MAGNETIC TAPE

MAGNETIC TAPE SYSTEM

INTRODUCTION

The magnetic tape system provides areas on magnetic tape for storage of 24K memory loads of SPIREL-compatible systems. Reading and writing may be done both manually (from the console) and under program control, as for dynamic dumping of production runs.

The tape is pre-marked into blocks numbered from 1 to 40 (octal), each containing a full 24K memory load. Reading and writing operations are carried out by the magnetic tape system programs which are located at the high end of memory. There are four means of communication with the magnetic tape system:

- in the SPIREL system (and the PLACER systems) from the console entry at location 37 for manual read or manual write -- set (CC) = 37 and fetch
- with the console bootstrap tape, BOOT, for manual read or manual write
- by transferring to an octal location (57700) for programmed reading
- by transferring to an absolute location (57701) for programmed writing.

- Manual READ

From the console a memory load may be obtained from magnetic tape by the following procedure:

1) Give the "MT i" command from the console or FETCH from location 37 (octal) if the appropriate tape routines are in memory, or LOAD the bootstrap tape for the tape unit to be used.

The magnetic tape system programs are read from tape, and the machine halts with an arrow in U. The current position (block number) is displayed in IL.

2) If IL addresses the block desired, simply CONTINUE; otherwise, set SL to the desired block number and CONTINUE.

The block will be read from tape and checksummed. All lights and registers (except T7) will be restored to their values at the time the block was written. The control word, if any, provided when the block was written will be executed. Control will be returned to the console communication loop if the block was written with a manual WRITE or to the location immediately following the transfer to 57701 for a programmed WRITE.

3) If an invalid block number is set into SL, SL will be cleared and the machine will halt again with the arrow in U. Go back to step 2).

4) If the designated block cannot be read, the machine will halt with NO in U. Go back to step 1) to try again.

- Manual WRITE

From the console a memory load may be written onto magnetic tape. Obtain the memory load by reading from magnetic tape or LOADing the "CLEAR" tape, then reading from paper tape as desired. All lights (except IL 10, 11, 12, 13 -- the tape search lights) and registers (except T7) will be stored on tape with the memory load and should be set as desired. The manual WRITE procedure is as follows:

1) Give the "MT" command from the console or FETCH from location 37 (octal) if the appropriate tape routines are in memory, or LOAD the bootstrap tape for the unit to be used.

   The magnetic tape system programs are read from tape, and the machine halts with an arrow in U. The current position (block number) is displayed in IL.

2) Turn off "NOT WRITE" light on the transport to be used.

3) Turn on SL[1].

4) If you wish to have a control word executed when the block is read from tape, type it into U.

5) If IL addresses the block desired, simply CONTINUE: otherwise, set the desired block number into the right end of SL and CONTINUE.

   The memory will be written at the designated block and control will be returned to the console communication loop. The control word to be executed when the block is read is not executed at this time.

6) If an invalid block number is set into SL, SL will be cleared and the machine will halt again with the arrow in U. Go back to step 3).

7) If the block cannot be written without error, the machine halts with NO in U. The memory load is not destroyed. Go back to step 3) to try again.

8) Turn on "NOT WRITE" light on the transport used.

- Programmed READ

From a program, control may be passed to the magnetic tape system to read a memory load or to go into the manual READ procedure.

1) To read block K from magnetic tape, set (T7)=K and TRA to the programmed READ location, 57700.

Operation continues as for manual READ, step 2) -- and halt with NO in U will show block which could not be read as current position in IL.

2) To pass control to the manual READ procedure, set (T7)≤0 and TRA to the programmed READ location, 57700.

Operation continues at step 2) in manual READ, with an arrow in U and current position (block number) in IL.

- Programmed WRITE

From a program, the magnetic tape system may be used to dump a memory load, control then being returned to program after the write. The procedure is as follows:

1) Code

```
                    set (T7)
                 TRA      57701
           [return after read]
           [return after write]
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2) The value (T7) = K, K > 0 will cause block K to be written
(T7) ≤ 0 will cause halt with arrow in U and current position (block number) in IL; then set block number for write in SL and CONTINUE

3) Control after write returns to second order beyond TRA to 57701 with all registers restored, except (T7) which indicates action taken:
(T7) = 0 if write was successful
(T7) =-1 if invalid block number given
(T7) =-2 if successful write could not be performed

4) Control upon subsequent READ of block goes to first order beyond TRA to 57701 -- no control word being executed and all registers but T7 as before WRITE.

SYSTEM ORGANIZATION

The magnetic tape system consists of the programs BOOT, CALL, MAIN, MARK, and COPY.

BOOT is used to initialize the system from the console. With the LOAD switch it goes into memory at location 57400, searches tape backward to the nearest copy of CALL, reads CALL and transfers to it.

CALL normally remains in memory at locations 57700 to 57777. The entry points for programmed operations are in CALL, as is the entry from BOOT. CALL saves all registers except T7, CC, P2, and S, then reads MAIN from magnetic tape and transfers control there. CALL tries five times to read the nearest MAIN without error; if this fails, it searches backward for the next MAIN to try again.

MAIN normally remains in memory at locations 57400 to 57677. It controls the logic of positioning, reading, writing, handling tape errors, and unsaving. As in CALL, five attempts are made to do each read or write correctly. MAIN does not have to remain in memory. The standard end of allocatable memory for SPIREL is set at 57377. If the 300 words occupied by MAIN are required for dynamic allocation in a SPIREL system, the end of memory may be set to 57700, allowing MAIN to be overwritten. In this case, a SPIREL REORGANIZATION of the STEX domain should be requested and location 100 checked before writing to ensure that no information will be over-stored when MAIN is brought in for the WRITE operation.

The memory arrangement used by the magnetic tape system is as follows:

10-57377	dumped on and read from magnetic tape
40-77	used by MT system to store fast and special registers
57400-57677	MAIN program
57700-57777	CALL program

PUBLIC SYSTEMS TAPE

A public systems tape for transport 3 is maintained by the Computer Project. It contains **copies** of the programming systems: SPIREL and PLACER. Each user is assigned a block for storage of a private system. For the protection of all users, programmed writing is inhibited on the public systems tape.

System tape maintenance involves three system tape reels. Tape A is in current use and is copied once a week. Tape B is 0 - 1 week old, and tape C is 1 - 2 weeks old.

Once a week tape A becomes tape B, tape B becomes tape C, and tape C is used for the new tape A. As much as possible of tape B is copied onto tape A. Blocks which cannot be read from tape B are written as zeros on tape A.

If tape A becomes unusable, a new tape A will be copied from tape B. If tape A becomes unusable and tape B cannot be copied, tape C becomes tape B, and tape B may be copied as tape C to have three reels on hand.

It may be necessary for a user to fill or update his block on a new system tape A. Users have access to tapes B and C for reading, NOT FOR WRITING, but this will not solve all problems. A user should always be able to regenerate his block from paper tape.

At the time a new tape A is written re-allocation of blocks may be made on the basis of computer usage; watch for this so that you are always writing in your own block.

DYNAMIC DUMPING

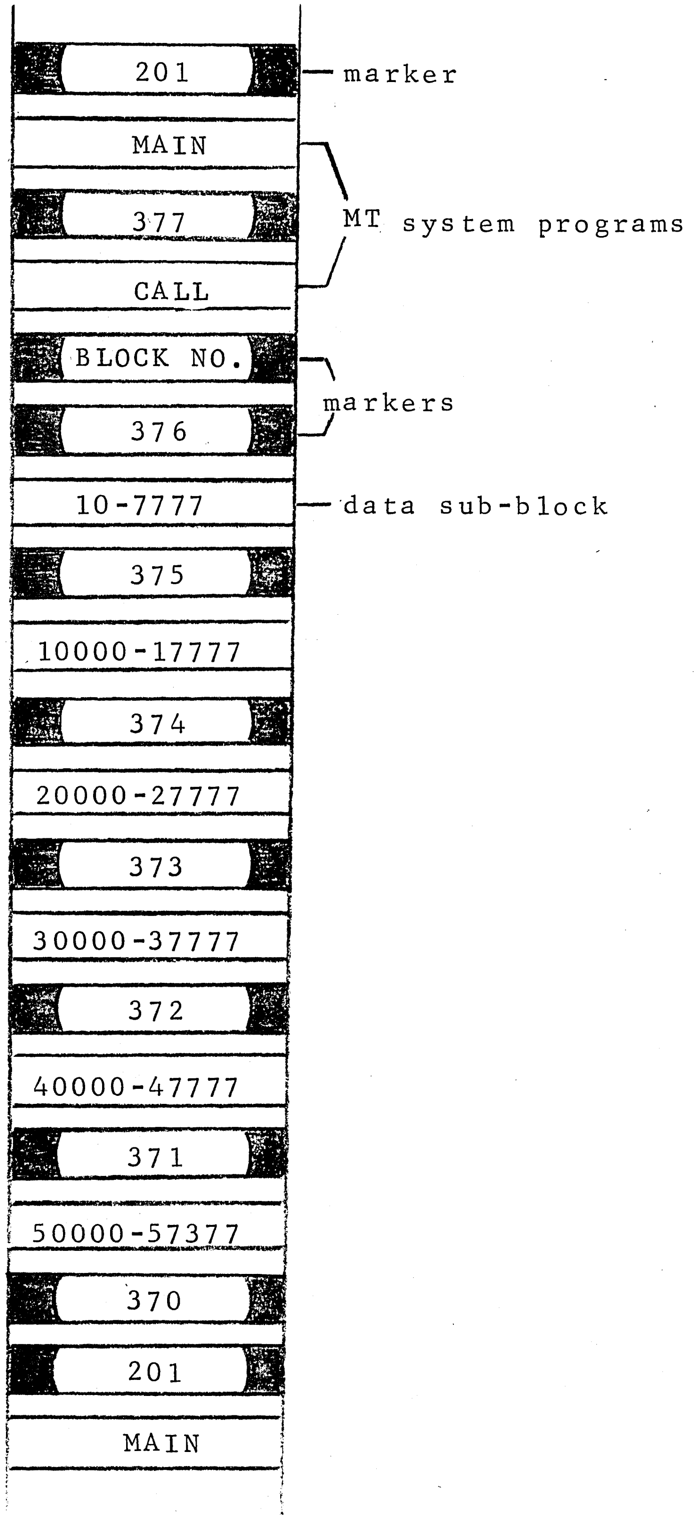
The magnetic tape system programs are easily used in a dump-restart procedure for a production package. Dumping may be cycled through a series of blocks, so that the past several dumps are always available.

At each dump the date, time, and number of the dump along with any results of interest may be printed. P2 and T7 may be saved if these are necessary in the running program. After each dump control returns to the second order beyond the TRA to 57701, and the system may continue to run.

Restart is accomplished by a manual READ, and control returns to the first order beyond the TRA to 57701. Initialization of any sort may be done, and then the system may continue to run.

TAPE FORMAT

The present system provides 40 blocks written in sub-blocks of about 10,000 words separated by markers as shown below. The number of blocks on the tape, the size of the segments, the total amount of memory written, and the logical transport on which the system runs may be changed by simple edits of the symbolic programs.



- MARK

The MARK program loads at location 57300, marks a system tape in the format described, fills all blocks with the same content, does not check for bad areas on the tape or for unsuccessful writing. The system used as content for the blocks may not have memory in use above location 57277.

To prepare a tape with MARK:

1) either a) clear memory with the "CLEAR" tape and load SPIREL from paper tape
   or b) load SPIREL from magnetic tape
   or c) load some other system, which you wish to have written in all blocks on the tape.

2) Self-load CALL for the transport to be used; machine will stop with

```
(I):   Z     HTR     Z
```

3) Self-load MAIN for the transport to be used; machine will stop with

```
(I):   Z     HTR     Z
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4) Self-load MARK for the transport to be used; machine will stop with

```
(I):          HTR     57300
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5) Turn off "NOT WRITE" light and CONTINUE. Tape will be marked, and machine will halt as for manual READ. Normally 40 (octal) blocks are provided. The number of the block being written is kept in B1, and the program may be stopped short of 40 blocks.

Paper tape copies of CALL, MAIN, and MARK for transports 2 and 3 are available in the programming office.

- COPY

The COPY program loads at location 7000 and marks a tape in the format described. It writes each block on the new tape as directed by a control paper tape -- as a copy of a block on the old tape or blank. As each block on the new tape is written, it is checked for being written correctly and for being readable. "Bad spots" on the tape are detected and avoided.

To prepare a tape with COPY:

1) Mount the old tape as logical tape 3.
2) Mount the new tape as logical tape 2 with the "NOT WRITE" light OFF.
3) Self-load CALL for the logical unit on which the new tape will be used.
4) Self-load MAIN for the logical unit on which the new tape will be used.
5) Self-load COPY, and a HTR to the first instruction of COPY (at location 7000) will occur.
6) Position control paper tape (format described below) in the reader.
7) CONTINUE to location 7000 to rewind both tapes and start the copy procedure. Bypass the order at location 7000 to avoid rewinding the old tape which must be positioned before the first block to be copied. Bypass the order at location 7001 to avoid rewinding the new tape. In any case, the copy procedure is begun at location 7002 by writing leader of markers 201 on the new tape.
8) The copy procedure reads from the control paper tape for each block of the new tape. The number of the block being written is maintained in PF.
9) If there is no paper tape in the reader, COPY will hang on a a read order and the control information for the block number shown in PF may be typed into U as it would have been read from the control paper tape.

10) All reads from the old tape are checked for parity and checksum; they are repeated until both are correct. Five read failures on the same sub-block (there are six in each block) will cause COPY to halt; three options are then available:

(a) Pushing CONTINUE will cause writing of a sub-block of zeros instead of the copy from the old tape. The block will be readable, and the checksum correct.

(b) Typing a number into B6 and fetching from F0 will cause that number of further read attempts to be made. If they all fail, COPY will return to the same halt.

(c) Typing a number into U and fetching from F3 will cause the block with that number on the old tape to be written instead of the one found unreadable.

11) All writes on the new tape are checked for parity and word-to-word correspondence to what should have been written. After five unsuccessful writes, COPY fills the unwritable section with markers 200 and tries again.

12) The copy procedure is terminated by simply letting COPY hang on a read paper tape order.

The COPY control tape contains a directive for each block to be written on the new tape, these being given for blocks 1,2,... in order. Each directive consists of exactly three punches:

cr NN

where NN is the two-digit octal block number of the block to be copied from the old tape. If a block on the new tape is not to contain a copy of a block from the old tape but is to be written as zeros, punch NN as 00.