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.

*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
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 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

PUNCH1,
RSA
JMP OUT
DONE,
LAM -100
DAC TE+M
DONE1,
ISZ COUNT
PSF
JMP .-1
PLS+10
ISZ TEM
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 COUNT
DZM CHK SUM
DZM TEST
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 CHECK
LAM -2
DAC FINCNT
LAC COUNT
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
/TELETYPYPE 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
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/MASTER TAPE DUPLICATOR
/TABLE FOR TITLE PUNCH

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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,

DAC CNT
PLS+10

FEEL,

PSF
JMP -1
PLS+10
ISZ CNT
JMP FEEL
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
VER1, RSF
JMP .-1
RRB
ADD (1 /ISZ GOES THROUGH -0
DAC CHARCT /GET MASTER CHARCNT
RSA
VER2, RSA
JMP .-1
RRB
NEWCHK
ADD NEWCHK
DAC NEWCHK /ACCUMULATE NEW CHECKSUM
ISZ CHARCT /ACCUMULATE NEW CHARCNT
JMP VER2
RSA
ADD CKSUM
SAD (-0
JMP OK
DAC ERROR
JMP ERRROUT

OK, LAW A-1
JMS ERR1
JMP MAIN
ERRROUT, LAW B-1
JMS ERR1
LAC ERROR
HLT
JMP MAIN
/MASTER TAPE DUPLICATOR
/T TYPE ROUTINES

ERR1, 0
DAC 17

ERO, LAC I 17
SNA
JMP I ERR1
703301
SKP
JMS RR6
TLS
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JMP .-1
JMP ERRO

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21502
21210
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START MAIN