DRIVER PROGRAM PROCEDURES

SIO DISC-DRUM

HP Order No. HP 20079 (current version)

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Small Programs Manual
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SIO DISC-DRUM DRIVER

The SIO Disc-Drum Driver operates in a non-interrupt environment for disc operation, identically simulating magnetic tape unit operation. The driver is stored in high memory (immediately preceding the Tape Punch Driver) and because it overlays the same core locations as the magnetic tape SIO drivers, the driver is not used with magnetic tape operation.

DRIVER ORGANIZATION

The driver must be initialized (as the first request) by doing a REWIND or REWIND/STANDBY. This performs the additional function of reading in the first sector from the disc. REWIND and REWIND/STANDBY requests perform the same function: REWIND. There is no standby mode of operation for the disc memory.

STATUS returns give identical status replies as those for the magnetic tape SIO drivers; EOT, BOT, EOF, or zero (no condition).

READ may be followed by WRITE and WRITE may be followed by READ if the user is aware of the written data formats on the disc. Fixed length record formats are recommended for use if this feature is to be utilized. (This feature is not available with actual magnetic tape units.)

Records of any length may be read or written. There are no minimum or maximum lengths to be observed as with magnetic tape operation. The minimum length is one word, and the maximum is limited to the core storage buffer available to the user.

READS and WRITES on the disc itself are performed in sector blocks with no regard for track boundaries. This fact has no bearing on record lengths which may be less than or greater than 64 word sectors. This driver does not attempt to read or write beyond its last configured track number; it will give an "EOT" status and return.

The driver can simulate up to eight separate and distinct logical units (magnetic tapes) simultaneously on a physical disc. Though unit numbers may be accessed in random order, each unit is a sequential access unit, essentially making the disc a single continuous string of words. It is possible to have more than one unit defined to occupy the same or overlapping areas on the disc.

All calling sequences are exactly the same as those for the magnetic tape SIO drivers with one difference: the GAP request has no meaning and performs no function other than an immediate return to the user. The driver entry point linkage is in location 107B and requires DMA channel (no.6) The registers contain the same information upon return.

Auxiliary I/O Buffer

For normal operation the driver has an internal buffer of 128 words in length serving all eight logical disc units. At execution time an auxiliary I/O buffer may be assigned to the driver to expedite disc-to-disc transfer operations between logical units--therefore, eliminating a large amount of buffer swapping overhead time over the single buffer operation. The auxiliary buffer may be assigned at any time during the execution of the calling program but cannot be re-originated or released once it is assigned. The most common need for the auxiliary buffer occurs when a program desires to read information from one logical unit and copy it on another logical unit.

ASSIGNMENT OF AUXILIARY I/O BUFFER

The auxiliary I/O buffer is assigned to the driver by one of the following I/O requests:

REQUEST	COMMAND CODE
Write End-of-File (EOF)	2
Rewind	3
Rewind/Standby	5
Gap	6
Status	7

Any of these requests may be given in the normal manner, but with bit 15 of the command code word set to one. Bit 15 indicates to the driver that the contents of the B-register contain the beginning address of the auxiliary I/O buffer.

The I/O buffer must be 128 words in length. Immediately following the buffer, there must be a flag word (initialized to zero) for the driver to use. Therefore, the user is giving the driver a block of 129 words, with the last word containing the initial value of zero. The driver assumes all buffer control from this point on. Note that the I/O request assigning the auxiliary buffer may refer to any logical unit. All subsequent calls to the driver with bit 15 of the command code word set to one in no way alter I/O buffering. Thus, subsequent allocation type calls are treated as if bit 15 were set to zero.

If a buffer allocation request is made and the B-register contains zero upon entry to the driver, then the request option is removed. The auxiliary buffer still remains unassigned.

0--READ

One record is read into the user buffer if it is not an end-of-file (EOF) mark. The number of characters or words transmitted to the user is returned in the A-register as a positive integer. Characters or words are determined by the form the user uses when calling the driver; word requests are negative and character requests are positive. If the record is an end-of-file (EOF), then control is returned to "EOF/EOT/BOT" return address (P+2). The B-register will have the "EOF" status bit set on.

If an end-of-tape (EOT) condition exists when a READ request is made, the request is ignored and control returned to the "EOF/EOT/BOT" return (P+2). The B-register will have the EOT status bit set on(40_8).

A requested record length of zero causes an immediate return to the user without performing any action. Control is returned to the normal return address (P+4).

Control returns to the error return address (P+3) if a record checksum does not properly compute. The B-register contains parity status (02_8).

1--WRITE

The user buffer is written on the disc as one record; there are no length restrictions. If the A-register is positive, then the record length is in characters; if negative, then it is in words.

In an end-of-tape (EOT) condition exists when a WRITE request is made, the request is ignored and control returned to the "EOF/EOT/BOT" return address (P+2). The B-register will have the EOT status bit set on (40_8).

A requested record length of zero causes an immediate return to the user without performing any action. Control is returned to the normal return address (P+4).

The error return address (P+3) will never be used by this request.
See ABORT under ERROR HALTS.

2-WRITE END-OF-FILE (EOF)

This command causes an end-of-file mark (EOF) to be written on the disc. EOF is a record of zero length and may be written at any time.

3-REWIND

This request reads the first sector from the disc and resets the next sector to be read or written as the first sector for which the driver is configured. If the last request was a write or write "EOF", then the current sector buffer is written on the disc prior to the "rewind." Thus, a REWIND must be done before any other procedure, to initialize the driver.

4-POSITION

This is a general command to position the disc logically by records and/or file marks. The A- and B-registers control the operation as specified in the calling sequences. The backspace file request always leaves the disc positioned so that it is at the beginning of a given file (e.g., a backspace one file positions the disc to the beginning of the current file; a backspace two files positions the disc at the beginning of the previous file). During record spacing, file marks are counted as one record. All positioning is relative to the current position. Therefore, the disc is not directly addressable. File positioning is processed before record positioning.

Since there are only forward links for each record on the disc, the following procedure is used for positioning:

a. A count is kept of the number of records and file marks written on the disc.

b. For forward spacing, the new file or record number is calculated and the required number of files and/or records are skipped (registers greater than zero in value).

c. For backward spacing, the new file or record number is calculated. The disc is then rewound. Backspace one record is considered to be a special case and may not require the rewind and forward record searching operation.

If the new commands position the disc ahead of the "BOT", then the request is immediately terminated. Control is returned to the "EOF/EOT/BOT" return address (P+2) with the disc at BOT. The BOT status bit is set in the B-register (100_8).

d. After rewinding, the disc is spaced forward the required number of files or records. If the EOT is encountered, the request is immediately terminated, and control returned to the "EOF/EOT/BOT" return address (P+2) with the disc at EOT. The EOT status bit is set on in the B-register (40_8).

e. The backward requests (file and record) may cause the disc to be rewound twice, as file and record spacing are handled separately.

f. The maximum number of files and records that can be accurately written on a unit is 65,535.

g. If any record passed over during the positioning process does not compute a correct checksum, then return is made to (P+3). The parity error status will be in the B-register (02_8).

5-REWIND/STANDBY

See the REWIND request.

6--GAP

This command causes an immediate normal return to (P+4); no action.

7--STATUS

No disc action results. Because of the nature of the driver, only the status bits for the following conditions are set into the B-register.

a. Beginning-of-tape (BOT)

b. End-of-tape (EOT)

c. No condition (B=Ø)

USER CALLING SEQUENCES

READ,WRITE, POSITION

LDA <buffer length> or <file count>

If "A" > Ø, then <characters> or <forward>
If "A" < Ø, then <words> or <backwards>.
If "A" = Ø, then <no action>.

LDB <buffer address> or <record count>

JSB 1Ø7B,I

OCT <command code> Ø or 1 or 4

<EOF/EOT/BOT return>

<error return> (never used by this driver for WRITE operations)

<normal return>

WRITE END-OF-FILE,GAP

JSB 1Ø7B,I

OCT <command code> 2 or 6

<EOF/EOT/BOT return>

<error return> (not used by this request)

<normal return>

REWIND, REWIND/STANDBY, STATUS

JSB 1Ø7B,I

OCT <command code> 3 or 5 or 7

<normal return>

The command code word in all calling sequences is <unit#><command> in the following word format:

* Bit 15 is detailed under "Assignment of Auxiliary I/O Buffer."

ERROR HALTS

DISC Speed (Not Ready)

If the driver halts with 1Ø2Ø44B in the T-register, the disc is either not ready to accept data transfer commands, not spinning at a high enough rate of speed, or is not turned on. The disc should be up to speed about three minutes after being turned on.

When the operator presses RUN, the driver again checks this condition. If it has been cleared, the driver operation will continue; otherwise, it will halt again.

Tracks Protected

If the driver halts with 1Ø2Ø55B in the T-register, then either the user did not configure the driver properly and/or the hardware track protection feature is on. The track protect feature of the disc memory inhibits writing on certain selected tracks, giving these tracks a read-only capability. The switch, when on, always protects track ØØ (octal). Additional tracks may or may not be protected. The A-register will indicate the illegal track/sector address. The operator then either correctly reconfigures the driver for unprotected tracks or turns off the hardware track protection feature.

Error Halt-ABORT

If the driver halts with 102011B in the T-register, the disc is not able to correctly transfer a sector of data to or from core memory via the Direct Memory Access (DMA). Before this halt is executed, the driver attempts to rewrite or reread the sector 10 times. If this data transfer is still not successful, then it is considered a hardware failure of serious nature.

If RUN is pressed, the driver retries the operation another 10 times. When the computer has halted, the E-register indicates the direction attempted on data transfer. E = 0 indicates a failure on the read check following a write operation. E = 1 may be either a read or write failure during the actual operation.

The driver only recovers and continues upon completion of a successful operation after RUN is pressed.

DRIVER CONFIGURATION:

The disc driver should be the last SIO driver loaded with the basic binary loader.

a. Load Address: 2B

b. Set the select code of the DATA channel (high priority) into the switch register, bits 4-0. Set bit 15 as follows:
   0 = 90 Sectors/Programming track
   1 = 128 Sectors/Programming track

c. Press RUN: the computer will halt with 102001B in the T-register.

d. Set the first (octal) track address to be made available to the driver into the switch register, bits 7-0. Set bits 14-12 to the intended disc logical unit number (0-7). This parameter is the BOT for this unit.

e. Press RUN; the computer halts with 1Ø2ØØ2B in the T-register.

f. Set the last (octal track address to be made available to the driver into the switch register, bits 7-Ø). This parameter is the EOT track for this unit.

g. Press RUN. If the computer halts with 1Ø2ØØØB in the T-register, then the last track for the current logical unit is less than that of the first track address given. Restart driver configuration with Step b. If switch 15 was set to one for either Step d or Step f, then the driver terminates configuration, even if all eight logical units have not been specifically defined. Configuration of the first logical unit sets the other seven logical units to the same configuration in case of premature termination. If switch 15 was not set for Steps d or f, then configuration continues with Step d. A maximum of eight logical units may be defined.

h. Configuration is complete when the computer halts with 1Ø2Ø77B. The driver may be completely reconfigured again by starting with Step b.

i. The driver may be dumped, if desired, with the SIO System Dump routine.