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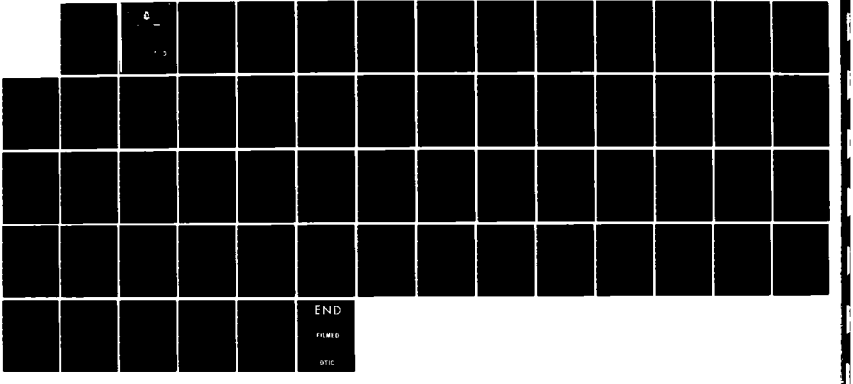

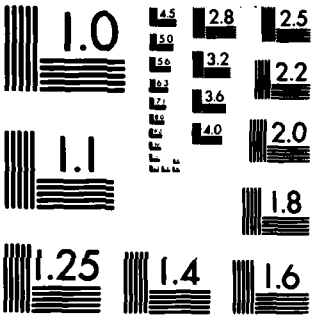

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TAPTRN - A TAPE UTILITY PROGRAM

by

S. Shan

DEFENCE RESEARCH ESTABLISHMENT OTTAWA
TECHNICAL NOTE 83-38

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by

S. Slinn
SARSAT Project
Electronics Division

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ABSTRACT

The computer program TAPTRN, a utility routine used to read magnetic tapes of unknown content and format, is described for use on an HP 1000 computer. It provides the user ready access to all the capabilities of the tape handling hardware of the HP 1000. TAPTRN is documented in terms of a brief description of the utility, its capabilities, a guide on how to use it, and the source and pseudocode for the routines written.

RÉSUMÉ

Cet ouvrage porte sur le programme d'ordinateur TAPTRN, sous-programme de service utilisé avec l'ordinateur HP 1000 pour lire des bandes magnétiques de présentation et de contenu inconnus. Ce programme permet à l'utilisateur d'avoir facilement accès à toutes les possibilités du dérouleur de bande de l'ordinateur HP 1000. L'auteur fait une brève description du sous-programme de service TAPTRN, explique quelles sont ses possibilités, fournit des instructions sur la façon de l'utiliser et indique la source et le pseudo-code des routines écrites.

TABLE OF CONTENTS

1.0 INTRODUCTION

TAPTRN is a utility program to aid in the processing of digital tapes.

This report describes two programs, TAPTRN and TSTAPE. TAPTRN is a FORTRAN callable subroutine designed to facilitate the processing of digital tapes. It contains a variety of functions which makes available all the capabilities of the mag tape hardware. This subroutine is written in FORTRAN 4X and FLECS, a FORTRAN preprocessor.

TSTAPE is a main program, written in FORTRAN 4X, that has been created to facilitate the usage of the TAPTRN program by providing full access to all the TAPTRN functions.

Both of the programs, TAPTRN and TSTAPE, are intended to be used on an HP1000 computer with a RTE IVB operating system.

In the following sections, TAPTRN will be documented under the headings: Program Overview, Calling Sequence and Parameter List, and Error Codes. The source listing for TAPTRN is found in Appendix A and the pseudo code describing the source listing in Appendix B. TSTAPE will be documented under the headings: Program Overview, and Compiling and Running the Program. The source listing for TSTAPE is found in Appendix C and the pseudo code describing the source listing in Appendix D.

2.0 TAPTRN DESCRIPTION

2.1 PROGRAM OVERVIEW

The facilities provided by TAPTRN are as follows:

1) Variable record length.

2) Ability to skip and backspace multiple records or files, thereby allowing the user to:

a) skip to subsequent files without having to read through intervening files;

b) position the tape at the logical end of volume;

c) perform a logical rewind to position the tape at the beginning of a file which is not the first file on the reel.

3. Provide the calling program with information on the tape position, i.e. BOT, EOF.

4. Return success or failure on all requested functions along with device status word.

5. Erase four inches of tape.

TAPTRN has ten different functions. With this capability, the user has all the necessary functions to perform any combination of operations on the tape drive. The only restrictions imposed are those of the hardware limitations of the controller and drive.

2.2 CALLING SEQUENCE AND PARAMETER LIST

TAPTRN is called by the FORTRAN statement:

```
CALL TAPTRN(IUNIT,KODE,KOUNT,IERR,NTRAN,IPOS,ISTAT,IBUFF)
```

None of these parameters are optional, however, some of the parameters are for input, and some are for output. The input parameters are:

IUNIT - the logical unit number assigned to the tape drive, it has to be zero (not related to the system logical unit numbers).

KODE - the function code.

KOUNT - the count, used in combination with KODE as shown in the table for TAPTRN function codes.

IBUFF - the user buffer name, an integer array to receive the data read from the tape, or it contains the data to be written to the tape. The maximum length allowed for this buffer is 9950 words.

The output parameters are:

IERR - the error code, where:

0 - successful completion of the requested operation
<0 - failure of requested operation.

IPOS - the tape position, where:

=1, BOT
=2, EOF
=3, EOT
=4, EOV

ISTAT - status return information (see table).

NTRAN - for reading/writing records, it contains the actual number of words transferred (in reading, this may differ from KOUNT if an EOF is encountered). For the skip/backspace functions, NTRAN contains the number of files/records skipped.

TABLE 1

TAPTRN Function Codes

KODE	Function
-2	Unlock logical unit
-1	Obtain resource number and lock logical unit
0	Status request
1	Rewind tape
2	Write end-of-file
3	Skip KOUNT records forwards
4	Backspace KOUNT records
5	Skip KOUNT files forwards
6	Backspace KOUNT files
7	Erase four inches of tape
8	Read a record and transfer up to KOUNT words (maximum 500 words)
9	Write a record KOUNT words long (maximum 500 words)

TABLE 2

Status Return Information (ISTAT)

ISTAT	Meaning
1	Parity and/or timing error.
2	Reel does not have Write enable ring.
3	I/O request requested: a) Tape motion required, but tape is at load point. b) Backward tape motion required, but tape is at load point. c) Write request was given, but reel does not have write enable ring.
4	Timing error on last read/write operation.
5	End-of-tape marker sensed.
6	Start-of-tape marker sensed.
7	End-of-file record encountered when reading, forward spacing, or backward spacing.
8	Unit available for use.
9	Unit disabled.
10	Unit currently in operation.
11	Unit waiting for an available DMA channel.

2.3 ERROR CODES

TAPTRN carried out a number of checks on the input parameter list to ensure valid requests. The code placed in IERR is generated by TAPTRN and not by the operating system. The error codes which can be set by TAPTRN are listed below.

TAPTRN Error Codes (IERR)

Code	Description	Source
-2	Invalid function code.	KODE out of range (-2 to 9).
-37	No file accessed on logical unit number.	Logical unit was not locked.
-92	Invalid logical unit.	Logical unit number was not zero.
-93	Logical unit was not unlocked.	Specified logical unit not in SST.

3.0 TSTAPE DESCRIPTION

3.1 PROGRAM OVERVIEW

TSTAPE has been created to (a) facilitate the usage of the TAPTRN program and (b) be used as an aid in the analysis of computer tapes of unknown format. TSTAPE has many commands which provide full access to all the TAPTRN functions. These are as follows:

```
COMMAND SUMMARY (X=UNIT,DEFAULT=0)

IN(X) = INITIALIZE THE DRIVE (-****MUST BE FIRST COMMAND INPUT****)
RD(X) = READ A RECORD
WT(X) = WRITE A RECORD
DI    = DISPLAY A READ/WRITE BUFFER
ST    = DRIVE STATUS (LAST COMMAND)
SL    = SET RECORD LENGTH
RW(X) = REWIND TAPE
NR(X) = NUMBER OF RECORDS IN THE FILE
SK(X) = SKIP
RL(X) = FIND THE RECORD LENGTH (WORDS)
EF(X) = WRITE AN EOF
TS(X) = WRITE/READ TEST
SH    = SHOW THE FIRST RECORD OF EACH FILE ON THE TAPE
EX    = EXIT
HE    = HELP
```

When first using this tape package, the most helpful command is HE, the help command. This command will display the command summary shown above, on the screen.

The commands are self explanatory but a few will be expanded upon here. It should be noted that the first command that should be input is IN(X), initialize the drive. If another command is input first, before this one, an error message will appear stating that the drive has not been initialized. This command has been incorporated to accommodate multiple tape drives on the system, allowing the user to acquire one drive solely for their use.

The command DI, Display the Read/Write Buffer, has the capability to display the buffer in ASCII, integer or octal format, and to convert EBCDIC and BCD data to ASCII before displaying. The user will be queried which of these capabilities is to be utilized at the appropriate time.

For all the commands that have (X) included in them, i.e. IN(X), it is not necessary to include the (X) with the command if the user wishes to use the unit default of 0. For example, instead of entering RD(0), the user can enter RD.

3.2 COMPILING AND RUNNING THE PROGRAM

In order to run this program, enter the following command while in file manager:

```
:RU,TSTAPE
```

The initial screen display introducing the program will then appear.

Command files have been created in case it is necessary to re-compile and load the program. A listing of these command files is found in Appendix E. The rebuilding of the program is done in two stages. First invoke the transfer file, RTAPE, by entering:

```
:TR,RTAPE
```

in order to rebuild the TAPTRN program. Then, invoke the transfer file, CTSTAP, by entering:

```
:TR,CTSTAP
```

in order to rebuild the TSTAPE program and to link and load the TSTAPE and TAPTRN programs together. The program TSTAPE, is then ready to run in the manner stated above.

4.0 SUMMARY COMMENTS

This report has described the two programs, TSTAPE and TAPTRN. TSTAPE has been described along with a description of how to compile and run the program. TAPTRN has been described along with a description of its parameter list, error codes and status return information. Further documentation of each program is provided in the comments of the program.

APPENDIX A

TAPTRN SOURCE LISTING

```
C*************************************************************************
C This is a FORTRAN callable subroutine that is designed to give
C the user the capability to manipulate the tape drive in order
C to read any type of tape.
C The facilities provided by TAPTN are:
C   1)Variable record length
C   2)Ability to skip and backspace multiple records or files
C     thus permitting the user to:
C        a)skip to subsequent files without having to read through
C          intervening files
C        b)position the tape at the logical end of volumne
C        c)perform a logical rewind to position the tape at the
C          beginning of a file which is not the first file on the reel
C        d)provide the calling program with information on the tape
C          position eg.BOT,EOF
C        e)allow tape formatting eg.writing EOF,EOV
C        f)return success or failure on all requested functions along
C          with device status word
C        g)erase four inches of tape
C
C The calling sequence to invoke this subroutine is:
C
C    CALL TAPTN(IUNIT,KODE,KOUNT,IERR,NTRAN,IPOS,ISTAT,IBUFF)
C
C See the program documentation for a description of the parameters.
C
C The files used with this program are:
C      &TAPTRN -source module
C      %TAPTRN -relocatable module
C      TAPTN   -runnable program
C      RTAPE   -transfer file to compile TAPTN
C  -note- all these files reside on cartridge 13
C
C To create this subroutine invoke the transfer file, RTAPE by,
C      :TR,RTAPE
C
```

```
C
C Author: Suzanne Slinn
C Date: November 6,1982
C
C*************************************************************************
C
C
C
$FILES(15,15)
      SUBROUTINE TAPIN(IUNIT,KODE,KOUNT,IERR,NTRAN,IPOS,ISTAT,IBUFF)
      INTEGER IERR,ISTAT,KODE,IUNIT,ICON,LURAY(6),NUM,I,ITOPB,ICNWD,
     1        ISTA1,LUN,IA,IB,IN,OUT,TYPE,IBUFL,ITEST,IBUFF(9950)
      LOGICAL FOUND,EOF,EOT,ILOCK
      DATA IN/1/,OUT/1/,ILOCK/.FALSE./
C
C     Initialize error codes
      IERR=-2
      ISTAT=0
      NTRAN=0
      ISTA1=0
      IPOS=0
C
C     Check for valid function code
      IF ((KODE .LT. -2) .OR. (KODE .GT. 9)) RETURN
C
C     Check if Magtape unit number valid
      IERR=-92
      IF (IUNIT .NE. 0) RETURN
      LUN=IUNIT+8
      IERR=-37
      IF (KODE .GE. 0)
         IF (.NOT.(ILOCK)) RETURN
      FIN
      IERR=0
```

```
C
C       Case Function Code of
        SELECT (KODE)
         (-2)
C             Unlock
              ICON=000000B
              NUM=1
              LURAY(1)=LUN
C             Unlock the LU
              CALL LURQ(ICON,LURAY,NUM)
              ILOCK=.FALSE.
              RETURN
              FIN
C
         (-1)
C             Lock
              ICON=000001B
              NUM=1
              LURAY(1)=LUN
C             Lock the LU
              CALL LURQ(ICON,LURAY,NUM)
              ILOCK=.TRUE.
              RETURN
              FIN
C
         (0)
C             Status request
              ICNWD=0
              ICNWD=ICNWD+8
              CALL EXEC(13,ICNWD,ISTA1)
              CALL STATS(ISTA1,ISTAT)
              IERR=0
              RETURN
              FIN
C
```

```
        (1)
C           Rewind tape
            CALL MANIP(4,LUN)
            CALL EXEC(13,LUN,ISTAT)
            CALL STWAT(ISTAT)
            ISTAT=0
            IPOS=1
            IERR=0
            RETURN
            FIN
C
        (2)
C           Write end of file
            CALL MANIP(1,LUN)
            CALL EXEC(13,LUN,ISTAT)
            CALL STWAT(ISTAT)
            ISTAT=0
            IERR=0
            IPOS=2
            RETURN
            FIN
C
        (3)
C           Skip KOUNT records forwards
```

```
                I=1
                EOF=.FALSE.
                WHILE ((I .LE. KOUNT) .AND. (.NOT. (EOF)))
C                   Forward space 1 record
                    CALL MANIP(3,LUN)
                  ICNWD=8
                  CALL EXEC(13,ICNWD,ISTA1)
                  CALL STWAT(ISTA1)
                  ITEST=IAND(ISTA1,(2**7))
                  WHEN (ITEST .EQ. 2**7)
                    EOF=.TRUE.
                    ISTAT=7
                    IPOS=2
                    I=I-1
                  FIN
                  ELSE
                    ITEST=IAND(ISTA1,(2**5))
                    IF (ITEST .EQ. (2**5))
                      EOF=.TRUE.
                      ISTAT=5
                      IPOS=3
                      I=I-1
                    FIN
                  FIN
                  I=I+1
                FIN
                WHEN (I .GT. KOUNT)
                  NTRAN=I-1
                FIN
                ELSE
                  NTRAN=I
                FIN
                IERR=0
                RETURN
                FIN
C
```

```
      (4)
C        Skip KOUNT records backwards
         I=1
         EOF=.FALSE.
         WHILE (( I .LE. KOUNT) .AND. (.NOT. (EOF)))
C          Backward space 1 record
           CALL MANIP(2,LUN)
           ICNWD=8
           CALL EXEC(13,ICNWD,ISTA1)
           CALL STWAT(ISTA1)
           ITEST=IAND(ISTA1,(2**7))
           WHEN (ITEST .EQ. 2**7)
             EOF=.TRUE.
             ISTAT=7
             IPOS=2
             I=I-1
           FIN
           ELSE
             ITEST=IAND(ISTA1,(2**6))
             IF (ITEST .EQ. (2**6))
               EOF=.TRUE.
               ISTAT=6
               IPOS=1
               I=I-1
             FIN
           FIN
           I=I+1
         FIN
         WHEN (I .GT. KOUNT)
           NTRAN=I-1
         FIN
         ELSE
           NTRAN=I
         FIN
         IERR=0
         RETURN
         FIN
C
```

```
      (5)
C        Skip KOUNT files forwards
         I=1
         EOT=.FALSE.
         WHILE ((I .LE. KOUNT) .AND. (.NOT. (EOT)))
C             Forward space a file
           CALL MANIP(13B,LUN)
           ICNWD=8
           CALL EXEC(13,ICNWD,ISTA1)
           CALL STWAT(ISTA1)
           ITEST=IAND(ISTA1,(2**5))
           IF (ITEST .EQ. 2**5)
             IPOS=3
             EOT=.TRUE.
             ISTAT=5
             I=I-1
           FIN
           I=I+1
         FIN
         IERR=0
         WHEN (I .GT. KOUNT)
           NTRAN=I-1
         FIN
         ELSE
           NTRAN=I
         FIN
         RETURN
         FIN
C
```

```
        (6)
C           Skip KOUNT files backwards
            I=1
            EOT=.FALSE.
            WHILE ((I .LE. KOUNT) .AND. (.NOT. (EOT)))
C               Backward space a file
              CALL MANIP(14B,LUN)
              ICNWD=8
              CALL EXEC(13,ICNWD,ISTA1)
              CALL STWAT(1STA1)
              ITEST=IAND(ISTA1,(2**6))
              IF (ITEST .EQ. 2**6)
                IPOS=1
                EOT=.TRUE.
                ISTAT=6
                I=I-1
              FIN
              I=I+1
            FIN
            IERR=0
            WHEN (I .GT. KOUNT)
              NTRAN=I-1
            FIN
            ELSE
              NTRAN=I
            FIN
            RETURN
            FIN
C
        (7)
C           Erase four inches of tape
            CALL MANIP(12B,LUN)
            CALL EXEC(13,LUN,ISTAT)
            CALL STWAT(ISTAT)
            IERR=0
            RETURN
            FIN
C
```

```
        (8)
C           Read a record
            ICODE=1
            ICNWD=8
            IBUFL=KOUNT
            CALL EXEC(ICODE,ICNWD,IBUFF,IBUFL)
            CALL ABREG(IA,IB)
            NTRAN=IB
            CALL STATS(IA,ISTAT)
            IF (ISTAT .EQ. 7)IPOS=2
            IERR=0
            RETURN
            FIN
C
         (9)
C           Write a record
            ICODE=2
            ICNWD=8
            IBUFL=KOUNT
            CALL EXEC(ICODE,ICNWD,IBUFF,IBUFL)
            CALL ABREG(IA,IB)
            CALL STATS(IA,ISTAT)
            IERR=0
            RETURN
            FIN
          FIN
        RETURN
        END
C
C
C*************************************************************************
C     This subroutine continually polls the status of the operation
C     until the current operation is complete.
C*************************************************************************
C
C
```

```
      SUBROUTINE STWAI(ISTAT)
        INTEGER ISTAT
 15     CONTINUE
          ITEST=(ISTAT .AND. 32768)
          IF (ITEST .EQ. 0) RETURN
          CALL EXEC(13,8,ISTAT)
          GO TO 15
      END
C
C
C*********************************************************************
C     This subroutine performs the I/O control calls such as rewind,
C     write end of file.
C*********************************************************************
C
C
      SUBROUTINE MANIP(FUNC,LUN)
        INTEGER FUNC,LUN,ICNWD
        ICNWD=0
C       Shift the function code six bits to the left in ICNWD
        ICNWD=ICNWD+ISHFT(FUNC,6)
        ICNWD=ICNWD+LUN
        CALL EXEC(3,ICNWD)
        RETURN
        END
C
C
C*********************************************************************
C     This subroutine sets the appropriate bits in ISTAT for status
C     return information.
C*********************************************************************
C
C
      SUBROUTINE STATS(ISTA1,ISTAT)
        INTEGER CHECK,ISTAT,I,ISTA1
        LOGICAL FOUND
        CHECK=0
C       Set the 14 and 15 bits to 1 in CHECK
```

```
      CHECK=CHECK+16384
      CHECK=CHECK+32768
C     Save bits 14 and 15
      CHECK=IAND(CHECK,ISTA1)
C     no bits set
      IF (CHECK .EQ. 0) ISTAT=8
C     14 bit set
      IF (CHECK .EQ. 16384) ISTAT=9
C     15 bit set
      IF (CHECK .EQ. 32768) ISTAT=10
C     14 and 15 bit set
      IF (CHECK .EQ. 49152) ISTAT=11
      I=1
      FOUND=.FALSE.
C     Find the STATUS bit set for bits 1-7
      WHILE (( I.LE. 7) .AND. (.NOT. (FOUND)))
        CHECK=0
        CHECK=IAND(ISTA1,(2**I))
        IF (CHECK .EQ. 2**I)
          ISTAT=I
          FOUND=.TRUE.
        FIN
        I=I+1
      FIN
      RETURN
      END
```

APPENDIX B

PSEUDOCODE

```
Subroutine TAPTRN

        Initialize error codes and other variables

        If (Kode < -2  or Kode > 9)

        then

            Return indicating KODE range error

        endif

        If (Iunit ≠ 0)

        then

            Return indicating invalid logical unit number error

        endif

        If (Kode ≥ 0 and unit not locked)

        then

            Return indicating resource not locked error

        endif

        Case Function Code of

            -2: Unlock the logical unit
                Set locked flag to false
                Return

            -1: Lock the logical unit
                Set locked flag to true
                Return
```

```
0: Obtain present drive status
   Set ISTAT to reflect status
   Return

1: Manipulate the bits for rewind code
   Obtain present driver status
   Wait until the driver is available for use
   Return

2: Manipulate the bits for end-of-file code
   Obtain present driver status
   Wait until the driver is available for use
   Return

3: Initialize loop counters
   While (record counter < KOUNT and NOT(EOF))

       Manipulate bits to space 1 record forwards
       Obtain present driver status
       Wait until device is ready for use
       If end of file record bit is set
       then

            EOF = True
            Set ISTAT to reflect EOF
            Set IPOS to reflect EOF
            Decrement record counter

       Else
       If end-of-tape marker bit is set
       then

            EOT = True
            Set ISTAT to reflect EOT
            Set IPOS to reflect EOT
            Decrement record counter

       endif
       Increment record counter

   Endwhile
   If (Record counter > KOUNT)

            NTRAN = record counter-1

   else

            NTRAN = record counter

   endif
   Return
```

```
4: Initialize loop counters
   While (Record counter ≤ KOUNT and NOT(EOF))

       Manipulate bits to backspace one record
       Obtain present driver status
       Wait until device is ready for use
       If end of file record bit is set
       then

            EOF = True
            Set ISTAT to reflect EOF
            Set IPOS to reflect EOF
            Decrement record counter

       else
       If start of tape marker bit is set
       then
            EOF = True
            Set ISTAT to reflect BOT
            Set IPOS to reflect BOT
            Decrement record counter
       endif
       endif
   Endwhile
   If (Record counter > KOUNT)
   then

       NTRAN = record counter-1

   else

       NTRAN = record counter

   endif
   Return

5: Initialize loop counters
   While (Record counter ≤ KOUNT and NOT (EOT))

       Manipulate bits for forward space one file
       Obtain present driver status
       Wait until device is ready for use
       If end-of-tape marker bit is set
       then

            EOT = True
            Set ISTAT to reflect EOT
            Set IPOS to reflect EOT
            Decrement record counter

       endif
       Increment record counter

   Endwhile
   If (Record counter > KOUNT)
   then

          NTRAN = record counter-1
```

```
                else
                     NTRAN = record counter
                endif
                Return

           6: Initialize loop counters
              While (Record counter ≤ KOUNT and NOT (EOT))
                     Manipulate bits to backspace one file
                     Obtain present driver status
                     Wait until device is ready for use
                     If start-of-tape marker bit is set
                     then
                          EOT = True
                          Set ISTAT to reflect EOT
                          Set IPOS to reflect EOT
                          Decrement record counter
                     endif
                     Increment record counter
              Endwhile
              If (Record counter > KOUNT)
              then
                     NTRAN = record counter-1
              else
                     NTRAN = record counter
              endif
              Return

           7: Manipulate bits to erase four inches of tape
              Obtain present driver status
              Wait until device is ready for use
              Return

           8: Read the record
              Determine the present driver status
              Return

           9: Write the record
              Determine the present driver status
              Return

      End Case on Function Code
      Return
      End Subroutine TAPTRN
```

```
Subroutine STWAT

        c  Subroutine to wait for driver to be ready for use
           While driver not available for use

               Obtain present driver status

           Endwhile
           Return

        End Subroutine STWAT


Subroutine MANIP

        c  Subroutine to manipulate bits for desired function code

               Shift function code six bits to the left in ICNWD
               Add the logical unit number to ICNWD
               Perform the function

           Return

        End Subroutine MANIP


Subroutine STATS

        c  Subroutine to set appropriate bits in ISTAT to reflect
        c  present driver status

               If neither the 14th nor 15th bits in driver status are set
               then

                    ISTAT=8

               If 14th bit set in driver status
               then

                    ISTAT=9

               If 15th bit set in driver status
               then

                    ISTAT=10

               If 14th and 15th bits are set in driver status
               then

                    ISTAT=11
```

```
        Initialize loop counters
        While (Present bit ≤ 7 and NOT FOUND)

           If Present bit in driver status set
           then

                ISTAT = Present bit
                FOUND = True

           endif
           Present bit = Present bit +1

        Endwhile
        Return

End Subroutine STATS
```

```
FTN4,T
C*****************************************************************
C This is a FORTRAN program that has been created to
C  (1) facilitate the usage of the TAPTRN program,
C  (2) aid in the analysis of computer tape of unknown format.
C
C TSTAPE has several commands which provide full access to all
C the TAPTRN functions.  To obtain a list of the commands, type
C HE in response to the INPUT COMMAND) prompt when the program
C runs.
C
C To invoke this program, type RU,TSTAPE.
C
C The files used with this program are:
C   &TSTAPE -source program
C   %TSTAPE -relocatable module
C   LTSTAPE -transfer file for LOADR
C   CTSTAPE -transfer file to compile and load TSTAPE
C  -note- all these files reside on cartride 13
C
C To create this program invoke the transfer file,CTSTAP by,
C     :TR,CTSTAPE
C AFTER building the subroutine TAPTRN.
C
C To run this program after invoking the transfer file, CTSTAPE,
C type,
C         :RU,TSTAPE
C
C
C Author: Suzanne Y. Slinn
C Date:   November 6,1982
C*****************************************************************
C
```

```
$FILES(15,15)
      PROGRAM TSTAPE
      INTEGER BCM(2),FM,AIO,IIO,OIO,EAO,BAO,TRO,YES,ICOMD,IB,TT
      INTEGER BF1(120),BF2(120),BF3(240),VT(6)
      INTEGER NAME(40),IBIT(2),ILOCK(2),VOL
      DIMENSION IB1(9950),INIT(2),POSN(5),ICMD(19)
      EQUIVALENCE (BF3,BF1),(BF3(121),BF2),(IB1(1),IBIT(1))
      DATA ICMD/'IN','SH','RD','WT','DI','ST','SL','CO',
     1          'RW','NR','SK','RL','EF','TS','EX','HE','DU','LE',
     2          'SA'/
      DATA INIT/2*0/
      DATA AIO/'A'/,IIO/'I'/,OIO/'O'/,EAO/'E'/,BAO/'B'/,TRO/'?'/,
     1     YES/'Y'/,IU,KT,IR,NT,IP,IS/6*0/
      DATA VT/015452B,062106B,015510B,015517B,015452B,062105B/
      DATA POSN/'    ',' BOT',' EOF',' EOT',' EOV'/
      DATA ILOCK/015554B,015555B/
C
C     Clear the screen, home the cursor, display initial messages.
      WRITE(1,490) (VT(I),I=1,6)
 490  FORMAT(6A2,//,' TSTAPE: THIS PROGRAM IS INTENDED AS ',/,
     1       ' A) A TEST PROGRAM FOR THE SUBROUTINE TAPTRN AND ',/,
     2       ' B) A UTILITY PROGRAM TO AID IN THE ANALYSIS OF ',/,
     3       '    COMPUTER TAPES OF UNKNOWN FORMAT.',/,
     4       '  **TYPE (HE)LP TO DISPLAY THE AVAILABLE COMMANDS.')
      IC=1
      ID=0
C
C.....Issue the desired command
C     Move cursor to display line
 110  CALL KLOAD(22,0)
      WRITE(1,500)
      READ(1,485)ICM,BCM(2)
 485  FORMAT(A2,A1)
      ICL=IC
      IUL=ID
      DO 100 I=1,17
        IF (ICM .EQ. ICMD(I)) GO TO 105
 100  CONTINUE
```

```
 120  CALL KLOAD(22,0)
      WRITE(1,510)
      CALL TIME
      GO TO 110
C
C     A valid command has been identified
 105  IB=BCM(2)
      ID=0
      IF (IB .EQ. 2H0 ) ID=0
      IF (IB .EQ. 2H  ) ID=0
      IF (IB .EQ. 2H1 ) ID=1
      IF (( ID .LT. 0) .OR. (ID .GT.1)) GO TO 120
      IF (ID .EQ. 0) IU=0
      IF (ID .EQ. 1) IU=1
      I=I
C     Determine if it is the initialization command or a command
C     that does not determine a previous initialization.
      IF ((IC .EQ. 1) .OR. (IC .GT. 14)) GO TO 125
      IF (INIT(IU+1) .EQ. 1) GO TO 125
      CALL KLOAD(22,0)
      WRITE(1,515)
      CALL TIME
      GO TO 110
C
C     Case command of:
 125  CALL KLOAD(22,0)
      WRITE(1,1111)ILOCK(1)
      GO TO (5,10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85
     1       ,90,95),IC
C
C....*IN*, Initialize tape command
  5   CALL TAPTN(IU,-1,KT,IR,NT,IP,IS,IB1)
      INIT(IU+1)=1
      ICL=IC
      IUL=ID
      GO TO 30
```

```
C
C.....*SH*, Show the contents of the first record of each file
 10    KT=9950
       VOL=0
       CALL KLOAD(22,0)
       WRITE(1,541)
       READ(1,505)FM
       CALL TAPTN(IU,1,KT,IR,NT,IP,IS,IB1)
 11    CONTINUE
C      Repeat until EOV is true
       IF (VOL .EQ. 1)GO TO 30
          IP=0
          CALL TAPTN(IU,8,KT,IR,NT,IP,IS,IB1)
          IF ((IP .EQ. 2) .OR. (IP .EQ. 3)) VOL=1
          IF (VOL .EQ. 1) GO TO 30
C         If not end of tape, write out first record of file
            WRITE(18,590)NT
            IF (FM .EQ. A10)WRITE(18,545)(IB1(I),I=1,NT)
            IF (FM .EQ. I10)WRITE(18,550)(IB1(I),I=1,NT)
            IF (FM .EQ. O10)WRITE(18,555)(IB1(I),I=1,NT)
C           IF (FM .EQ. EA0)CALL EBCDIC(IB1,NT)
            IF (FM .EQ. BA0)CALL BCD(IB1,NT)
            IP=0
 12         CONTINUE
            IF (IP .EQ. 2) GO TO 13
              CALL TAPTN(IU,8,KT,IR,NT,IP,IS,IB1)
              GO TO 12
 13    GO TO 11
```

```
C
C.....*RD*, Read a record
 15   CALL KLOAD(22,0)
      WRITE(1,530)
C     Get the Kount words to be read
      READ(1,525)KT
      IF ((KT .EQ. 0) .OR. (KT .GT. 9950)) KT=9950
      DO 16 I=1,KT
 16     IB1(I)=0
C     Read one record of the desired length
      CALL TAPTN(IU,8,KT,IR,NT,IP,IS,IB1)
      IF (IP .EQ. 0) GO TO 14
      CALL KLOAD(22,0)
      WRITE(1,535)
      CALL TIME
 14   CALL KLOAD(22,0)
      WRITE(1,635)
 635  FORMAT(' DUMP TO LINE PRINTER? (Y)=YES )_')
      IO=18
C     KT=NT
C     Determine if dump to line printer desired.
      READ(1,505)BF1(1)
      IF (BF1(1) .EQ. YES) GO TO 24
      GO TO 30
C
C.....*WT* Write a record
 20   CALL KLOAD(22,0)
      WRITE(1,530)
C     Get number of words to write
      READ(1,525)KT
      IF ((KT .EQ. 0) .OR. (KT .GT. 9950)) KT=9950
      CALL KLOAD(22,0)
      WRITE(1,532)
 532  FORMAT(' ENTER POSITION IN BUFFER OF WHERE TO START WRITING)_')
C     Get position in buffer of where to start writing data to
      READ(1,525)ISTRT
      I~~RT=ISTRT-1
```

```
      DO 22 I=1,KT
 22    IB1(I)=ISTRT+I
C     Write one record of the desired length
      CALL IAPIN(IU,9,KT,IR,NT,IP,IS,IB1)
      GO TO 30
C
C.....*DI* Display the read buffer
 25   IO=1
 24   CALL KLOAD(22,0)
      WRITE(1,541)
      READ(1,505)FM
      WRITE(1,1111)ILOCK(2)
      WRITE(1,640)(VT(I),I=1,6)
C
C     Determine which form of output is desired.
      IF (FM .EQ. AIO) GO TO 26
      IF (FM .EQ. IIO) GO TO 27
      IF (FM .EQ. OIO) GO TO 28
      IF (FM .EQ. EAO) GO TO 29
      IF (FM .EQ. BAO) GO TO 31
      IF (FM .EQ. TRO) GO TO 32
      GO TO 120
C
C     Ascii data
 26   CALL KLOAD(22,0)
      WRITE(1,650)
      READ(1,505)ICOMD
      IF (ICOMD .NE. YES) GO TO 37
      WRITE(1,640)(VT(I),I=1,6)
      WRITE(IO,545)(IB1(I),I=1,KT)
      IF (IO .EQ. 18) GO TO 30
      GO TO 110
 37   LW=40
      IF (ICOMD .NE. YES)LW=66
 38   WRITE(1,640)(VT(I),I=1,6)
      WRITE(IO,545) (IB1(I),I=1,NT)
      IF (IO .EQ. 18) GO TO 30
      GO TO 110
```

```
C       Integer data
 27     WRITE(IO,550) (IB1(I),I=1,NT)
        IF (IO .EQ. 18) GO TO 30
        GO TO 110
C       Octal data
 28     WRITE(IO,555) (IB1(I),I=1,NT)
        IF (IO .EQ. 18) GO TO 30
        GO TO 110
C       Ebcidic data
 29     CONTINUE
        CALL EBCDC(IB1,KT)
        GO TO 26
C       Bcd data
 31     CONTINUE
        CALL BCD(IB1,KT)
        GO TO 26
C       Convert to octal data
 32     CONTINUE
C       CALL CONVRT(IB1,KT)
C       WRITE(IO,555)(IB1(I),I=1,KT)
        IF (IO .EQ. 18) GO TO 30
        GO TO 110
C
C.....*ST* Status of the drive
 30     WRITE(1,1111)ILOCK(2)
        WRITE(1,560)(VT(I),I=1,6),IBL,ICMD(ICI),KCODE,KT,NT,
       1      POSN(IP+1),IR,IS
        GO TO 110
C
C.....*SL* Set record length
 35     CALL KLOAD(22,0)
        WRITE(1,565)
        READ(1,525)KT
        IF ((KT .EQ. 0) .OR. (KT .GT. 9950)) KT=9950
        GO TO 30
C
 40     GO TO 110
```

```
C
C.....*RW* Rewind tape
 45   CALL TAPTN(IU,1,KT,IR,NT,IP,IS,IB1)
      GO TO 30
C
C.....*NR* Get the number of records in a file
 50   IF ((IP .EQ. 1) .OR. (IP .EQ. 2)) GO TO 51
      CALL KLOAD(22,0)
      WRITE(1,575)
      CALL TIME
      GO TO 30
C
 51   K=0
      KS=KT
      KT=9950
C     Read one record
 54   CALL TAPTN(IU,8,KT,IR,NT,IP,IS,IB1)
      IF ((K .EQ. 0) .AND. (IP  EQ. 2)) GO TO 52
      IF (IP .EQ. 2) GO TO 53
      K=K+1
      NTL=NT
      GO TO 54
 52   CALL KLOAD(22,0)
      WRITE(1,580)
      CALL TIME
      GO TO 30
 53   WRITE(1,1111)ILOCK(2)
      CALL KLOAD(21,0)
C     Write out the number of records found
      WRITE(1,1111)ILOCK(1)
      WRITE(1,585)K,NTL
      CALL TIME
      KT=KS
      GO TO 30
```

```
C
C.....*SK* Skip to end of file
 55   CALL KLOAD(22,0)
      WRITE(1,625)
      READ(1,505)ICOMD
      IK=3
      IF (ICOMD .NE. YES) IK=5
      CALL KLOAD(22,0)
      WRITE(1,630)
      READ(1,525)KT
      IF (KT .GE. 0) GO TO 56
      IK=IK+1
      KT=-KT
 56   CALL TAPTN(IU,IK,KT,IR,NT,IP,IS,IB1)
      GO TO 30
C
C.....*RL* Find record length
 60   KT=9950
      CALL TAPTN(IU,8,KT,IR,NT,IP,IS,IB1)
      CALL KLOAD(22,0)
      WRITE(1,590)NT
      CALL TIME
      GO TO 30
C
C.....*EF* Write end of file
 65   CALL TAPTN(IU,2,KT,IR,NT,IP,IS,IB1)
      GO TO 30
C
C.....*TS* TEST READ WRITE/READ PATTERN
 70   CALL KLOAD(22,0)
      WRITE(1,530)
      READ(1,525)KT
      CALL KLOAD(22,0)
      WRITE(1,600)
      READ(1,605)NW,INC
      CALL KLOAD(22,0)
```

```
      WRITE(1,620)
      READ(1,505)ICOMD
      IF(ICOMD .NE. YES) GO TO 71
      CALL KLOAD(22,0)
      WRITE(1,540)
      READ(1,505)FM
C
 71   KT1=KT
      DO 81 I=1,NW
        DO 82 J=1,KT1
 82       IB1(J)=J
        IF (ICOMD .NE. YES) GO TO 72
        IF (FM .EQ. AIO)WRITE(18,545)(IB1(L),L=1,KT1)
        IF (FM .EQ. IIO)WRITE(18,550)(IB1(L),L=1,KT1)
        IF (FM .EQ. OIO)WRITE(18,555)(IB1(L),L=1,KT1)
C       Write a record
 72     CALL TAPTN(IU,9,KT1,IR,NT,IP,IS,IB1)
        IF (IR .EQ. 0) GO TO 83
        WRITE(1,1111)ILOCK(2)
        WRITE(1,560)(VT(J),J=1,6),IUL,ICMD(ICL),KCODE,KT1,NT,
     1                    POSN(IP+1),IR,IS
 83     KT1=KT1+INC
        IF ((KT1 .LE. 0) .OR. (KT1 .GT.9950)) GO TO 84
 81   CONTINUE
C
C.....Write 2 end of files/rewind and read
 84   CALL TAPTN(IU,2,KT,IR,NT,IP,IS,IB1)
      CALL TAPTN(IU,2,KT,IR,NT,IP,IS,IB1)
      CALL TAPTN(IU,1,KT,IR,NT,IP,IS,IB1)
C
      IUL=IU
      KT1=KT
      DO 86 I=1,NW
        DO 89 J=1,KT1
 89       IB1(J)=0
```

```
C        Read a record
         CALL TAPTN(IU,8,KT1,IR,NT,IP,IS,IB1)
         IF (ICOMD .NE. YES) GO TO 73
         IF (FM .EQ. AIO) WRITE(18,545)(IB1(L),L=1,KT1)
         IF (FM .EQ. IIO) WRITE(18,550)(IB1(L),L=1,KT1)
         IF (FM .EQ. OIO) WRITE(18,555)(IB1(L),L=1,KT1)
 73      IEC=0
         DO 87 J=1,KT1
            IF (IB1(J) .NE. J) IEC=IEC+1
 87      CONTINUE
C
         IF (IR .EQ. 0) GO TO 88
         WRITE(1,1111)ILOCK(2)
         WRITE(1,560)(VT(J),J=1,6),IUL,ICMD(ICL),KCODE,KT1,
     1     NT,POSN(IP+1),IR,IS
 88      IF (IEC .EQ. 0) GO TO 92
            CALL KLOAD(22,0)
            WRITE(1,610)I,IEC
 92      KT1=KT1+INC
         IF ((KT1 .LE. 0) .OR. (KT1 .GT. 9950)) GO TO 110
 86    CONTINUE
       CALL TAPTN(IU,1,KT,IR,NT,IP,IS,IB1)
       GO TO 110
C
C.....*EX* Exit
 75    WRITE(1,1111)ILOCK(2)
       CALL TAPTN(IU,-2,KT,IR,NT,IP,IS,IB1)
       STOP
C
C.....*HE* Help facility
 80    WRITE(1,1111)ILOCK(2)
 1111  FORMAT(A2)
       WRITE(1,640)(VT(I),I=1,6)
       OPEN(33,FILE='HELINS',IOSTAT=IOS)
 998   CONTINUE
```

```
      READ(33,222,ERR=111,END=111)(BF1(I),I=1,80)
  222 FORMAT(80A1)
      WRITE(1,223)(BF1(I),I=1,72)
  223 FORMAT(1X,72A1)
      GO TO 998
  111 CONTINUE
      CLOSE(33)
      GO TO 110
C
  85  GO TO 110
  90  GO TO 110
  95  GO TO 110
C
C
C.....Format statements.
  500 FORMAT(' INPUT COMMAND )_')
  505 FORMAT(2A1)
  510 FORMAT(' *INVALID COMMAND*')
  515 FORMAT(' *INITIALIZE DRIVE*')
  520 FORMAT(' INPUT PARITY (O)DD,(E)VEN )_')
  525 FORMAT(I7)
  530 FORMAT(' INPUT RECORD SIZE (DEFAULT, KT=9950) )_')
  535 FORMAT(' *EOF MARKER READ*')
  540 FORMAT(' FORMAT? (A)SCII,(I)NTEG,(O)CTAL,(E)BC OR (B)CD TO ',
     1       ' ASCII )_')
  541 FORMAT(' FORMAT? (A)SCII,(I)NTEG,(O)CTAL,(E)BC OR (B)CD TO ',
     1       ' ASCII )_')
  545 FORMAT(2X,38A2)
  550 FORMAT(12X,8I7)
  555 FORMAT(12X,8O7)
  560 FORMAT(6A2,//,35X,' TAPE STATUS',//,' UNIT',7X,I6,11X,
     1       'LAST COMMAND',5X,A2,/,' PAR/DENS   ',I6,11X,
     2       'KOUNT',7X,I7,11X,'NTRAN',7X,I7,/,' POSN',9X,A4,11X,
     3       'IERR',8X,I7,11X,'ISTAT',7X,I7)
  565 FORMAT(' INPUT KOUNT SIZE(DEFAULT KT=9950 )_')
  570 FORMAT(' *ROUTINE NOT WRITTEN*')
  575 FORMAT(' *TAPE IS NOT AT BOT OR EOF*')
```

```
580   FORMAT(' *END OF TAPE*')
585   FORMAT(' NO. OF RECORDS(EOF EXCLUDED)',I7,/,1X,
     1        ' SIZE LAST DATA RECORD',I7)
590   FORMAT(' NO. OF WORDS READ=',I7)
600   FORMAT(' INPUT NO OF RECORDS AND INC/DEC (7 DIGITS) )_')
605   FORMAT(I7,1X,I7)

610   FORMAT(' RECORDS NO=',I7,'NO OF READ ERRORS=',I7)
620   FORMAT(' DO YOU WANT BUFFER DUMPS? (Y)=YES  ) ')
625   FORMAT(' RECORD SKIP? (Y)=YES ) _')
630   FORMAT(' INPUT KOUNT,NEGATIVE MEANS BACKSKIP ) _')
640   FORMAT(6A2)
650   FORMAT(' WITH CARRIAGE CONTROL? (Y)=YES ) _')
655   FORMAT(' TWO LINE WIDTH NOT AVAILABLE')
660   FORMAT(A2)
665   FORMAT(' TAPE IS MOUNTED AND DRIVE INITIALIZED? (Y)=YES )_')
670   FORMAT(' IS SOURCE TAPE ON DRIVE ZERO? (Y)=YES )_')
675   FORMAT(' DO YOU WANT A CODE CONVERSION? (Y)=YES ) ')
680   FORMAT(' WHICH ONE? (E)BC OR (B)CD TO ASCII? ) _')
685   FORMAT(' DO YOU WANT A MAP DUMP OF THE TAPE? (Y)=YES ) _')
690   FORMAT(6I6)
695   FORMAT(' DEFAULT MAP IS TO SPOOL? (Y)=YES ) _')
6000  FORMAT(' FILENAME? )_')
6005  FORMAT(40A1)
6010  FORMAT(' RECORD SIZE ON OUTPUT (MAX=132)? ) _')
6015  FORMAT(I6)
6020  FORMAT(132A1)
      END
```

```
C
C THIS SUBROUTINE GETS THE CURRENT SYSTEM TIME
C
      SUBROUTINE TIME
      INTEGER ITIME(5),SEC,DIFF
      CALL EXEC(11,ITIME)
      SEC=ITIME(2)
      DIFF=0
 1    CONTINUE
      IF (DIFF .GT. 2) GO TO 2
         CALL EXEC(11,ITIME)
         DIFF=ITIME(2)-SEC
         GO TO 1
 2    CONTINUE
      RETURN
      END
```

```
FTN4X,I
C
C
C
C
C  KLOAD
C
      SUBROUTINE KLOAD(IRL,ICL)
      IMPLICIT REAL*8(A-H,O-Z)
      INTEGER ICA(2),ICB(1),ICC(2),ARAY(24),IC(24)
      DATA ICA/015446B,060400B/
      DATA ICB/071000B/
      DATA ICC/041400B,015512B/
      DO 1 I=1,7
 1      IC(I)=2H
      ENCODE(24,500,IC) (ICA(I),I=1,2),IRL,ICB,ICL,(ICC(I),I=1,2)
 500  FORMAT(2A2,I2,A2,I2,2A2)
      WRITE(1,510)(IC(I),I=1,7)
 510  FORMAT(1X,7A2)
      RETURN
      END
```

```
 & EBCDIC
FTN4

C THE FOLLOWING SUBROUTINE ACCEPTS AN ARRAY OF WORDS (MAXIMUM SIZE 9950)
C CODED IN EBCDIC AND CONVERTS EACH WORD TO ASCII CODE.  THE SIZE OF THE
C ARRAY IS PASSED THROUGH PARAMETER "NO" AND THE RESULTANT ASCII CODE IS
C PASSED BACK THROUGH THE PARAMETER "BUFF".

      SUBROUTINE EBCDC(BUFF,NO)
      INTEGER CD1,CD2
      INTEGER ASC(255),NO,I,TEMP1,BUFF(9950),HIGH,LOW
      DATA ASC/1B,2B,3B,0B,11B,0B,177B,0B,0B,0B,13B,14B,15B,16B,17B,
     1          20B,21B,22B,0B,0B,0B,10B,0B,30B,31B,0B,0B,0B,0B,0B,0B,
     1          0B,0B,34B,0B,0B,12B,27B,33B,0B,0B,0B,0B,0B,5B,6B,7B,
     1          0B,0B,26B,0B,0B,36B,0B,4B,0B,0B,0B,0B,24B,25B,0B,32B,
     1          40B,40B,40B,40B,40B,40B,40B,40B,40B,40B,40B,56B,74B,50B,
     1          53B,174B,46B,40B,40B,40B,40B,40B,40B,40B,40B,40B,
     1          41B,44B,52B,51B,73B,40B,55B,57B,40B,40B,40B,40B,
     1          40B,40B,40B,40B,40B,54B,45B,137B,76B,77B,40B,40B,
     1          40B,40B,40B,40B,40B,40B,40B,140B,72B,43B,100B,47B,
     1          75B,42B,40B,141B,142B,143B,144B,145B,146B,147B,
     1          150B,151B,40B,40B,40B,40B,40B,40B,40B,152B,153B,154B,
     1          155B,156B,157B,160B,161B,162B,40B,40B,40B,40B,40B,40B,
     1          40B,176B,163B,164B,165B,166B,167B,170B,171B,172B,
     1          40B,40B,40B,133B,40B,40B,40B,40B,40B,40B,40B,40B,40B,40B,
     1          40B,40B,40B,40B,40B,135B,40B,40B,173B,101B,102B,103B,
     1          104B,105B,106B,107B,110B,111B,40B,40B,40B,40B,40B,40B,
     1          175B,112B,113B,114B,115B,116B,117B,120B,121B,122B,
     1          40B,40B,40B,40B,40B,40B,134B,40B,123B,124B,125B,126B,
     1          127B,130B,131B,132B,40B,40B,40B,40B,40B,40B,60B,61B,
     1          62B,63B,64B,65B,66B,67B,70B,71B,174B,40B,40B,40B,40B,40B/
      IF (NO.EQ.0) GOTO 6
```

```
      DO 8 I=1,NO
         TEMP1=BUFF(I)
         HIGH = ISHFT(TEMP1,-8)
         LOW  = ISHFT(HIGH,8)
         LOW  = TEMP1 - LOW
         CALL OTOD(HIGH)
         CALL OTOD(LOW)
         CD1=ASC(HIGH)
         CD2=ASC(LOW)
         BUFF(I)=ISHFT(CD1,8)+CD2
8     CONTINUE
6     RETURN
      END

C THE FOLLOWING SUBROUTINE CONVERTS AN OCTAL NUMBER TO A DECIMAL NUMBER

      SUBROUTINE OTOD(NUM)
        INTEGER NUM,J,N,R
        J = NUM
        J = J/100B
        N = J*64
        R = NUM - J*100B
        J = R/10B
        N = N + J*8
        R = R - J*10B
        NUM = N + R
      RETURN
      END
```

```
FTN4
      SUBROUTINE BCD(BUFF,NO)

C THE FOLLOWING SUBROUTINE ACCEPTS AN ARRAY OF WORDS STORED IN "BUFF" AND AN
C INTEGER "NO" REPRESENTING THE NUMBER OF WORDS IN BUFF.   EACH WORD CONTAINS
C TWO CHARACTERS IN BCD CODE REPRESENTED IN STANDARD FORMAT WHICH ARE BROKEN
C DOWN INTO SEPARATE BCD CODES, CONVERTED TO ASCII CODE BY MEANS OF A TABLE,
C AND THEN STORED TWO CHARACTERS PER WORD IN THE STANDARD FORMAT BACK IN THE
C THE ARRAY BUFF FROM WHERE IT WAS TAKEN

      INTEGER BCT(63),BUFF(9950),NO,I,NEW,TEMP1,TEST
C THE LARGEST ARRAY ACCEPTED BY THE SUBROUTINE BCD IS 9950
      INTEGER CD1,CD2
      DATA BCT/061B,062B,063B,064B,065B,066B,067B,070B,
     1          071B,060B,043B,100B,072B,076B,075B,040B,
     1          057B,123B,124B,125B,126B,127B,130B,131B,
     1          132B,137B,054B,050B,047B,134B,042B,055B,
     1          112B,113B,114B,115B,116B,117B,120B,121B,
     1          122B,041B,044B,052B,135B,073B,045B,053B,
     1          101B,102B,103B,104B,105B,106B,107B,110B,
     1          111B,077B,056B,051B,133B,074B,136B/
      IF (NO.EQ.0) GOTO 6
      DO 8 I=1,NO
         TEMP1=BUFF(I)
         NEW=40000B
  5      NEW=NEW-400B
         TEST=TEMP1-NEW
         IF (TEST.GE.000B) GOTO 3
         GOTO 5
```

```
C   TEST IF THE VALUE OF THE SECOND BCD CODE NUMBER
C   NEW IS THE FIRST BCD CODE NUMBER TO BE SHIFTED RIGHT 8 BITS
  3       NEW=ISHFT(NEW,-8)
          CD1=BCT(NEW)
          CD2=BCT(TEST)
C   CD1 AND CD2 CONTAIN THE ASCII  EQUIVALENTS OF NEW AND TEST
          BUFF(I)=ISHFT(CD1,8)+CD2
  8    CONTINUE
  6    RETURN
       END
```

APPENDIX D

PROGRAM TSTAPE

```
Display start up message on the console
Repeat

    Move the cursor to line 22
    Read in the desired command
    If not a valid command
    then

        Display error message

    else

        If the drive has not yet been initialized
        then

            Display error message

        else

            Move cursor to line 22
            Turn memory lock on
            Case Command of

                In: Initialize the tape drive
                    Call TAPTRN (KODE = -1)
                    Display Status

                SH: Show the contents of the first record of each file
                    End-of-volume = False
                    Move cursor to line 22
                    Determine the format the record is to be displayed in
                    Rewind the tape
                    Repeat

                        Read a record
                        If EOV encountered
                        then

                            End-of-volume = True

                        endif
                        If not EOV
                        then
```

```
                Write out number of words transferred
                Display record of format desired
                While not EOF

                    Read next record

                Endwhile
            endif

        Until EOV
        Display status

RD:     Read a record
        Move cursor to line 22
        Read in the number of words to be read
          (Default is 9950 words)
        Initialize buffer to zeroes
        Call TAPTRN (Kode = 8)
        Move cursor to line 22
        If end of file marker read
        then

            Display appropriate message

        else

            Determine if buffer read is to be dumped to the
            line printer
            If buffer is to be dumped
            then

                Move cursor to line 22
                Turn off memory lock
                If ASCII output desired
                then
                    Output data
                    Display status

                endif
                If Integer output desired
                then
                    Output data
                    Display status

                endif
                If Octal output desired
                then
                    Output data
                    Display status

                endif
                If EBCDIC output desired
                then
                    Call EBCDIC
                    Output converted ASCII data
                    Display status
```

```
            endif
            If BCD output desired
            then
                Call BCD
                Output converted ASCII data
                Display status
            endif
            else
                Display status
            endif

WT: Write a record
    Move cursor to line 22
    Determine number of words in the record that are
      to be written
    Determine starting place in the write buffer
    Call TAPTRN (KODE = 9)

DI: Display the read buffer
    Move cursor to line 22
    Determine which form of output is desired
    If ASCII output desired
    then
        Output data
        Display status
    endif
    If Integer output desired
    then
        Output data
        Display status
    endif
    If Octal output desired
    then
        Output data
        Display status
    endif
    If EBCDIC data desired
    then
        Call EBCDIC
        Output converted ASCII data
        Display status
    endif
    If BCD output desired
    then
        Call BCD
        Output converted ASCII data
        Display status
    endif
```

```
ST: Status of the drive
    Turn off memory lock
    Display status of the last command

SL: Set record length
    Move cursor to line 22
    Read in desired record length
    Display status

RW: Rewind tape
    Call TAPTRN (Kode = 1)
    Display status

NR: Number of records in a file
    If not (BOT) or
       not (EOF) display
       error message
    endif
    Record counter = 0, EOF = False
    Repeat
        Call TAPTRN (Kode = 8)
        If end of file has been reached
        then
            Display the number of records read and the
              length of the last data record read
            EOF = True
        else
            Increment record counter
        endif
    Until EOF = True
    Display status

SK: Skip to end of file
    Move cursor to line 22
    Determine if record or file skip
    Determine number of records/files to skip
    If record skip
    then
        Kode = 3
    else
        Kode = 5
    endif
    If number of records/files to skip < 0
    then
        Kode = Kode +1
        Number of records/files to skip =
        -(Number of records/files to skip)
```

```
    endif
    Call TAPTRN (Kode)
    Display status

RL: Record length
    Call TAPTRN (Kode = 8)
    Move cursor to line 22
    Display the number of words read
    Display status

EF: Write End of File marker
    Call TAPTRN (2)
    Display status

TS: Test Read/Write Pattern
    Move cursor to line 22
    Determine length of record to write
    Determine the number of records to be written
    Determine if buffer dumps desired
    For I=1 to Number of records to be written
        If buffer dumps desired
        then
            Output buffer in appropriate form
        endif
        Call TAPTRN (Kode = 9)
        Increment length of record to write
    Endfor
    Call TAPTRN (Kode = 2)
    Call TAPTRN (Kode = 2)
    Call TAPTRN (Kode = 1)
    For I=1 to Number of records to be read
        Call TAPTRN (Kode = 8)
        If buffer dumps desired
        then
            Output buffer in appropriate form
        endif
        Increment length of record to read
    Endfor
    Call TAPTRN (Kode = 1)

EX: Exit
    Turn off memory lock
    Call TAPTRN (Kode = -2)
    Halt

HE: Help facility
    Open external file
    Read command summary for external file
    Close file
```

```
    End Case (of commands)
    endif (valid command)
    Until Exit command chosen

End Program TSTAPE
```

```
SUBROUTINE TIME

c   The following subroutine gets the current system time.
c   This subroutine is used in order that all messages displayed on the
c   console to the user are present for 2 seconds.

    Subroutine TIME

        Obtain the current system time
        Sec = current second
        Difference = 0
        Repeat

            Obtain current system time
            Difference = current second - Sec

        Until difference > 2
        Return

End Subroutine TIME



SUBROUTINE BCD (BUFF, NO)

c   The following subroutine converts an array of BCD characters to their
c   corresponding ASCII characters.
c   The characters to be converted are input in BUFF and the number of
c   characters to convert are input in NO.
    If there are characters to convert
    then

        For I=1 to NO

            Temp = BUFF(I)
            Get the upper 8 bits and shift left
            Look up this number in the table for ASCII equivalent
            Get lower 8 bits and look up the ASCII equivalent
            Store the ASCII equivalent back into BUFF(I)

        Endfor

    endif

End Subroutine BCD



SUBROUTINE &EBCDIC (BUFF,NUMBER)

c   The following subroutine accepts an array of words, BUFF, (maximum size
c   9950) coded in EBCDIC and converts each word to ASCII code.  The size
c   of the array is passed through the parameter "NUMBER" and the resultant
c   ASCII code is passed back through the parameter "BUFF".
    If NUMBER > 0
    then

        For I=1 TO NUMBER DO
```

```
            TEMP = BUFF(I)
            HIGH = TEMP SHIFTED RIGHT 8 BITS
            LOW = HIGH SHIFTED LEFT 8 BITS
            LOW = TEMP-LOW
            CONVERT HIGH TO A DECIMAL NUMBER
            CONVERT LOW TO A DECIMAL NUMBER
            CONVERT1 = ASCII EQUIVALENT OF EBCDIC HIGH
            CONVERT2 = ASCII EQUIVALENT OF EBCDIC LOW
            BUFF(I) = CONVERT1 SHIFTED LEFT 8 BITS + CONVERT2
        Endfor
     endif
     Return
End Subroutine


SUBROUTINE &KLOAD (Row,Column)

c   This subroutine moves the cursor to the desired row and column.
c   These values are given in the input parameters Row and Column.
        Clear Buffer
        Encode the octal commands for moving the cursor to the
          desired position into Buffer
        Write out Buffer to the screen
        Return
End Subroutine
```

```
RTAPE  T=00004 IS ON CR SY    USING 00002 BLKS R=0000

0001   :**This transfer file compiles the TAPTN program.
0002   :RU,FLECS,&TAPTRN,&TAPE::13,TAPE::13
0003   :RU,FTN4X,&TAPE::13,1,%TAPTRN::13
```

```
CTSTAP T=00004 IS ON CR00013 USING 00002 BLKS R=0000

0001   :**This transfer file compiles the TSTAPE program and the BCD and
0002   :**EBCDIC subroutines.  Then it links all together with the TAPTRN routine.
0003   :OF,TSTAE,8
0004   :RU,FTN4X,&BCD::13,1,%BCD::13
0005   :RU,FTN4X,&EBCDIC::13,1,%EBCDIC::13
0006   :RU,FTN4X,&TSTAPE,1,%TSTAPE::13
0007   :RU,LOADR,LTSTAPE
```

```
LTSTAP T=00004 IS ON CR00013 USING 00002 BLKS R=0000

0001   RE,%TSTAPE::13
0002   RE,%KLOAD::13
0003   RE,%TAPTRN::13
0004   RE,%BCD::13
0005   RE,%EBCDIC::13
0006   EN
```

APPENDIX E

TRANSFER FILES TO COMPILE AND LOAD THE PROGRAM

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13. ABSTRACT

The computer program TAPTRN, a utility routine used to read magnetic tapes of unknown content and format, is described for use on the HP 1000 computer. It provides the user ready access to all the capabilities of the tape handling hardware of the HP 1000. TAPTRN is documented in terms of a brief description of the utility, its capabilities, a guide on how to use it, and the source and pseudocode for the routine written.

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