1. IDENTIFICATION

1.1 Digital-7-40-U

1.2 Master Tape Duplicator

1.3 December 11, 1964

2. ABSTRACT

This program will make master tapes punched with a character count and checksum. The program will also verify a tape duplicated from the master tape. The master tape duplicator may also be used to duplicate a master tape or any tape.

4. USAGE

1. To make a master tape

Read in the duplicator. Put up AC_0. (All other switches = 0.) Place the tape from which the master is to be made in the reader. Press CONTINUE. When the computer halts after punching tape feed, type a title consisting of letters, numbers, and dashes on the teleprinter.* Follow this with a carriage return and line feed. When the punch stops, the new master is complete. A halt in 231 indicates that the checksum computed while reading does not match the one accumulated while punching.

2. To verify a tape duplicated from the master

Place the duplicated tape in the reader wrong end first. Make sure that all the AC switches are down. Press CONTINUE. If the tape is correct, the program will type OK. If the tape has an incorrect character count, the program will type ERROR and halt in 630 with AC=0. If the checksum is incorrect, the program will type ERROR and halt in the same place. The AC contains the difference between the checksum on the tape and the accumulated checksum. Pressing continue after such a halt will restart the program at 200.

3. To duplicate a master tape or any tape

Place the tape to be duplicated in the reader. Put up AC_1. (All other switches = 0.) Press CONTINUE.

6. DESCRIPTION

A master tape consists of a typed-in title punched in readable format with the seventh hole punched, a duplicate of the original tape, and a check block consisting of two binary words with the seventh hole punched. In order of punching the two words are the complement of the count of all the characters on the tape starting with the first character read and the checksum of all the characters.

The verify routine reads the master tape backward starting with the check block and compares this checksum and character count to the one accumulated while reading the tape. Neither the title punch nor leading tape feed are included in this count. Every tape duplicated from a master is a master as it has the checksum and character count on it.

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*True for KSR28 or KSR33.

8. FORMAT

Tape format: FIODEC, ASCII symbolic; FB.
Starting Address: location 200 (octal).

9. EXECUTION TIME

9.4 Timing

The program is I/O bound (will punch at the rate of 63.3 characters per second on the high-speed punch).

10. PROGRAM

10.4 Program Listing

```
MASTER TAPE DUPLICATOR PDP-7
/DUPLICATE
1/              JMP SERVIS
21/             HLT
SERVIS,         DAC  AC
                RSF
                JMP .+2
                JMP READER
                PSF
                JMP OUT
                JMP PUNCHO
OUT,            KRB
                LAC 0
                RAL
                LAC AC
                ION
                JMP I 0
READER,         RRB
                XX                      /JMP TAPE OR NOP
                AND (377
                DAC TEMP
                ADD TEST
                DAC TEST
                LAC TEMP
                DAC I 10
READ,           RSA
                LAC 10
                SAD (ENDBUF
                LAC (BUF
                DAC 10
```

```
                CMA
                ADD 11
                SPA
                ADD (ENDBUF-BUF
                ADD (-10
                SMA
                JMP OUT
                LAC (NOP
                DAC READ
                JMP OUT
TAPE,           SNA
                JMP READ
                DAC TEM
                LAC (NOP
                DAC READER+1
                LAC TEM
                JMP READER+2
PUNCHO,         LAC I 11
                PLS
                ISZ COUNT
                AND (377
                ADD CHKSUM
                DAC CHKSUM
                LAC 11
                SAD (ENDBUF
                LAC (BUF
                DAC 11
                CMA
                ADD 10
                SAD (1
                JMP DONE
                SPA
                ADD (ENDBUF-BUF
                ADD (-10
                SMA
                JMP OUT
                LAC PUNCH1
                SAD READ
                JMP OUT
                DAC READ
PUNCHI1,        RSA
                JMP OUT
DONE,           LAM -100
                DAC TE→M
DONE1,          ISZ C→OUNT
                PSF
                JMP .-1
```

```
                    PLS+10
                    ISZ T→EM
                    JMP DONE1
                    RRB
                    LAC I 11
                    CMA
                    ADD TEST
                    DAC TEST
                    JMP 1 BEG
BEG,                0
                    LAC (BUF
                    DAC 10
                    DAC 11
                    LAC (JMP TAPE
                    DAC READER+1
FEED1,              LAM -100
                    DAC TEM
                    DZM I 10
                    ISZ TEM
                    JMP .-2
CLEAR,              CRRB
                    CPCF
                    LSCF
                    LPCF
                    CLOF
                    KRB
                    TCF
                    DCF
                    MCI
                    MSI
                    LAC .+2
                    DAC READ
                    RSA
                    PLS+10
                    10N
                    JMP .

/MASTER TAPE DUPLICATOR
      /MAIN LOOP
      200/MAIN,     HLTVCLA
                    CLL
                    DZM C→OUNT
                    DZM CHK→SUM
                    DZM T→EST
                    LAS
                    SPA
                    STL
                    SZA
```

```
                JMP .+3
                JMS VERIFY
                JMP MAIN
                SZL
                JMS TITLE
                JMS BEG
                LAS
                SPAVCLL
                STL
                SNL
                JMP MAIN
                LAC TEST
                CMA
                ADD CHKSUM
                SAD (-0
                JMP .+2
MAIN1,          HLT
                LAM -100
                JMS FEED
                LAC COUNT
                CMA
                DAC COUNT
                LAM -1
                DAC CHE→CK
                LAM -2
                DAC FINCN→T
                LAC COUNT
ROTBEG,         DAC TEMP
                AND (77
                XOR (300
                PSF
                JMP .-1
                PLS
                LAC TEMP
                RTR         RTR         RTR
                ISZ FINCNT
                JMP ROTBEG
                LAC CHKSUM
                DAC COUNT
                ISZ CHECK
                JMP ROTBEG-3
                PSF
                JMP .-1
                LAM -500
                JMS FEED
                JMP MAIN
```

```
/MASTER TAPE DUPLICATOR
      /TITLE PUNCH
      TITLE,          0
                      LAM -400
                      JMS FEED
                      DZM FIGA DD
                      KSF
                      JMP .-1
                      KRB
                      703301
                      SKP
                      JMS TITLEA
                      DAC TEMP
                      SAD (2
                      JMP TITLE+3
                      SAD (10
                      JMP 1 TITLE
                      SAD (37
                      JMP TITLE+3
                      SAD (33
                      JMP FIG
                      LAC FIGADD
                      SZA
                      JMP FIG+3
                      LAC TEMP
      CODEAD,         RCL
                      ADD (LAC TABLE-2
                      ADD FIGADD
                      DAC CODE
                      JMS PUNCHR
                      JMP TITLE+4
      PUNCHR,         0
                      LAM-1
                      DAC CNT
                      XCT CODE
                      DAC. TEMP
                      LAM -2
                      DAC CNTPU N
      LEFT            LAC TEMP
                      RTL
                      RTL
                      RTL
                      DAC TEMP
                      RAL
                      JMS PUNLET
                      ISZ CNTPUN
                      JMP LEFT
                      ISZ C NT
                      JMP .+2
                      JMP I PUNCHR
                      ISZ CODE
                      JMP LEFT-4
```

```
PUNLET,         0
                AND (77
                ADD (100
                PSF
                JMP .-1
                PLS
                JMP I PUNLET


/MASTER TAPE DUPLICATOR
      /TELETYPE CONVERSION FOR FIGURES
      FIG,      LAC (76
                DAC FIGADD
                JMP TITLE+4
                LAC TEMP
                SAD (1
                LAC (5
                SAD (3
                LAC (11
                SAD (4
                LAC (13
                SAD (15             /0
                CLA
                SAD (35             /1
                LAC (1
                SAD (31             /2
                LAC (2
                SAD (20             /3
                LAC (3
                SAD (12             /4
                LAC (4
                SAD (25             /6
                LAC (6
                SAD (34             /7
                LAC (7
                SAD (14             /8
                LAC (10
                SAD (30
                LAC (12             /-
                JMP CODEAD
      TITLEA,   0
                DAC ITEM→A
                SAD (240
                JMP ATBU
                TAD (-237
                SPA
                JMP ATBL
                TAD (-77
                SMA
```

```
                JMP TITLE 4
                TAD (400100
                RCR
                ADD (ATB
                DAC . 1
                XX
                SNL     /ODD CODES IN RIGHT HALF, EVEN CODES IN
                        /LEFT HALF
                JMS TITLEC
TITLED,         DAC ITEMA
        RAR
                DAC ITEM+B
                LAC FIGADD
                SZA
                JMP XCH1
                SZL
                LAC (76
                DAC FIGADD
  ATBY,         LAC ITEMB
                AND (37
                JMP I TITLEA
  XCH1,         SNL
                DZM FIGADD
                JMP ATBY
  ATBL,         LAC ITEMA
                SAD (211
                JMP ATBTAB
                SAD (212
                LAC (400010
                SAD (215
                LAC (400002
                SMA
                JMP TITLE 4
                AND (37
                JMP I TITLEA
  ATBTAB,       LAC (51
                JMP TITLED
  ATBU,         LAC (4
                JMP I TITLEA

TITLEC,   0
                RTR
                RTR
                RTR
                RTR
                RAR
                JMP I TITLEC
```

```
AIB,    55          /BAUDOT CODES IN 9 BIT BYTES
        43013       /LEAST SIX CONCISE
        45000
        27065
        75023
        13027
        15061
        17057
        33073
        63041
        25003
        53071
        31007
        35037
        0
        47
        60
        46034
        44040
        54026
        12030
        64074
        22016
        14006
        32072
        24050
        2070
        36062
        56052
        42000
        0
        55000


/MASTER TAPE DUPLICATOR
    /TABLE FOR TITLE PUNCH
    TABLE,      010177      010100
                0           0
                364141      413600
                0           0
                771010      107700
                770214      207700
                770214      027700
                0           0
                774040      404000
                771111      314600
                364151      513000
```

```
                004177      410000
                771111      110600
                364141      412200
                073060      300700
                774545      414100
                615141      454300
                774141      413600
                774545      453200
                224545      453000
                010274      020100
                770505      010100
                412214      224100
                761111      117600
                376014      603700
                204040      403700
                0           0
                374040      403700
                364151      215600
                771014      224100
                364141      413600
                004277      400000
                625151      514600
                224145      453200
                141211      771000
                274545      453100
                364545      453000
                010171      050300
                324545      453200
                065151      513600
                101010      101000
                0           0
FEED,           0
                DAC CNT
                PLS+10
FEE1,           PSF
                JMP .-1
                PLS+10
                ISZ CNT
                JMP FEE1
                JMP I FEED
```

```
/MASTER TAPE DUPLICATOR
      /VERIFY
      VERIFY,        0
                     DZM →ERROR
                     DZM NEWCHK          /INITIALIZE NEW CHECKSUM
                     RSB
                     RSF
                     JMP .-1
                     RRB
                     DAC CKSUM           /GET MASTER CHECKSUM
                     RSB
      VERI,          RSF
                     JMP .-1
                     RRB
                     ADD (1    /ISZ GOES THROUGH -0
                     DAC CHARCT→         /GET MASTER CHARCNT
                     RSA
      VER2,          RSF
                     JMP .-1
                     RRB
                     RSA
                     ADD NEWCHK
                     DAC NEWCHK          /ACCUMULATE NEW CHECKSUM
                     ISZ CHARCT          /ACCUMULATE NEW CHARCNT
                     JMP VER2
                     RSF
                     JMP .-1
                     RRB
                     SZA
                     JMP ERROUT
                     LAC NEWCHK
                     CMA
                     ADD CKSUM
                     SAD (-0
                     JMP OK
                     DAC ERROR
                     JMP ERROUT
      OK,            LAW A-1
                     JMS ERR1
                     JMP MAIN
      ERROUT,        LAW B-1
                     JMS ERR1
                     LAC ERROR
                     HLT
                     JMP MAIN
```

```
/MASTER TAPE DUPLICATOR
      /TYPE ROUTINES
      ERR1,          0
                     DAC 17
      ERRO,          LAC I 17
                     SNA
                     JMP I ERR1
                     703301
                     SKP
                     JMS RR6
                     TLS
                     TSF
                     JMP .-1
                     JMP ERRO
      A,             20037
                     31703
                     31336
                     21502
                     21502
                     21210
                     0
      B,             20037
                     30520
                     32212
                     32212
                     31703
                     32212
                     21502
                     21502
                     21210
                     0
      RR6,           0
                     RTR
                     RTR
                     RTR
                     JMP I RR6
      BUF,           BUF 6000/
                     ENDBUF,   0
      START MAIN
```