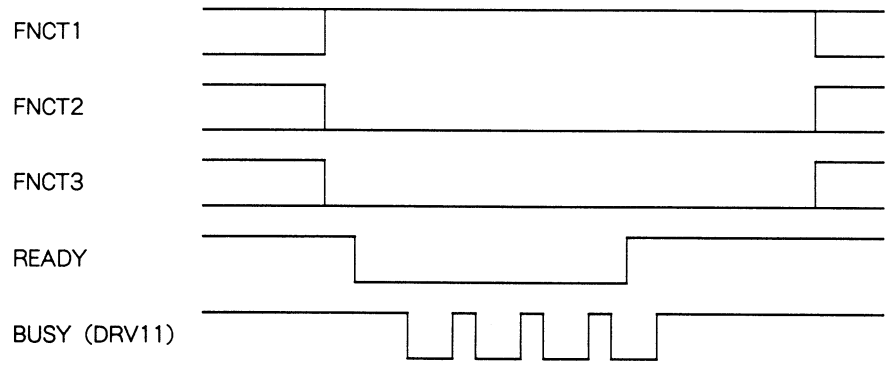


- **HDDF-500 → HOST**

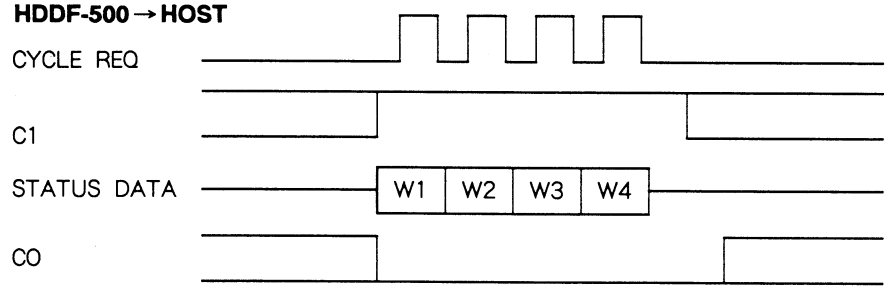


READ STATUS TIMMING

- **HOST → HDDF-500**

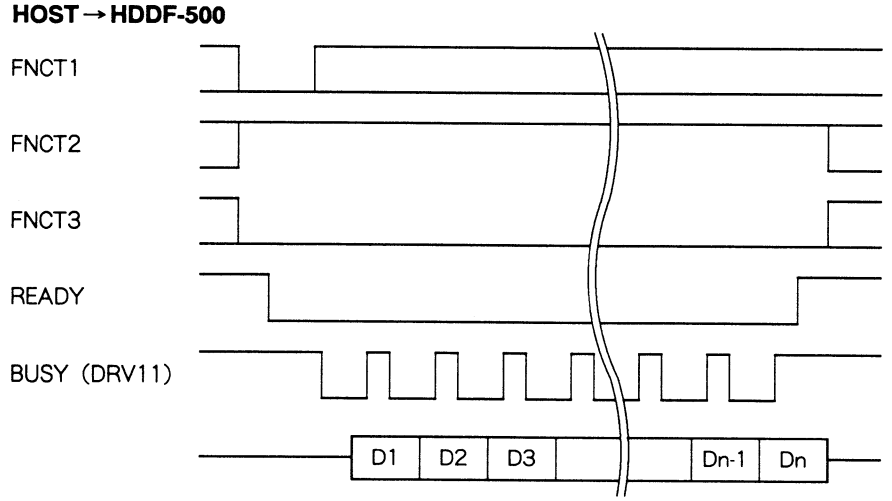


- **HDDF-500 → HOST**

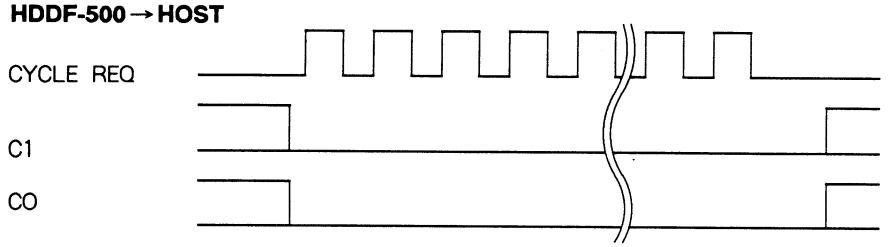


WRITE DATA TIMMING

- **HOST → HDDF-500**

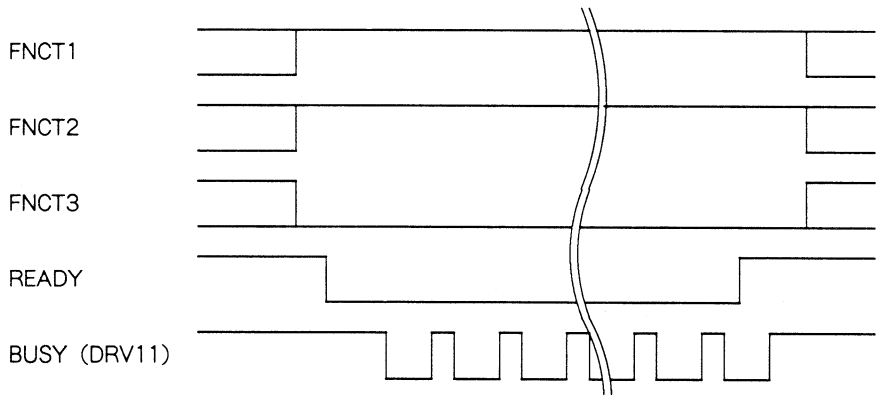


- **HDDF-500 → HOST**

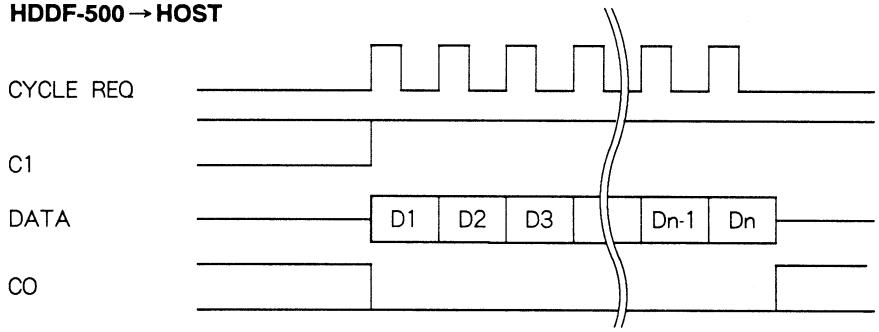


READ DATA TIMMING

- **HOST → HDDF-500**

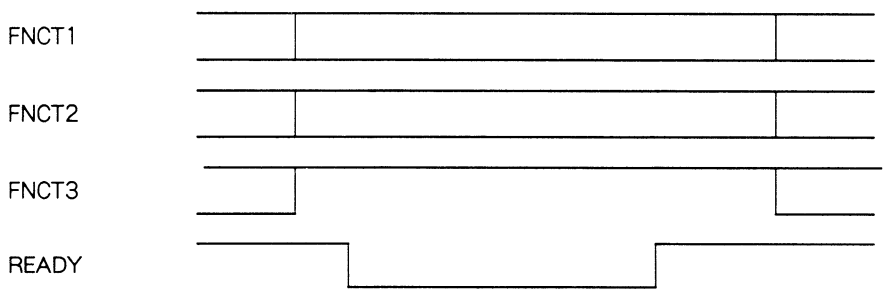


- **HDDF-500 → HOST**



RESET TIMMING

- **HOST → HDDF-500**



5. DETAILED DESCRIPTION OF COMMAND

5-1. WRITE/READ DATA

These modes are available to transfer video data to/from the specified channels in the selected area. When writing, multiple channenls may be specified (to write B/W (monochrome) data, G, B and R channels may be selected and loaded simultaneously).
When reading a single channel must be specified. Up to 65534 bytes may be transferred in one block. The selected frame may be operated on independently of the display frame.

5-1-1. Rectangular Transfer Mode

Parameter

WORD 1:	Command byte (D15–D8)	01H	
	Int (D4)	0	Single field transfer
		1	Interleaved transfer
	Fld (D3) Starting Field	0	First (Odd) field
		1	Second (Even) field
	Blu (D2)	0	Disable blue channel
		1	Enable blue channel
	Grn (D1)	0	Disable green channel
		1	Enable green channel
	Red (D0)	0	Disable red channel
		1	Enable red channel
WORD 2:	Frame number	0–maximum available*	
WORD 3:	Starting line	0–519	
WORD 4:	Starting column	0–1888 (MUST be divisable by 32)	
WORD 5:	End line	0–519	
WORD 6:	End column	32–1920 (MUST be divisable by 32)	

(*) The maximum number of frames which can be made available depends on the number and types of boards inserted.

5-1-2. Aligned Transfer Mode

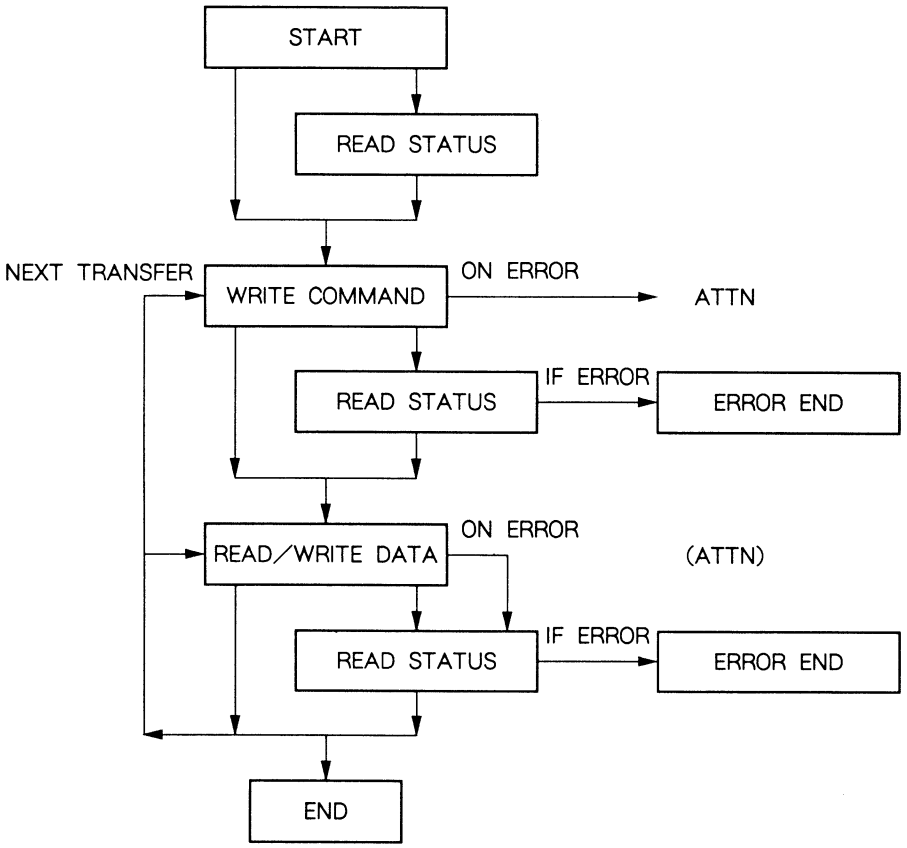
Parameter

WORD 1:	Command byte (D15–D8)	02H	
	Int (D4)	0	Single field transfer
		1	Interleaved transfer
	Fld (D3) Starting Field	0	First (Odd) field
		1	Second (Even) field
	Blu (D2)	0	Disable blue channel
		1	Enable blue channel
	Grn (D1)	0	Disable green channel
		1	Enable green channel
	Red (D0)	0	Disable red channel
		1	Enable red channel
WORD 2:	Frame number	0–maximum available*	
WORD 3:	Starting line	0–519	
WORD 4:	Starting column	0–1888 (MUST be divisable by 32)	
WORD 5:	Line count	0–520	
WORD 6:	Column count	32–1920 (MUST be divisable by 32)	

(*) The maximum number of frames which can be made available depends on the number and types of boards inserted.

Multiple READ/WRITE DATA

Multiple read or write data requests may be sent after one command transfer. When this is done, each sequential block of video data that is trasferred will start on the next line following the last block. The START COLUMN LINE COUNT and COLUMN COUNT will remain the same.



5-2. SELECT CURRENT FRAME COMMAND

SELECT CURRENT FRAME command is used to select the number of the frame to be displayed. This command is enabled only when the remote select switch is set to LOCAL.

Parameter

WORD 1: Command byte (D15–D8) 88H
Int (D4) ·····Unused
Fld (D3) ·····Unused
Blu (D2) ·····Unused
Grn (D1)·····Unused
Red (D0) ·····Unused
WORD 2: Frame number ·····0-maximum available*
WORD 3: Starting line ·····Unused
WORD 4: Starting column·····4Unused
WORD 5: Line count ·····Unused
WORD 6: Column count ·····Unused

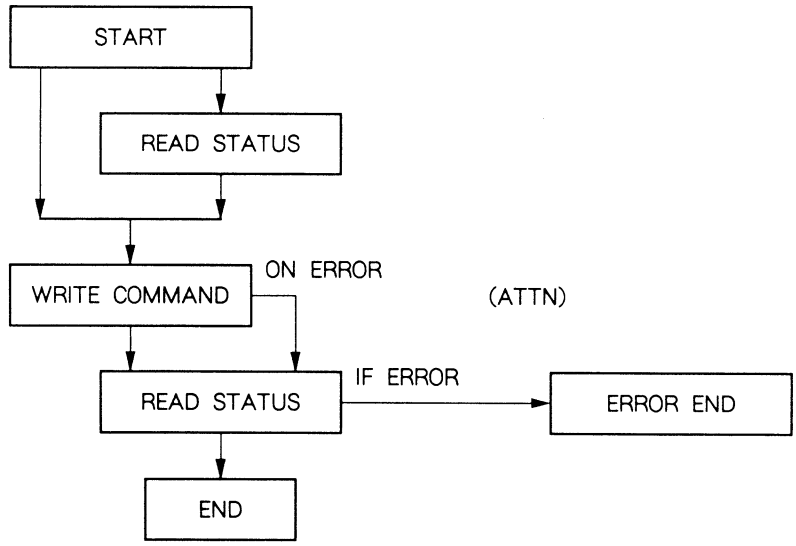
(*) The maximum number of frames which can be made available depends on the number and types of boards inserted.

5-3. CAPTURE CURRENT FRAME COMMAND

CAPTURE CURRENT FRAME command is used to execute the 1 frame recording command at which time 1 frame of the video input signal is recorded. The recording frame is selected by the abovementioned SELECT CURRENT FRAME command. This command is enabled only when the remote select switch is set to LOCAL.

Parameter

WORD 1: Command byte (D15–D8) 87H
Int (D4) ·····Unused
Fld (D3) ·····Unused
Blu (D2) ·····Unused
Grn (D1)·····Unused
Red (D0) ·····Unused
WORD 2: Frame number ·····Unused
WORD 3: Starting line ·····Unused
WORD 4: Starting column ·····4Unused
WORD 5: Line count ·····Unused
WORD 6: Column count ·····Unused



HDDF-500 (UC/EK)
SONY PARALLEL INTERFACE PROTOCOL
9-967-289-04

Sony Corporation
Communication Products Group

Printed in Japan
1990. 9 09