Servo Specification

S10004.08

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Revision History

Rev	Date	Author	Description
01	April 8, 1994	P. Groel	Initial Release
02	Feb. 8, 1996	P.Groel	Patty’s modifications
03	Feb. 15,1996	P.Groel	Added CSL commands
04	Sept 20, 1996	P.Orban	CSL Cartridge Cell bits
05	Sept 20, 1996	P.Orban	CSL u-code upload cmd
06	Oct 10, 1996	P.Orban	CSL Modifications
07	Oct 15, 1996	P.Orban	CSL MOdifications
08	Oct 28, 1996	P.Orban	CSL modifications

Shared Memory Controller - Servo

ADR[1]	CONTENTS	D7	D6	D5	D4	D3	D2	D1	D0
0	Control 1	New-C	-	-	-	-	-	-	-
1	Control 2	New-S	-	-	-	-	-	-	-
2	Command Byte 1								
3	Command Byte 2								
4	Status	Error	Attent	BOT	LEOT near PEOT	PEOT	N-Sect	CSL present	LEOT near BOT
5	Attention	Loaded	Thin Tape	Clean	Done	Clean tape present	Loading	Un-loading	Illegal Tape
6	Error Byte								
7	Sector #								
8	Spare Hardware Revision								
9	Spare Hardware Revision								
A	Spare serial #								
B	Spare Serail #								
C	Cell 8	Cell 7	Cell 6	Cell 5	Cell 4	Cell 3	Cell 2	Cell 1	
D	Drv 1	Drv 2					Cell 10	Cell 9	
E	CSL status								
F	Spare								
10	Motor Kt test result								
11	Motor Kt test result								
12	Number of Clean requests								
13	Number of Clean requests								
14	Clean cycles								
15	Clean cycles								
16	Number of ignored clean requests								
17	Number of ignored clean requests								
18	Power up loaded/unloaded option								
19	spare								
1A	CSL u-code download GROUP READY flags								
1B	CSL u-code download GROUP TAKEN flags								
1C	CSL u-code download READY flags								
1D	CSL u-code download READY flags								
1E	CSL u-code download TAKEN flags								
1F	CSL u-code download TAKEN flags								

[1] ADR signifies the offset into the shared memory resource. See document S10003.xx for actual addresses.

Control Byte 1 (Adr. 0)

D7: New Command. The control processor checks this bit to be a 0 before writing a new command to command byte 1 or 2. After updating one or both command bytes, the control processor sets the New Command bit in control byte 1 and interrupts the servo processor. The servo processor reads the new command and clears the New Command bit.
D6-D0: not used.

Control Byte 2 (Adr. 1)

D7: New Status. The servo processor verifies that this bit is cleared before updating any status. After updating the status information the servo processor sets this bit and interrupts the control processor. The control processor reads the new status and clears this bit.
D6-D0: not used.

Command byte 1 (Adr 2)

Bit 7 of the command byte indicates the tape speed. If this bit is set the read and write commands will be performed at 4 m/s. If the bit is reset the speed is 2 m/s. This bit is only applicable for the following commands:

Read forward 0x05, 0x85
Read backward 0x06, 0x86
Write forward 0x07, 0x87
Write backward 0x08 0x88
Data security erase 0x09 0x89

For all other commands this bit should be ignored.

0x00 Sense
Request for sense information. The servo updates the sense data starting with adr 7.

0x01 Complement and echo
This command is used for diagnostic purposes only. The servo processor reads the data in command byte 2, complements it.,

0x02 Rewind
Rewind tape to BOT. Upon completion the servo sets the BOT bit in the status byte, and interrupts the controller.

0x03 Unload
Rewind tape to BOT and unload cartridge. The servo resets the Ready bit (D7-Ready) in the attention byte and interrupts the controller.

If a CSL is present, command byte 2 indicates the location of the cartridge to be loaded and where to load it. The servo unloads the cartridge from drive and inserts the cartridge in the last CSL position if the destination is 0.
If the destination is not 0, the cartridge is placed in the specified destination according to the following table:

Bits 7-4	Bits 3-0
Source	Destination

Bits 7-4: Slot number (0x1 - 0xA) of cartridge to be loaded or 0xE for the current drive or 0xF or drive 2 of a two drive system.

Bits 3-0: Slot number (0x1 - 0xA) of cartridge to be loaded or 0xE for the current drive or 0xF or drive 2 of a two drive system.

The servo interrupts the controller to tell done. If the CSL reported an error in to the servo this error code is in the CSL status word.

0x04 Locate Sector

Move tape forward or backward to requested sector, possibly at high speed. The sector number is in Command byte 2. The sector numbers range from 0x01 through 0x5B for CST tape and from 0x01 through 5F for ECCST tape. The servo sets the Locate complete bit (D4-done) in the attention byte and interrupts the controller when the requested sector is found.

0x05 0x85 Read Forward

The servo starts tape movement in forward direction and generates 'GAPIN' when the correct speed and position is reached. Tape movement will stop when PEOT (for reading) is reached or a STOP Command is received. If bit 7 is set, the tape speed is 4m/s.

0x06 0x86 Read Backward

The servo starts tape movement in backward direction and generates 'GAPIN' when the correct speed and position is reached. Tape movement will stop when BOT is reached or a STOP Command is received. If bit 7 is set, the tape speed is 4m/s.

0x07 0x87 Write Forward

The servo starts tape movement in forward direction and generates 'GAPIN' when the correct speed and position is reached. Tape movement will stop when PEOT (for writing) is reached or a STOP Command is received. If bit 7 is set, the tape speed is 4m/s.

0x08 0x88 Write Backward

The servo starts tape movement in backward direction and generates 'GAPIN' when the correct speed and position is reached. Tape movement will stop when BOT is reached or a STOP Command is received. If bit 7 is set, the tape speed is 4m/s.

0x09 0x89 Data Security Erase

This command is similar to the Write Forward (0x07) command. The servo starts tape movement in forward direction and generates 'GAPIN' when the correct speed and position is reached. Tape movement will stop when PEOT (for reading) is reached or a STOP Command is received. If bit 7 is set, the tape speed is 4m/s.

0x0A Stop

The servo stops tape movement and returns to the stoplock position in anticipation of the next command.

0x0B Spare

0x0C Just Stop

The servo stops tape movement without returning to a defined stoplock position.

Commands 0x10 - 0x50 are used for diagnostic purposes only.

0x10 Enter Test
0x11 Exit Test
0x20 Lock
0x21 Tray up
0x22 Tray down
0x23 Thread CW
0x24 Thread CCW
0x25 Offset Adjust
0x26 KT Compare

0x27 Encoder Test
0x28 Limp Unload
0x40 Cycle at 2m/s
0x50 Cycle at 4m/s

0x60 Do not load

A fatal error in the unit was detected. The controller issues this command to prevent the servo from loading a tape.

0x70 Load Sequential

This command is only used if a CSL is present. The servo loads the next cartridge from the CSL.
The servo interrupts the controller to tell done. If the CSL reported an error in to the servo this error code is in the CSL status word.
This command can be deleted after Load Random is supported by servo and controller code sets.
If a CSL is present, command byte 2 indicates the location of the cartridge to be loaded and where to load it.

Bits 7-4	Bits 3-0
Source	Destination

Bits 7-4: Slot number (0x1 - 0xA) of cartridge to be loaded or 0xE for the current drive or 0xF or drive 2 of a two drive system.

Bits 3-0: Slot number (0x1 - 0xA) of cartridge to be loaded or 0xE for the current drive or 0xF or drive 2 of a two drive system.
The servo interrupts the controller to tell done. If the CSL reported an error in to the servo this error code is in the CSL status word.

0x78 Load CSL u-code

This command is only used if a CSL is present. Command byte 2 indicates the number of 4k blocks to be uploaded. SMR locations 0x1F200-0x1F2FF and 0x1F300-1F3FF are used to transfer 256 bytes of information. The SMR bytes 1E319-0x1E31E are READY, GROUP READY, TAKEN, and GROUP TAKEN flags.

1 -> 4K bytes
2 -> 2x4k = 8K bytes
0x4 -> 4x4k = 16K
0x8 -> 8x4K = 32K
0x10 -> 16x4k = 64k

For example; if the CSL u-code is 24k bytes long, the controller sends the servo a 0x78 command with 0x6 (4K*6 = 24K) in command byte 2 and resets all ready and taken flag bits. After the first 256 bytes are put into locations 0x1F200-0x1F2ff of SMR, the controller sets the first u-code READY flag 0x0001. The servo can then transfer the first 256 bytes of u-code to the CSL. When the first 256 bytes are transfered to the CSL, the servo ORs the first u-code TAKEN flag (0x0001) in the u-code taken flags. The controller is putting the second 256 into SMR 0x1f300-0x1F3FF and when ready ORs in the second READY flag (0x0003.) The controller must wait for the servo to set the “TAKEN” flag for the first set of 256 bytes before transferring data into SMR for the third set of 256 bytes. The process for sending sets of 256 bytes is continued until the controller sets the last ready flag; the 16 ready flag bits are set to 0xFFFF; and the servo has set all “TAKEN” flags bits(0xFFFF). So far, 16x256 or 4k bytes have been transferred.

After the first 4K bytes have been transferred, the controller clears all the ready and taken flags and sets the group flag to 1. It then puts the appropiate data into SMR and sets the first ready flag. The servo sees the first ready flag of the second group and sets the group taken flag to 1 and receives the first 256 bytes of the second 4k group. This continues until the controller has set the last group flag to 5 and the servo has set all the group flags to 5.

After the servo is finished setting all the flags bits; the servo interrupts the controller with the “DONE” bit set.

Command Summary

Command	Cmd 1	Cmd 2	Interrupt when complete
Sense	0x00	-	Yes
Complement	0x01	Data byte	Yes
Rewind	0x02	-	Yes. Set BOT, Attent
Unload	0x03	Location	Reset Ready, Set Attent immediately
Locate	0x04	Sector #	Yes. Set Done, Attent
Read Forward	0x05, 0x85	-	No[2]
Read Backward	0x06, 0x86	-	No[3]
Write Forward	0x07, 0x87	-	No[4]
Write Backward	0x08, 0x88	-	No[5]
DSE	0x09, 0x89	-	No[6]
Stop	0x0A	-	No
Just Stop	0x0C		
Diagnostic	0x10-0x50		
Do not load	0x60		
Load	0x70	-	Yes, set done with OK or error status
Load CSL u-code	0x78	# of blocks	Yes, set done

Command byte 2 (Adr 3)

Command Byte 2 is used as an extension to command byte 1 for the Complement and Locate commands.

Status Byte (Adr 4)

The servo interrupts the controller if a bit in the status byte is set.

D7: Error.

Set when the servo encounters an error condition. The type of error is indicated by the error byte (adr 6). Reset before the next servo to controller interrupt if the error condition is cleared.

D6: Attention.

Set when a bit in the attention byte (adr 5) changes its state. Reset before the next servo to controller interrupt.

D5: BOT.

Set when the tape is at BOT. Reset otherwise.

D4: LEOT.

Set when the forward (close to PEOT) LEOT position is reached during a write forward command or when the backward (close to BOT) LEOT position is reached during a write backward command.

D3: PEOT.

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[2] An interrupt is generated if PEOT is reached during the execution of this command.

[3] An interrupt is generated if BOT is reached during the execution of this command.

[4] An interrupt is generated if LEOT, PEOT or a new sector is reached while executing this command.

[5] An interrupt is generated if LEOT, BOT or a new sector is reached while executing this command.

[6] An interrupt is generated if PEOT is reached.

Set when the read PEOT position is reached during a read forward, a DSE command, or a Locate command. Set when the write PEOT position is reached during a write forward command.

D2: New Sector.

Set when during a write forward or a write backward command a sector boundary is reached. Reset before the next servo to controller interrupt.

D1: CSL present

This bit is set on power-up if a Cartridge Stacker/Loader (CSL) is present.

D0: Not used.

Attention Byte (Adr. 5)

D7: Loaded.

Set when a tape is loaded. Reset after receipt of an unload command and if the servo encounters a hard error condition. If a tape is loaded when the servo is powered up, this bit will not be set. The servo will in this case perform automatically an unload operation. This bit is also not set, if a clean tape is loaded. The servo will in this case perform automatically a clean cycle.

The servo sets the attention bit (D6) in the status byte and interrupts the controller when this bit changes from a 0 to a 1 or from a 1 to a 0.

D6:.Thin Tape

This bit is valid when bit 7 (Ready) is set. It indicates the type of type loaded.

0 - CST tape loaded.

1 - ECCST tape loaded

D5: Clean request.

The servo sets this bit to request a cleaning cycle. The servo resets this bit after completion of a cleaning cycle.

The servo sets the attention bit (D6) in the status byte and interrupts the controller when this bit changes from a 0 to a 1 or from a 1 to a 0.

D4: Done

The servo sets this bit after completing a Locate command. This bit is reset after receipt of the next command.

The servo sets the attention bit (D6) in the status byte and interrupts the controller when this bit changes from a 0 to a 1.

D3: Clean tape present

This bit is set when a cleaning cartridge is present.

D2: Loading

This bit is set when a cartridge is present and a load operation is in progress.

D1: Unloading

This bit is set when a cartridge is present and a unload operation is in progress.

D0: Illegal Tape

This bit is set when a tape with an illegal radius was loaded. The controller displays a warning message. Reading of this tape is allowed. However, writing to this tape is prohibited.

Error Byte (Adr. 6)

TBD.

Sector # (Adr. 7)

Valid after a Sense command was received. Indicates present sector if a tape is loaded. Set to 0x00 otherwise.

Adr. 0x08-0x09

Hardware Revision number.

Adr. 0x0A-0x0B

Serial number

Adr. 0x0C-0x0D

CSL Cell and Drive Status
These bits indicate when set to a “1” tata a cartridge is present in the cell. The bits are valid after a sense command.

Adr. 0x0E

CSL status

Adr. 0x0F

Spare

Adr. 0x10-0x11

Diagnostic result.

Adr. 0x12-0x18

Statistical data.

Adr. 0x1A-0x1F

CSL u-code download ready and taken flags.

Software revision (Adr. 0xF0-0xFF)

Valid after a sense command.