IBM-POUGHKEEPSIE
December 31, 1964

Diagnostic Engineering Publication
1410/7010

Subject: Diagnostic Program ST03C 1410 System Test (10K/20K)

Sequence Number 153
Replaces ST03B

ST03 requires system and channel control cards. These cards must be punched in accordance with the instructions given in the "1410/7010 Introduction", Volume 1.00, before the test can be run from cards.

System Control Card	ST03 001
Channel 1 Control Card	ST03 002
Channel 2 Control Card	ST03 003

The following changes were made to ST03B to create ST03C:
(All pages to which changes have been made are dated 12/31/64.)

1. Channel 2 READER & PUNCH pockets selected are the same as channel 1.
2. The channel 1 & 2 test for overlap routines have been changed to correct a problem that existed when two channels of Unit Record equipment were run in overlap mode. Too much time was taken between the I/O instruction and the test for overlap instruction resulting in an overlap error message.
3. Channel 2 Status Indicator and Not Ready routines changed to correct problem of dropping channel 1 I/O units after a channel 2 I/O unit had gone NOT READY.
4. Minor changes to increase running speed.
5. The tape rewind routines in the initialization procedure were changed to check the Channel Cards for tape before rewinding and to wait for the rewinding to be completed before starting channel testing.

Enclosures: 48 Pages
Card Deck for CARD ONLY SYSTEMS (as punched by UP51)
8 Cards - Card Loader (1-7) and 1 Core Clear
122 Cards No. 001-122 Data Cards
1 Card Execute Card

Distribution: X 1410 10K/20K only
7010
Other

ST03B

1410 SYSTEM TEST

for

10K/20K SYSTEMS

12/31/64

CONTENTS OF ST03 WRITE UP AND LISTING

3.00.00.0 TEST DESCRIPTION

00.1 MODIFICATIONS

See Release Page for description of changes from Level to Level.

00.2 DESCRIPTION

ST03 is a system test for a 1410 Data Processing System with a 10K or 20K memory (CPU model A1 or A2).[1]

The I/O devices used are:

1402-2	Card Reader - Punch
1442	Card Reader
1403	Printer, model 1 or 2
729/7330	Tape units
1011	Paper Tape Reader

These units are selected on the basis of their availability (according to information on the Channel 1 and 2 Control Cards) and used as they are found READY.
The Processing Overlap and Priority Features are used when they are available.
Three short CPU routines are included to cover the multiply, divide and edit instructions.

Operating in non overlap mode I/O units are selected sequentially and used if they are READY and not BUSY. On completion of a pass on the channel 1 I/O units,a similar pass is made on Channel 2, if it is available. Then the CPU routines are run, in Alert Mode if Priority is available. In between each CPU routine the channels are checked to see if they are still in operation or if any I/O unit found BUSY when it was first selected is no longer BUSY. At the end of the CPU routines 3 is added to the pass count and when the count reaches 1000 a program PASS is complete.

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1 For systems with larger memories consult the "Index of 1410/7010 Diagnostic Tests" for the system test applicable.

Operating in overlap mode devices are used on the same basis (READY and not BUSY). After the I/O operation is initiated in overlap on channel 1, channel 2 is checked to see if it is in process. If it is, the CPU routines are entered. If it is not the next I/O unit on channel 2 is started. As in unoverlapped operation in between each CPU routine the channels are checked to insure that they are kept in operation. When the CPU routines are complete a 1 is added to the pass counter. The test returns to the start of the CPU section to wait for an exit in between routines. Again when the pass counter reaches 1000 a program PASS is complete but in this case many more I/O operations have taken place than when in unoverlap mode.

Console inquires are only acknowledged during channel 1 operation at a point that will not disrupt the test operation. Channel 2 error messages are held up until they can be typed without disrupting channel operation.

For a more complete picture of overall test operation refer to the FLOW CHARTS, Section 3.00.06.0

00.3 EQUIPMENT REQUIRED

A basic 1410 system and either a card reader of tape unit from which to load the test into memory.

All of the other I/O units tested, F Channel, Processing Overlap and Priority Features are optional.

00.4 CARD DECK

A complete card deck of ST03 consists of:

7	cards	Load Program
1	card	Core Clear
122	data cards	Program Deck ST03
1	card	Execute Card (Branch to 02000)

NOTE: Card # 001 is a System Control Card
002 is a Channel 1 Control Card
003 is a Channel 2 Control Card

These cards do not have any system or channel information punched in them when they are released. See the "1410/7010 Introduction", Volume 1.00 for instructions on how to punch them.

00.5 EC LEVEL OF MACHINE

Not applicable.

3.00.01.0 LOADING PROCEDURES

Standard 1410/7010 Diagnostic Loading procedure is used. Refer to the "1410/7010 Introduction", Volume 1.00 for additional information.

3.00.02.0 OPERATING PROCEDURES

Load and set to READY status all I/O units to be tested. All units READY at the start of the test are used, except for tape drive 0. Drive 0 is not tested on either channel. Units may be added to or dropped from the test at any time by making the unit not READY. Additional tape drives can only be added to the test by restarting after they have been set to READY status. Caution must be exercised when pressing RESET on a tape drive while the drive is in use. It may cause the system to "hang up."

Program operation may be altered at any time by using the "Program Alter Routine". TADs are loaded as blanks and TAD locations are only tested for 1.

Standard TADs

TAD	Address	Not 1	1
TAD 0	01000	Do Not	Bypass Typeouts
TAD 1	01001	Do Not	Loop on Routine
TAD 2	01002	Do Not	Halt on Error
TAD 3	01003	Do Not	Repeat Program

Special TADs

TAD 4	01004	Do Not	Use Overlap
TAD 5	01005	Do Not	Use Priority

NOTE: After changing TAD 4 the test must be restarted to change the mode of operation. This can be accomplished by using RESET and START or ADDRESS SET to 02000.

3.00.03.0 OPERATING HINTS, COMMENTS

03.1 Loading ST03 from the Card Reader:
ST03 should not be run from cards with any other program decks stacked behind it. It can be run as one of a series of diagnostic tests if it is the last one. This is advised because ST03 uses the card reader if it is READY. No attempt is made to discriminate between a program deck or a test deck. Any card deck is acceptable reader input.

03.2 Caution is urged when using non-pattern decks as card reader input. On completion of one PASS of ST03, TAD 3 is checked to determine whether the test is to be repeated or the next test read in. If TAD 3 is not 1 the load program reads in the cards in the reader. If these cards are in program card format but not a test i.e. old card decks used as input, they will be read into memory and probably destroy ST03, or parts of it at least.

03.3 The error typeout:

UNKNOWN INTERRUPT is the result of one of two things:

1. A branch on channel 1 inquiry priority request or a branch on inquiry was taken but the request was not satisfied by a Read Console Printer operation.[1]

2. An interrupt occurred and no branch on channel 1 or 2 overlap priority request or channel 1 or 2 unit priority request or inquiry priority request was taken.

In either case the request should be serviced or the indicator reset. The typeout can be bypassed by operating without priority (Set TAD 5 to 1)on systems with the Priority Feature.

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[1] Indiscriminate use of the INQUIRY REQUEST and INQUIRY CANCEL keys may also be a cause.

3.00.04.0 PROGRAM STOPS, RESTARTS

04.1 STOPS

Normal

There are no Normal Stops in ST03

Error

Programmed Error Stops may occur for the following reasons:

a) one of the CPU routines did not produce the correct results. This is extremely unlikely without a SYSTEM CHECK occurring first. There are three such stops possible and there is no error message typed. These three Stops are not under TAD control.

b) an unconditional halt follows the message "UNKNOWN INTERRUPT". Refer to OPERATING HINTS Section 3.00.03.3 for further information on unknown interrupts.

c) stops occurring when TAD 2 is set to 1 are provided following all other error message typeouts.

04.2 PROGRAM RESTARTS

After all programmed STOPs, START causes the test to resume with the next sequential instruction. COMPUTER RESET and START causes the test to be restarted from the beginning repeating all initialization.

3.00.05.0 TYPEOUTS

05.1 NORMAL or NON-ERROR TYPEOUTS

ST03A — Test Identification, typed during initialization at the start of the test.

PASS — Typed on completion of one program pass. A program PASS is completed when the pass counter reaches 1000. This count depends on the mode of operation. Refer to the DESCRIPTION section 3.00.00.2 for more complete information.

05.2 ERROR TYPEOUTS

All error typeouts are given unless TAD 0 is set to 1. They are the result of some status indicator being set or the failure to met an expected condition.

All status indicator error messages are preceded by asterisks and are typed in the following format:

```
* L@B706500R      4
        a         b
```

Where:

"a" is the instruction issued and

"b" is the d - modifier of the test and branch instruction used to test the indicators. In this case the indicator set is DATA CHECK (4).

Under the category of failure to meet an expected condition:

NO BOL AFTR M*4806752W

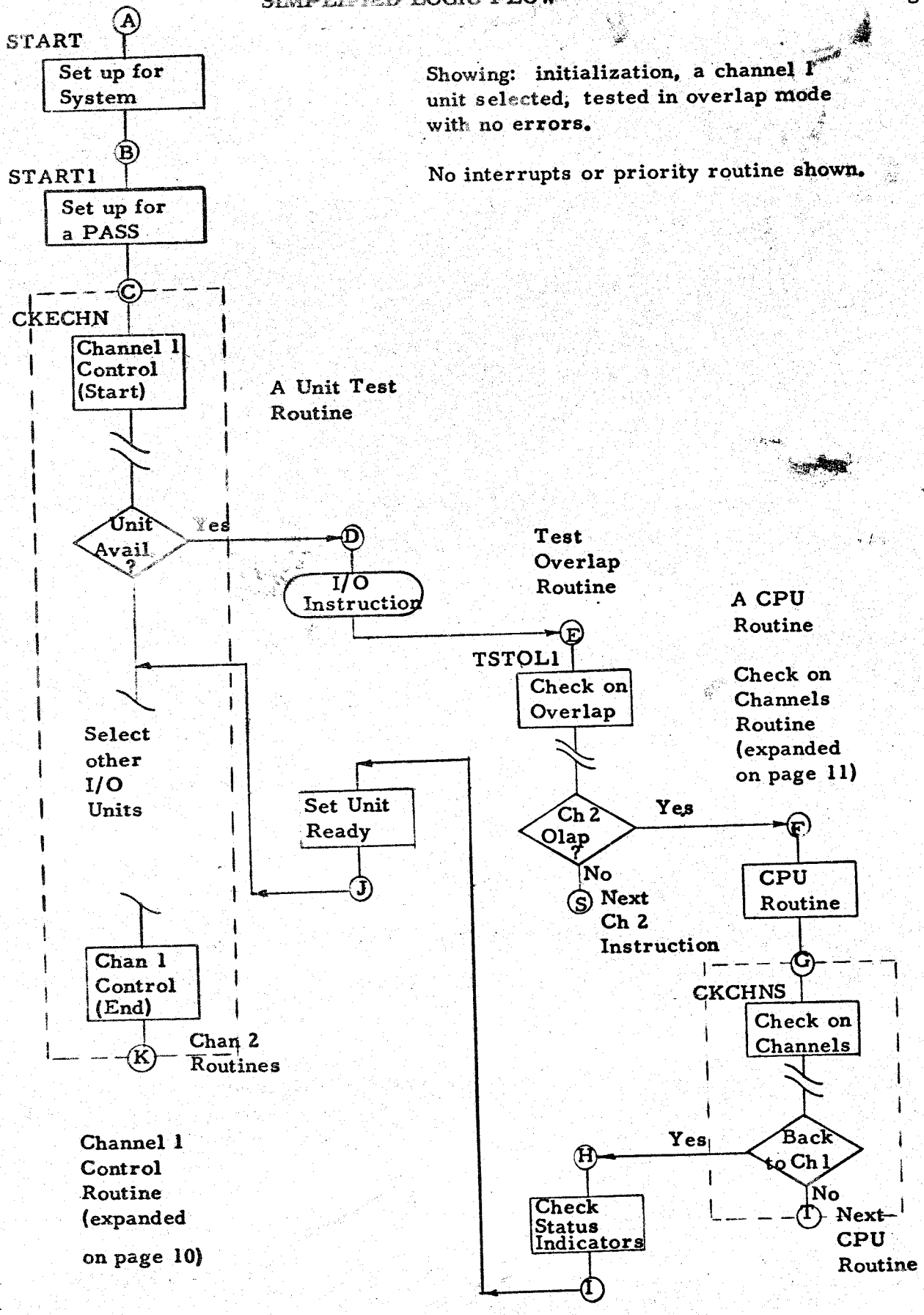
is self explanatory. The instruction is the actual instruction issued and a J(I)2 was not taken. No status indicator was set.

One other error typeout is possible:

UNKNOWN INTERRUPT

The reasons for this typeout and courses of action advisable are covered in OPERATING HINTS, COMMENTS, Section 3.00.03.3.

SIMPLIFIED LOGIC FLOW

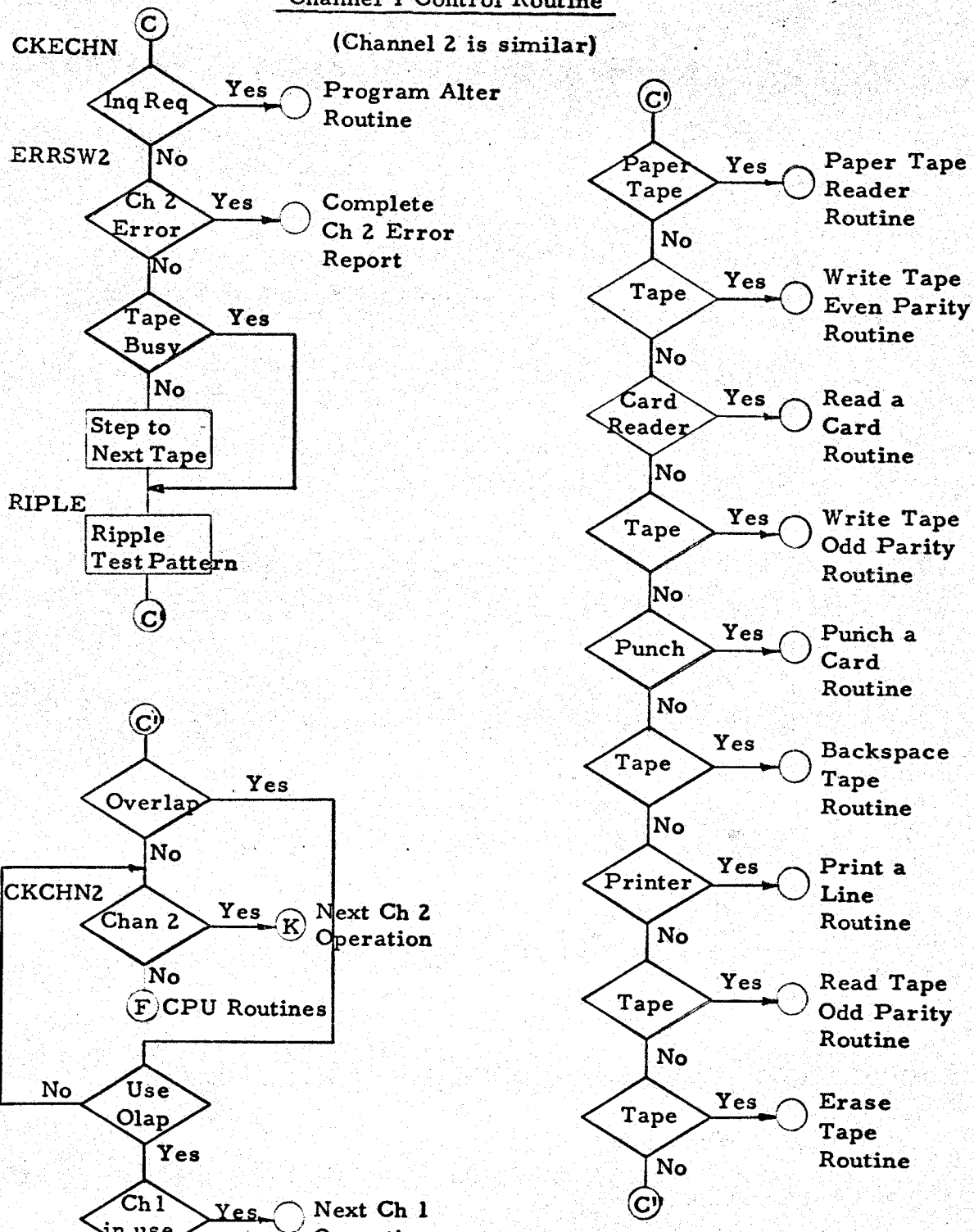


Showing: initialization, a channel 1 unit selected, tested in overlap mode with no errors.

No interrupts or priority routine shown.

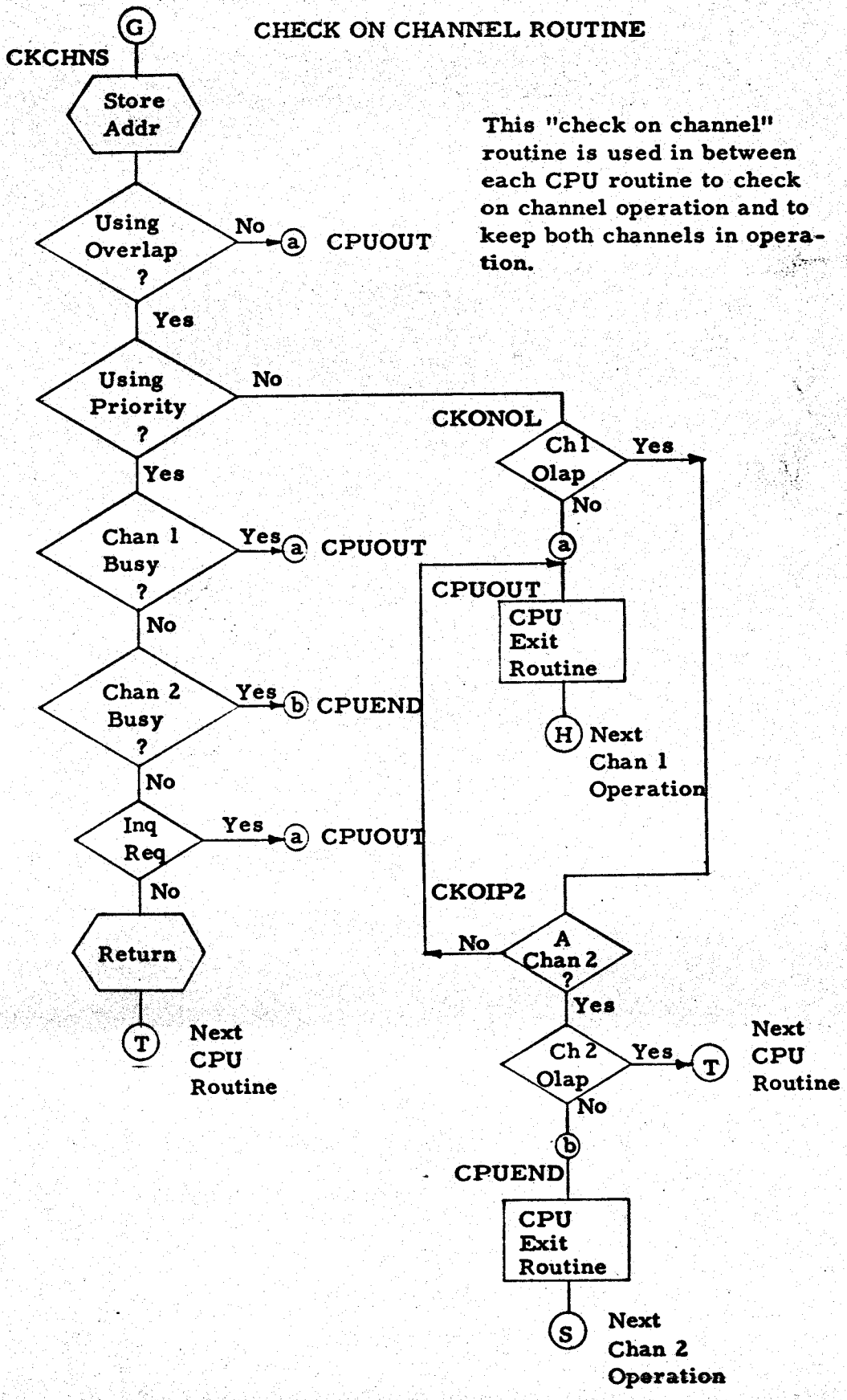
Channel 1 Control Routine

(Channel 2 is similar)



Branches are taken if the channel control card indicates the unit is available.

CHECK ON CHANNEL ROUTINE



This "check on channel" routine is used in between each CPU routine to check on channel operation and to keep both channels in operation.

```
LABEL     OPCOD  OPERAND                                    CT  ADDRS  INSTRUCTION

LOADER    EQU    400

                 ASSIGNMENT OF INDEX REGISTERS

   X1     CHANNEL 1 ROUTINE - ADDRESS OF NEXT CHAN 1 INSTRUCTION
   X2     CHANNEL 2 ROUTINE - ADDRESS OF NEXT CHAN 2 INSTRUCTION
   X3     C P U ROUTINES - ADDRESS OF NEXT C P U INSTRUCTION
   X4     CHANNEL 1 I/O INSTRUCTION - ADDRESS OF LAST ONE ISSUED
   X5     CHANNEL 2 I/O INSTRUCTION - ADDRESS OF LAST ONE ISSUED
   X6     C P U ROUTINES - ADDRESS OF NEXT C P U  SUB ROUTINE
   X7     ADDR OF RETURN TO CH 1 CONTROL ROUTINE FROM UNIT TEST RT
   X8     ADDR OF RETURN TO CH 2 CONTROL ROUTINE FROM UNIT TEST RT

   WRITE1 B-ADDR FOR PRINTER CH 1 - SET UP FOR 100/132 CHAR BUFFER
   WRITE2 B-ADDR FOR PRINTER CH 2 - SET UP FOR 100/132 CHAR BUFFER
   SXRA   UTILITY - USED MAINLY FOR TAPE DRIVE NUMBER CH 1
   SXRB   UTILITY - USED MAINLY FOR TAPE DRIVE NUMBER CH 2
   SXRC   UTILITY - USED MAINLY FOR UNIT SELECT CHARACTER CH 1
   SXRD   UTILITY - USED MAINLY FOR UNIT SELECT CHARACTER CH 2
```

```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION

          ORG    1000                                                       01000
*                *****    STANDARD  TADS    *****
                          NOT 1             1
TAD0      DC     @ @      DO NOT    BYPASS TYPE OUTS                     1  01000
TAD1             @ @      DO NOT    LOOP ON ROUTINE                      1  01001
TAD2             @ @      DO NOT    HALT ON ERRORS                       1  01002
TAD3             @ @      DO NOT    REPEAT PROGRAM                       1  01003

*                *****    SPECIAL   TADS    *****

TAD4             @ @      DO NOT    USE OVERLAP                          1  01004
TAD5             @ @      DO NOT    USE PRIORITY                         1  01005
                  G
GMWM      DCW    @M@                                                     1  01006

*                PROGRAM ALTER ROUTINE

ALTER     SBR    ALTRXT&5           STORE RETURN ADDRESS                 7  01007  G 01101 B
BA2SW1    NOP                                                            1  01014  N
                                                                                            G
          BA2    *&1                TURN OFF CH2 INTERLOCK               7  01015  X 01022 M
ENTER     RCP    ADDRES&4           ENTER LOCATION TO BE ALTERED        10  01022  M %T0 01057 R
                      T                                                                     T
          BEX1   ENTER,M            TRY AGAIN IF 1/2/4/8                 7  01032  R 01022 M
                                                                                            S
          BNT1   BUFINQ             CANT BE SATISFIED BY CONSOLE READ    7  01039  R 01084 B
                                                                                            G
          BA1    *&1                                                     7  01046  R 01053 M
ADDRES    RCPW   00000              ENTER DATA INTO ADDRES SPECIFIED    10  01053  L %T0 00000 R
                        S                                                                   S
          BEX1   ADDRES,M                                                7  01063  R 01053 M
                                                                                            G
          BA1    *&1                                                     7  01070  R 01077 M
          B      ALTRXT                                                  7  01077  J 01096

BUFINQ    BCE    CKTAD5,SYS1&8,1    CHECK FOR PRIORITY ON SYSTEM        12  01084  B 01103 01264 1
ALTRXT    B      00000              RETURN TO PROGRAM                    7  01096  J 00000
CKTAD5    BCE    ALTRXT,TAD5,1      NOT OPERATING IN PRIORITY MODE      12  01103  B 01096 01005 1
INTERR    B      TYP1                                                    7  01115  J 05489
          DCW    @UNKNOWN INTERRUPT@,G                                  17  01138
          H      START1             RESTART TEST                         6  01140  . 02007
          H                                                              1  01146  .
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

          ORG    1239              *CONTROL INFORMATION                01239
          DCW    a0'11'1a           ANY 10K OR 20K SYSTEM           6  01244
                 a1VL'9a            SEQ# 153,10K,SYS TST,RELIAB MODE 5  01249

TESTID    DCW    aST03a             TEST IDENTIFICATION             4  01253
LEVEL  C  DC     aCa,G              SUFFIX LEVEL                    1  01254

*                 STANDARD SYSTEM CONTROL CARD

          ORG    1256      CHARACTER & PURPOSE        COL            01256
SYS1      DC     a a  ALPHA O,I,X - 1410,1410ACC,7010 13             1  01256
        &1 DC     a a  0,1,3,5,7,9-10,20,40,60,80,100K 14           1  01257
        &2 DC     a a                SPARE             15           1  01258
        &3 DC     a a  1,2-CHNL1 100,132 CHAR PRINTER  16           1  01259
        &4 DC     a a  1,2-CHNL2 100,132 CHAR PRINTER  17           1  01260
        &6 DC     a  a               SPARES            18-19        2  01262
        &7 DC     a a  1 - OVERLAP                     20           1  01263
        &8 DC     a a  1 - PRIORITY ALERT              21           1  01264
        &9 DC     a a  1 - PRIORITY EXTENSION CHAN 2   22           1  01265
       &11 DC     a  a               SPARES                         2  01267
       &12 DC     a a  1 - CHANNEL ONE PRESENT         25           1  01268
       &13 DC     a a  1 - CHANNEL TWO PRESENT         26           1  01269
          DC     a                      ‡a  NOT INTERROGATED       19  01288
```

```
LABEL      OPCOD  OPERAND                                              CT  ADDRS  INSTRUCTION

*                 STANDARD CHANNEL 1 CONTROL CARD

           ORG    1289     CHARACTER & PURPOSE       COL                   01289

CHN1       DC     @ @  1 - PAPER TAPE READER          13               1  01289
        &1 DC     @ @                  NOT INTERROGATED               1  01290
        &2 DC     @ @  1 - TAPES 729/7330             15               1  01291
       &11 DC     @        @        SPARES         16-24               9  01300
       &12 DC     @ @  R,S,C - 1402,1442,7223 READER  25               1  01301
       &13 DC     @ @                  NOT INTERROGATED               1  01302
       &14 DC     @ @  P - 1402 PUNCH                 27               1  01303
       &15 DC     @ @                  NOT INTERROGATED               1  01304
       &16 DC     @ @  P - 1403 PRINTER               29               1  01305
       &17 DC     @                  @ NOT INTERROGATED              20  01325
           DC     @                 *@                               20  01345

*                 STANDARD CHANNEL 2 CONTROL CARD

           ORG    1346     CHARACTER & PURPOSE       COL                   01346

CHN2       DC     @ @  1 - PAPER TAPE READER          13               1  01346
        &1 DC     @ @                  NOT INTERROGATED               1  01347
        &2 DC     @ @  1 - TAPES 729/7330             15               1  01348
       &11 DC     @        @        SPARES         16-24               9  01357
       &12 DC     @ @  R,S,C - 1402,1442,7223 READER  25               1  01358
       &13 DC     @ @                  NOT INTERROGATED               1  01359
       &14 DC     @ @  P - 1402 PUNCH                 27               1  01360
       &15 DC     @ @                  NOT INTERROGATED               1  01361
       &16 DC     @ @  P - 1403 PRINTER               29               1  01362
       &17 DC     @                  @ NOT INTERROGATED              20  01382
           DC     @                 *@                               20  01402
           ORG    1403                                                   01403
```

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION

*                *INSTRUCTION ALTERATION ROUTINE
*                ALTER FOR UNOVERLAP OR OVERLAP OPERATION

I-A-R     SBR    SXRA                       7  01403  G 00074 B
          MLNA   4&SXRA,SXRB                12  01410  D 00..4 00079 /
IARSCN    SCNLB  09990,0&SXRB               12  01422  D 09990 00.,0M0 -
          SBR    SXRB                       7  01434  G 00079 B
          C      SXRB,9&SXRA                11  01441  C 00079 00..9
          BH     11&SXRA                    7  01452  J 00.,J1 U
          MLCS   1&SXRB,*&12                12  01459  D 00.,0M1 01482 3
          BCE    IARIOP,IAROPS,0            12  01471  B 01492 01513 0
          BCE                                1  01483  B
          BCE                                1  01484  B
          B      IARSCN                     7  01485  J 01422
IARIOP    MLCS   10&SXRA,2&SXRB             12  01492  D 00.,J0 00.,0M2 3
          B      IARSCN                     7  01504  J 01422

IAROPS    DCW    @ULM@                      3  01513

*                *****

*                TYPING ROUTINE

TYP       SBR    TYPE&8                     7  01514  G 01536 B
          BAI    *&1                        7  01521  R 01528 GM
TYPE      WCP    00000                     10  01528  M %TO 00000 W
          SBR    TYPEXT&5                   7  01538  G 01564 B
          BCBI   TYPE                       7  01545  R 01528 2G
          BAI    *&1                        7  01552  R 01559 M
TYPEXT    B      00000                      7  01559  J 00000
          H                                 1  01566  .
```

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

*                READY - NOT READY TABLE

*                LOCATIONS ARE BLANK WHEN I/O UNITS ARE READY AND
*                CONTAIN A UNIT SEL CHAR IF THE UNIT IS NOT READY

          ORG    *&X00                                                01600
RDYON1    DCW    @ @              NOT USED                        1   01600
RDR1      DC     @ @              ANY CARD READER CH 1            1   01601
PRT1           @ @                PRINTER CH 1                    1   01602
PUN1           @  @               PUNCH CH 1                      2   01604
PTR1           @   @              PAPER TAPE CH 1                 3   01607
               @  @                                               2   01609
RDYON2    DCW    @ @              NOT USED                        1   01610
RDR2      DC     @ @              ANY CARD READER CH 2            1   01611
PRT2           @ @                PRINTER CH 2                    1   01612
PUN2           @  @               PUNCH CH 2                      2   01614
PTR2           @   @              PAPER TAPE CH 2                 3   01617
               @  @                                               2   01619

*                LOCATIONS FOR DRIVE NUMBERS ARE BLANK IF THE
*                DRIVES ARE READY AND SET TO THE DRIVE NUMBER
*                WHEN THEY ARE NOT READY

 TDSCH1   DCW    @          @     TAPE DRIVES CHANNEL 1           10  01620
 TDSCH2   DCW    @          @     TAPE DRIVES CHANNEL 2           10  01630

*                STATUS AND AVAILABILITY INDICATORS

CH1SW     DC     @ @              CHANNEL 1 IN USE SWITCH         1   01640
CH2SW     DC     @ @              CHANNEL 2 IN USE SWITCH         1   01641
BUSY1     DC     @ @              CHANNEL 1 BUSY NOT BUSY SWITCH  1   01642
TP1BZY    DC     @ @              TAPE UNIT BUSY CH 1             1   01643
BUSY2     DC     @ @              CHANNEL 2 BUSY NOT BUSY SWITCH  1   01644
TP2BZY    DC     @ @              TAPE UNIT BUSY CH 2             1   01645
```

```
LABEL    OPCOD  OPERAND                                                    CT  ADDRS  INSTRUCTION

*               STEP TO NEXT READY TAPE DRIVE ON A CHANNEL

SETPS1   S      SXRA                  ZERO INDEX REG USED FOR COUNTER       6  01646  S 00074
NEXTP1   A      *-10,ATDNO1           STEP UP TO NEXT TAPE DRIVE           11  01652  A 01652 01766
         MLNS   ATDNO1,SXRA           SET DRIVE NUMBER IN INDEX REG        12  01663  D 01766 00074 1
         BCE    RIPLE1,SXRA,0         DRIVE ZERO IS NOT TESTED             12  01675  B 02092 00074 0
                                     G                                                             G
         BBE    NEXTP1,TDSCH1&SXRA,M            DRIVE IS NOT READY         12  01687  W 01652 010K0 M
         MLNS   SXRA,WT1&3            SET DRIVE NUMBER IN TAPE OPS         12  01699  D 00074 02673 1
         MLNS   SXRA,WTB1&3                                                12  01711  D 00074 02780 1
         MLNS   SXRA,BSP1&3                                                12  01723  D 00074 02880 1
         MLNS   SXRA,RTB1&3                                                12  01735  D 00074 02975 1
         MLNS   SXRA,SKP1&3                                                12  01747  D 00074 03025 1
         B      RIPLE1                BACK TO E CHANNEL ROUTINE             7  01759  J 02092

ATDNO1   DCW    @ @                   USED FOR TAPE DRIVE NUMBER CH 1       1  01766

*                                     *****

SETPS2   S      SXRB                                                        6  01767  S 00079
NEXTP2   A      *-10,ATDNO2           STEP UP TO NEXT TAPE DRIVE           11  01773  A 01773 01887
         MLNS   ATDNO2,SXRB           SET DRIVE NUMBER IN INDEX REG        12  01784  D 01887 00079 1
         BCE    RIPLE2,SXRB,0         DRIVE ZERO IS NOT TESTED             12  01796  B 02356 00079 0
                                     G                                                             G
         BBE    NEXTP2,TDSCH2&SXRB,M            DRIVE IS NOT READY         12  01808  W 01773 010C0 M
         MLNS   SXRB,WT2&3            SET DRIVE NUMBER IN TAPE OPS         12  01820  D 00079 03127 1
         MLNS   SXRB,WTB2&3                                                12  01832  D 00079 03234 1
         MLNS   SXRB,BSP2&3                                                12  01844  D 00079 03334 1
         MLNS   SXRB,RTB2&3                                                12  01856  D 00079 03429 1
         MLNS   SXRB,SKP2&3                                                12  01868  D 00079 03479 1
         B      RIPLE2                BACK TO F CHANNEL ROUTINE             7  01880  J 02356

ATDNO2   DCW    @ @                   USED FOR A TAPE DRIVE NUMBER CH 2     1  01887
```

```
LABEL     OPCOD  OPERAND                                                  CT  ADDRS  INSTRUCTION
**********       START OF TEST
          ORG    2000                                                         02000
START     B      SETUP          INITIALIZATION-DONE 1ST PASS ONLY         7  02000  J 05947
START1    CW     CKECHN&1       SET STARTING ADDRESS OF ROUTINE           6  02007  ¤ 02053
          SAR    X1             IN INDEX REG - CHANNEL 1 ROUTINE          7  02013  G 00029 A
          CW     CKFCHN&1       SET STARTING ADDRESS OF ROUTINE           6  02020  ¤ 02332
          SAR    X2             IN INDEX REG - CHANNEL 2 ROUTINE          7  02026  G 00034 A
          CW     CPURT1&1       START OF CPU ROUTINES                     6  02033  ¤ 03559
          SAR    X3             IN INDEX REG - CPU ROUTINE                7  02039  G 00039 A
          S      CPUCNT         ZERO PASS COUNTER FOR CPU ROUTINE         6  02046  $ 07511
```

```
LABEL     OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

          CHECK FOR I/O UNITS TO BE TESTED ON CHANNEL 1

CKECHN    BNQ    ALTER            TO PROGRAM ALTER ROUTINE        7  02052  J 01007 Q
          CW     CH1SW            SET CHAN 1 IN USE SWITCH OFF    6  02059  ¤ 01640
ERRSW2    NOPWM                                                   1  02065  N
          B      0&X2             BR IF A CH 2 ERROR IS WAITING   7  02066  J 000'0
          BW     *&8,TP1BZY       DONT STEP TO NEXT DRIVE YET    12  02073  V 02092 01643 1
          B      SETPS1           SET UP FOR THE NEXT TAPE DRIVE  7  02085  J 01646
RIPLE1    MRCG   WAREA1,WAREA1-1  RIPPLE DATA FIELD              12  02092  D 06700 06699 $
          MLCS   WAREA1-1,END1                                   12  02104  D 06699 06831 3

          BCE    PTAPE1,CHN1,1    PAPER TAPE CH 1                12  02116  B 02606 01289 1
          BCE    TAPEA1,CHN1&2,1  TAPE -MAGNETIC- CH 1  DO A WT  12  02128  B 02663 01291 1
          BBE    READR1,CHN1&12,M ANY CARD READER CH 1           12  02140  W 02713 01301 M
          BCE    TAPEB1,CHN1&2,1  TAPE -MAGNETIC- CH 1  DO A WTB 12  02152  B 02770 01291 1
          BCE    PUNCH1,CHN1&14,P PUNCH CH 1                     12  02164  B 02820 01303 P
          BCE    TAPEC1,CHN1&2,1  TAPE -MAGNETIC- CH 1  DO A BSP 12  02176  B 02870 01291 1
          BCE    PRNTR1,CHN1&16,P PRINTER CH 1                   12  02188  B 02915 01305 P
          BCE    TAPED1,CHN1&2,1  TAPE -MAGNETIC- CH 1  DO A RTB 12  02200  B 02965 01291 1
          BCE    TAPEE1,CHN1&2,1  TAPE -MAGNETIC- CH 1  AN ERASE 12  02212  B 03015 01291 1
          DCW    @N          @    SPARE- FOR MORE ROUTINES       12  02235
          DCW    @N          @    SPARE- FOR MORE ROUTINES       12  02247
          CW     CKECHN&1         SET STARTING ADDRESS OF ROUTINE 6  02248  ¤ 02053
          SAR    X1               IN INDEX REG - CHANNEL 1 ROUTINE 7 02254  G 00029 A

          BCE    CKTAD4,SYS1&7,1  BR IF SYSTEM HAS OVERLAP FEATURE 12  02261  B 02292 01263 1
CKCHN2    BCE    0&X2,SYS1&13,1   GO TO CH 2 ROUTINES IF CH2 ON SYS 12  02273  B 000'0 01269 1
          B      CPURTS           GO TO CPU  ROUTINES             7  02285  J 03514
CKTAD4    BCE    CKCHN2,TAD4,1    BR TO CK ON CH2 IF NOT USING OLAP 12  02292  B 02273 01004 1
          BW     0&X1,CH1SW       BR BACK TO CH1 RT IF CH1 WAS RDY 12  02304  V 000*0 01640 1
BOL21     NOP                                                     1  02316  N
          BOL2   CPURTS           TO CPU ROUTINES                 7  02317  J 03514 2
          B      CKCHN2           GO SEE ABOUT CHANNEL 2          7  02324  J 02273
```

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LABEL    OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION

                CHECK FOR I/O UNITS TO BE TESTED ON CHANNEL 2

CKFCHN   CW     CH2SW                  SET CHAN 2 IN USE SWITCH OFF     6  02331  ¤ 01641
         BW     *&8,TP28ZY             DONT STEP TO NEXT DRIVE YET     12  02337  V 02356 01645 1
         B      SETPS2                 SET UP FOR THE NEXT TAPE DRIVE   7  02349  J 01767
RIPLE2   MRCG   WAREA2,WAREA2-1        RIPPLE DATA FIELD               12  02356  D 06900 06899 $
         MLCS   WAREA2-1,END2                                           12  02368  D 06899 07031 3

         BCE    PTAPE2,CHN2,1          PAPER TAPE CH 2                 12  02380  B 03060 01346 1
         BCE    TAPEA2,CHN2&2,1        TAPE -MAGNETIC- CH 2  DO A WT   12  02392  B 03117 01348 1
         BBE    READR2,CHN2&12,M       ANY CARD READER CH 2            12  02404  W 03167 01358 M
         BCE    TAPEB2,CHN2&2,1        TAPE -MAGNETIC- CH 2  DO A WTB  12  02416  B 03224 01348 1
         BCE    PUNCH2,CHN2&14,P       PUNCH CH 2                      12  02428  B 03274 01360 P
         BCE    TAPEC2,CHN2&2,1        TAPE -MAGNETIC- CH 2  DO A BSP  12  02440  B 03324 01348 1
         BCE    PRNTR2,CHN2&16,P       PRINTER CH 2                    12  02452  B 03369 01362 P
         BCE    TAPED2,CHN2&2,1        TAPE -MAGNETIC- CH 2  DO A RTB  12  02464  B 03419 01348 1
         BCE    TAPEE2,CHN2&2,1        TAPE -MAGNETIC- CH 2  AN ERASE  12  02476  B 03469 01348 1
         DCW    @N          @          SPARE- FOR MORE ROUTINES        12  02499
         DCW    @N          @          SPARE- FOR MORE ROUTINES        12  02511
         CW     CKFCHN&1               SET STARTING ADDRESS OF ROUTINE  6  02512  ¤ 02332
         SAR    X2                     IN INDEX REG - CHANNEL 2 ROUTINE 7  02518  G 00034 A

         BCE    *&8,SYS1&7,1           BRANCH IF OVERLAP ON SYSTEM     12  02525  B 02544 01263 1
         B      CPURTS                 TO CPU ROUTINES                  7  02537  J 03514
         BCE    CPURTS,TAD4,1          GO TO CPU ROUTINES IN NOT IN OLAP 12  02544  B 03514 01004 1
         BW     0&X2,CH2SW             BR TO CH2 ROUTINE IF CH2 WAS RDY 12  02556  V 000.0 01641 1
         BOL1   CPURTS                 TO CPU ROUTINES                  7  02568  J 03514 1
         BW     CPURTS,BUSY1           TO CPU ROUTINES IF CH 1 WAS BUSY 12  02575  V 03514 01642 1
         BW     0&X1,CH1SW             CH1 RTS IF CH1 WAS READY         12  02587  V 000+0 01640 1
         B      CPURTS                 TO CPU ROUTINES                  7  02599  J 03514
```

LABEL	OPCOD	OPERAND		CT	ADDRS	INSTRUCTION
*		CHANNEL 1 UNIT TEST ROUTINES				
PTAPE1	SBR	X7	STORE ADDR FOR RETURN	7	02606	G 00059 B
	CS	RAREA1&79		6	02613	/ 07231
	CS			1	02619	/
	RPT	1,RAREA1	READ PAPER TAPE	10	02620	M %P0 07152 R
	B	TSTOL1	GO TEST FOR OVERLAP CHAN 1	7	02630	J 03859
	B	CKBA1	GO TEST ALL STATUS INDICATORS	7	02637	J 04269
	MLCS	ABLANK,PTR1		12	02644	D 05269 01607 3 Q
	B	O&X7	RETURN FOR NEXT I/O DEVICE CH 1	7	02656	J 00*M0
TAPEA1	SBR	X7	STORE ADDRESS FOR RETURN	7	02663	G 00059 B
WT1	WT	11,WAREA1	WRITE EVEN PARITY	10	02670	M %U1 06700 W
	B	TSTOL1	GO TEST FOR OVERLAP CHAN 1	7	02680	J 03859
	B	CKBA1	GO TEST ALL STATUS INDICATORS	7	02687	J 04269
	MLCS	ABLANK,TOSCH1&SXRA	SET LOC TO BLANK IF DRIVE READY	12	02694	D 05269 01OKO 3 Q
	B	O&X7	RETURN FOR NEXT I/O DEVICE CH 1	7	02706	J 00*M0
READR1	SBR	X7	STORE ADDR FOR RETURN	7	02713	G 00059 B
	CS	RAREA1&79	CLEAR OUT READ AREA	6	02720	/ 07231
	CS			1	02726	/
	R	1,RAREA1	READ A CARD-STACK IN POCKET 1	10	02727	M %11 07152 R
	B	TSTOL1	GO TEST FOR OVERLAP CHAN 1	7	02737	J 03859
	B	CKBA1	GO TEST ALL STATUS INDICATORS	7	02744	J 04269
	MLCS	ABLANK,RDR1	BLANK OUT POSITION IF READY	12	02751	D 05269 01601 3 Q
	B	O&X7	RETURN FOR NEXT I/O DEVICE CH 1	7	02763	J 00*M0
TAPEB1	SBR	X7	STORE ADDRESS FOR RETURN	7	02770	G 00059 B
WTB1	WTB	11,WAREA1	WRITE TAPE ODD PARITY	10	02777	M %B1 06700 W
	B	TSTOL1	GO TEST FOR OVERLAP CHAN 1	7	02787	J 03859
	B	CKBA1	GO TEST ALL STATUS INDICATORS	7	02794	J 04269
	MLCS	ABLANK,TOSCH1&SXRA	SET LOC TO BLANK IF DRIVE READY	12	02801	D 05269 01OKO 3 Q
	B	O&X7	RETURN FOR NEXT I/O DEVICE CH 1	7	02813	J 00*M0

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LABEL     OPCOD  OPERAND                                                    CT  ADDRS  INSTRUCTION

PUNCH1    SBR    X7                STORE ADDR FOR RETURN                     7  02820  G 00059 B
          P      4,PAREA1          PUNCH A CARD-STACK IN POCKET  4          10  02827  M %44 06752 W
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1                7  02837  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS             7  02844  J 04269
          MLCS   ABLANK,PUN1                                                12  02851  D 05269 01604 3
                                                                                              Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1          7  02863  J 00‡M0

TAPEC1    SBR    X7                STORE ADDRESS FOR RETURN                  7  02870  G 00059 B
BSP1      BSP    11                BACK SPACE                                5  02877  U %U1 B
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1                7  02882  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS             7  02889  J 04269
          MLCS   ABLANK,TDSCH1&SXRA SET LOC TO BLANK IF DRIVE READY         12  02896  D 05269 010K0 3
                                                                                              Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1          7  02908  J 00‡M0

PRNTR1    SBR    X7                STORE ADDR FOR RETURN                     7  02915  G 00059 B
                                                                                                    Q
          W      0&WRITE1          INDEXED FOR 100-132 CHAR BUFFER          10  02922  M %20 00M00 W
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1                7  02932  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS             7  02939  J 04269
          MLCS   ABLANK,PRT1                                                12  02946  D 05269 01602 3
                                                                                              Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1          7  02958  J 00‡M0

TAPED1    SBR    X7                STORE ADDRESS FOR RETURN                  7  02965  G 00059 B
RTB1      RTB    11,TAREA1         READ  ODD  PARITY                        10  02972  M %81 07100 R
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1                7  02982  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS             7  02989  J 04269
          MLCS   ABLANK,TDSCH1&SXRA SET LOC TO BLANK IF DRIVE READY         12  02996  D 05269 010K0 3
                                                                                              Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1          7  03008  J 00‡M0

TAPEE1    SBR    X7                STORE ADDRESS FOR RETURN                  7  03015  G 00059 B
SKP1      SKP    11                ERASE/SKIP                                5  03022  U %U1 E
          B      TSTOL1            GO TEST FOR OVERLAP CHAN 1                7  03027  J 03859
          B      CKBA1             GO TEST ALL STATUS INDICATORS             7  03034  J 04269
          MLCS   ABLANK,TDSCH1&SXRA SET LOC TO BLANK IF DRIVE READY         12  03041  D 05269 010K0 3
                                                                                              Q
          B      0&X7              RETURN FOR NEXT I/O DEVICE  CH 1          7  03053  J 00‡M0
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LABEL     OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION

*                CHANNEL 2 UNIT TEST ROUTINES

PTAPE2    SBR    X8                STORE ADDR FOR RETURN     7  03060  G 00064 B
          CS     RAREA2&79                                   6  03067  / 07431
          CS                                                 1  03073  /
          RPT    2,RAREA2          READ PAPER TAPE          10  03074  M ¤P0 07352 R
          B      TSTOL2            GO TEST FOR OVERLAP CHAN 2  7  03084  J 04059
          B      CKBA2             GO TEST ALL STATUS INDICATORS 7 03091 J 04730
          MLCS   ABLANK,PTR2                                12  03098  D 05269 01617 3
          B      0&X8              RETURN FOR NEXT I/O DEVICE  CH 2  7  03110  J 00.00

TAPEA2    SBR    X8                STORE ADDRESS FOR RETURN  7  03117  G 00064 B
WT2       WT     21,WAREA2         WRITE EVEN PARITY        10  03124  M ¤U1 06900 W
          B      TSTOL2            GO TEST FOR OVERLAP CHAN 2  7  03134  J 04059
          B      CKBA2             GO TEST ALL STATUS INDICATORS 7 03141 J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY 12 03148 D 05269 010C0 3
          B      0&X8              RETURN FOR NEXT I/O DEVICE  CH 2  7  03160  J 00.00

READR2    SBR    X8                STORE ADDR FOR RETURN     7  03167  G 00064 B
          CS     RAREA2&79         CLEAR OUT READ AREA       6  03174  / 07431
          CS                                                 1  03180  /
        C R2     1,RAREA2          READ A CARD-STACK IN POCKET 1 10 03181 M ¤11 07352 R
          B      TSTOL2            GO TEST FOR OVERLAP CHAN 2  7  03191  J 04059
          B      CKBA2             GO TEST ALL STATUS INDICATORS 7 03198 J 04730
          MLCS   ABLANK,RDR2       BLANK OUT POSITION IF READY 12  03205  D 05269 01611 3
          B      0&X8              RETURN FOR NEXT I/O DEVICE  CH 2  7  03217  J 00.00

TAPEB2    SBR    X8                STORE ADDRESS FOR RETURN  7  03224  G 00064 B
WTB2      WTB    21,WAREA2         WRITE TAPE ODD PARITY    10  03231  M ¤B1 06900 W
          B      TSTOL2            GO TEST FOR OVERLAP CHAN 2  7  03241  J 04059
          B      CKBA2             GO TEST ALL STATUS INDICATORS 7 03248 J 04730
          MLCS   ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY 12 03255 D 05269 010C0 3
          B      0&X8              RETURN FOR NEXT I/O DEVICE  CH 2  7  03267  J 00.00
```

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LABEL     OPCOD OPERAND                                                    CT  ADDRS  INSTRUCTION

PUNCH2    SBR   X8                 STORE ADDR FOR RETURN                    7  03274  G 00064 B
        C P2    4,PAREA2           PUNCH A CARD-STACK IN POCKET 4          10  03281  M ¤44 06952 W
          B     TSTOL2             GO TEST FOR OVERLAP CHAN 2               7  03291  J 04059
          B     CKBA2              GO TEST ALL STATUS INDICATORS            7  03298  J 04730
          MLCS  ABLANK,PUN2                                                12  03305  D 05269 01614 3
          B     0&X8               RETURN FOR NEXT I/O DEVICE  CH 2         7  03317  J 00.00

TAPEC2    SBR   X8                 STORE ADDRESS FOR RETURN                 7  03324  G 00064 B
BSP2      BSP   21                 BACK SPACE                               5  03331  U ¤U1 B
          B     TSTOL2             GO TEST FOR OVERLAP CHAN 2               7  03336  J 04059
          B     CKBA2              GO TEST ALL STATUS INDICATORS            7  03343  J 04730
          MLCS  ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY         12  03350  D 05269 010C0 3
          B     0&X8               RETURN FOR NEXT I/O DEVICE  CH 2         7  03362  J 00.00

PRNTR2    SBR   X8                 STORE ADDR FOR RETURN                    7  03369  G 00064 B
                                                                                               Q
          W2    0&WRITE2           INDEXED FOR 100-132 CHAR BUFFER         10  03376  M ¤20 00M*0 W
          B     TSTOL2             GO TEST FOR OVERLAP CHAN 2               7  03386  J 04059
          B     CKBA2              GO TEST ALL STATUS INDICATORS            7  03393  J 04730
          MLCS  ABLANK,PRT2                                                12  03400  D 05269 01612 3
          B     0&X8               RETURN FOR NEXT I/O DEVICE  CH 2         7  03412  J 00.00

TAPED2    SBR   X8                 STORE ADDRESS FOR RETURN                 7  03419  G 00064 B
RTB2      RTB   21,TAREA2          READ  ODD  PARITY                       10  03426  M ¤B1 07300 R
          B     TSTOL2             GO TEST FOR OVERLAP CHAN 2               7  03436  J 04059
          B     CKBA2              GO TEST ALL STATUS INDICATORS            7  03443  J 04730
          MLCS  ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY         12  03450  D 05269 010C0 3
          B     0&X8               RETURN FOR NEXT I/O DEVICE  CH 2         7  03462  J 00.00

TAPEE2    SBR   X8                 STORE ADDRESS FOR RETURN                 7  03469  G 00064 B
SKP2      SKP   21                 ERASE/SKIP                               5  03476  U ¤U1 E
          B     TSTOL2             GO TEST FOR OVERLAP CHAN 2               7  03481  J 04059
          B     CKBA2              GO TEST ALL STATUS INDICATORS            7  03488  J 04730
          MLCS  ABLANK,TDSCH2&SXRB SET LOC TO BLANK IF DRIVE READY         12  03495  D 05269 010C0 3
          B     0&X8               RETURN FOR NEXT I/O DEVICE  CH 2         7  03507  J 00.00
```

```
LABEL     OPCOD  OPERAND                                                CT  ADDRS  INSTRUCTION
*                THIS IS THE ONLY ENTRY TO THE CPU ROUTINE SERIES
CPURTS    BCE    0&X3,TAD5,1          GO TO CPU ROUTINES NO PRIORITY    12  03514  B 000M0 01005 1
          ZA     STOREO               RESTORE CPU STATUS BEFORE RETURN   6  03526  M 05946
          C      STORLO-1,STOREQ                                        11  03532  C 05943 05945
BEPASW    NOP                                                            1  03543  N
          BEPA   0&X3                 ENTER ALERT MODE AND GO TO CPU RT  7  03544  Y 000M0 E
          B      0&X3                 TO CPU ROUTINES                    7  03551  J 000M0
*                CPU ROUTINES
CPURT1    MLCA   MULT1,MULFLD-17                                        12  03558  D 07527 07592 T
          M      MULT2,MULFLD         MULTIPLY                         11  03570  @ 07543 07609
          C      MULFLD,PRODCT                                         11  03581  C 07609 07576
          BE     *&2                                                    7  03592  J 03600 S
          H                                                             1  03599  .
          B      CKCHNS               GO SEE HOW THE CHANNELS ARE DOING  7  03600  J 05590
          ZA     DIV1,MULFLD-2        SET UP DATA FIELD                11  03607  M 07629 07607
          D      DIV2,MULFLD-21       DIVIDE                           11  03618  % 07639 07588
          C      MULFLD-2,DIV3                                         11  03629  C 07607 07670
          BE     *&2                                                    7  03640  J 03648 S
          H                                                             1  03647  .
          B      CKCHNS               GO SEE HOW THE CHANNELS ARE DOING  7  03648  J 05590
          MLCWA  @ *$0@,CTLFLD        SET UP EDIT                      12  03655  D 07688 07679 X
          MCE    @6.0@,CTLFLD         EDIT                             11  03667  E 07691 07679
          SBR    BAR                                                    7  03678  G 07675 B
          C      BAR,BAROK            CHECK ON ADDR AT END OF EDIT     11  03685  C 07675 07684
          BU     *&19                 SHOULD BE EQUAL                   7  03696  J 03721 /
          C      CTLFLD,@$6.0@                                         11  03703  C 07679 07695
          BE     *&2                                                    7  03714  J 03722 S
          H                                                             1  03721  .
```

```
LABEL     OPCOD  OPERAND                        CT  ADDRS  INSTRUCTION
BXPA2     NOP                                    1  03722  N
          BXPA   *&1              EXIT PRIORITY ALERT MODE  7  03723  Y 03730 X
          CW     CPURT1&1         START OF CPU ROUTINES     6  03730  ¤ 03559
          SAR    X3               IN INDEX REG - CPU ROUTINE 7 03736  G 00039 A
ONEPAS    A      *-10,CPUCNT      ADD 1 TO CPU COUNTER     11  03743  A 03743 07511
          BCE    TYPASS,CPUCNT-3,1                         12  03754  B 03820 07508 1
          BCE    *&13,TAD4,1      BR TO ADD  IF NOT USING OVERLAP 12 03766 B 03790 01004 1
          BCE    CPURTS,SYS1&7,1  BR IF OVERLAP ON SYSTEM   12  03778  B 03514 01263 1
          A      *&1,CPUCNT       ADD TWO                  11  03790  A 03801 07511
          BCE    TYPASS,CPUCNT-3,1                         12  03801  B 03820 07508 1
          B      0&X1             BR BACK TO CHANNEL 1 ROUTINES 7 03813 J 000#0

*                TYPE PASS AND CHECK FOR EOJ

TYPASS    B      TYP                                       7  03820  J 01514
          DCW    @PASS@,G                                  4  03830
BA2SW2    NOP                                              1  03832  N
          BA2    *&1              RESET CH 2 INTERLOCK      7  03833  X 03840 GM
          BCE    START1,TAD3,1    REPEAT TEST              12  03840  B 02007 01003 1
          B      LOADER           CALL IN NEXT PROGRAM      7  03852  J 00400
*                                 *****
```

```
LABEL      OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

*                 TEST FOR OVERLAP ON CHANNEL 1

TSTOL1     SBR    X1              STORE ADDR FOR RETURN     7  03859  G 00029 B
BOL11  C   NOP                                     1  03866  N
       C   BOL1   CH1OIP          CONTINUE OVERLAP ROUTINES 7  03867  J 03996 1
       C   MLNA   X1,X4           SAVE ADDRESS             12  03874  D 00029 00044 /
           S      TWELVE,X4       SUB FOR ADDR OF I/O OP CODE 11 03886  S 07503 00044
           BCE    0&X1,0&X4,U     LEAVE IF IT WAS A UNIT CONTROL OP 12 03897 B 000*0 00*00 U
           S      FIVE,X4         SUB FOR ADDR OF I/O OP CODE 11 03909  S 07512 00044
           BCE    0&X1,TAD4,1     BACK TO CH 1 IF NOT USING OVERLAP 12 03920 B 000*0 01004 1
OLSW1  C   NOPWM                                   1  03932  N
       C   B      0&X1            BR TO CHAN 1 ROUTINES IF NO OLAP 7 03933 J 000*0
           BA1    0&X1            RETURN TO CHANNEL 1 ROUTINE  7  03940  R 000*0 G M
           MLCA   9&X4,OLOP1      SET INSTRUCTION IN ERROR MESSAGE 12 03947 D 00*09 03987 T
           B      TYP1                                7  03959  J 05489
       C   DCW    @NO BOL AFTR @  FAILED TO BR ON OLAP IN PROCESS 12 03977
OLOP1      DCW    @       @,G     INSTRUCTION ISSUED       10  03987
           B      0&X1            BR BACK TO CHANNEL 1 ROUTINES 7 03989 J 000*0

CH1OIP     SW     CH1SW           SET CHAN 1 IN USE SWITCH ON  6 03996 , 01640
       C   MLNA   X1,X4           SAVE ADDRESS             12  04002  D 00029 00044 /
           S      @17@,X4         SUB FOR ADDR OF I/O OP CODE 11 04014 S 07697 00044
CH2BR1 C   NOPWM                                   1  04025  N
       C   B      CPURTS          BR ON IF CHAN 2 NOT AVAILABLE 7 04026 J 03514
           BOL2   CPURTS          TO CPU ROUTINES          7  04033  J 03514 2
           B      0&X2            BR BACK TO CHANNEL 2 ROUTINES 7 04040 J 000*0
       C   DCW    @N      @       FILLER                   12  04058
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LABEL      OPCOD  OPERAND                                                    CT  ADDRS  INSTRUCTION

*                 TEST FOR OVERLAP ON CHANNEL 2

TSTOL2     SBR    X2                   STORE ADDR FOR RETURN                  7  04059  G 00034 B
BOL22   C  NOP                                                                1  04066  N
        C  BOL2   CH2OIP               CONTINUE OVERLAP ROUTINES              7  04067  J 04214 2
        C  MLNA   X2,X5                SAVE ADDRESS                          12  04074  D 00034 00049 /
           S      TWELVE,X5            SUB FOR ADDR OF I/O OP CODE           11  04086  S 07503 00049
           BCE    0&X2,0&X5,U          LEAVE IF IT WAS A UNIT CONTROL OP     12  04097  B 000.0 00‡‡0 U
           S      FIVE,X5              SUB FOR ADDR OF I/O OP CODE           11  04109  S 07512 00049
           BCE    0&X2,TAD4,1          BACK TO CH 2 IF NOT USING OVERLAP     12  04120  B 000.0 01004 1
OLSW2   C  NOPWM                                                              1  04132  N
        C  B      0&X2                 BR TO CH 2 ROUTINES IF NO OLAP         7  04133  J 000.0
           BA2    0&X2                 RETURN TO CHANNEL 2 ROUTINE            7  04140  X 000.0 G/M
           MLCA   9&X5,OLOP2           SET INSTRUCTION IN ERROR MESSAGE      12  04147  D 00‡‡9 04205 T
           BW     ERRON2,CH1SW         CH 2 ERR BUT CH 1 IN USE              12  04159  V 05214 01640 1
           CW     ERRSW2&1             CLEAR CH 2 ERROR PENDING SWITCH        6  04171  ¤ 02066
           B      TYP1                                                        7  04177  J 05489
        C  DCW    @NO BOL AFTR @       FAILED TO BR ON OLAP IN PROCESS       12  04195
OLOP2      DCW    @            @,G     INSTRUCTION ISSUED                    10  04205
           B      0&X2                 BR BACK TO CHANNEL 2 ROUTINES          7  04207  J 000.0

CH2OIP     SW     CH2SW                SET CHAN 1 IN USE SWITCH ON            6  04214  , 01641
        C  MLNA   X2,X5                SAVE ADDRESS                          12  04220  D 00034 00049 /
           S      @17@,X5              SUB FOR ADDR OF I/O OP CODE           11  04232  S 07697 00049
           BOL1   CPURTS               TO CPU ROUTINES                        7  04243  J 03514 1
           B      0&X1                 BR BACK TO CHANNEL 1 ROUTINES          7  04250  J 000‡0
        C  DCW    @N           @       FILLER                                12  04268
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LABEL      OPCOD  OPERAND                                              CT  ADDRS  INSTRUCTION

*                 TEST CHANNEL STATUS INDICATORS FOR EACH I/O UNIT
*                 SAVE NOT READY AND BUSY INDICATIONS
*                 PREPARE ERROR MESSAGE FOR TYPEOUT
*                                 CHANNEL 1

CKBA1      SBR    X1                STORE ADDR FOR RETURN               7  04269  G 00029 B
           BNR1   CK4NR1            CHECK FURTHER IF NOT READY          7  04276  R 04539 1
           BCB1   BZYON1            UNIT BUSY                           7  04283  R 04649 2
           SW     CH1SW             CHAN 1 READY - NOT READY SWITCH     6  04290  , 01640
NOBZY1     CW     BUSY1             NO LONGER BUSY                      6  04296  ¤ 01642
           CW     TP1BZY            SET TAPE UNIT NOT BUSY SWITCH       6  04302  ¤ 01643
                                                                                          G
           BA1    *&8                                                   7  04308  R 04322 M
           B      0&X1                                                  7  04315  J C00‡0

           MLCA   BLANKS,WHAT       BLANK RIGHT HALF OF ERROR MESSAGE  12  04322  D 07501 05268 T
           MLCA   4&X4,WHAT-5       SET I/O INSTRUCTION IN ERROR MSGE  12  04334  D 00‡04 05263 T
           BZN    *&13,4&X4,&       BR IF OP WAS BSP OR ERASE          12  04346  V 04370 00‡04 B
           MLCA   9&X4,WHAT         SET I/O INSTRUCTION IN ERROR MSGE  12  04358  D 00‡09 05268 T
           MLCS   CKBA1&7,BSP&5     SET OP CODE                        12  04370  D 04276 05432 3
           MLCS   CKBA1&7,SKP&5                                        12  04382  D 04276 05444 3
           MLCS   CKBA1&7,RWD&5                                        12  04394  D 04276 05475 3
           MLCA   ALLIND,INDSET     SET ALL STATUS INDICATORS IN MSGE  12  04406  D 07507 05276 T
           BNR1   *&13              NOT READY                           7  04418  R 04437 1
           MLCS   ABLANK,INDSET-5                                      12  04425  D 05269 05271 3
           BCB1   *&13              BUSY                                7  04437  R 04456 2
           MLCS   ABLANK,INDSET-4                                      12  04444  D 05269 05272 3
           BER1   *&13              DATA CHECK                          7  04456  R 04475 4
           MLCS   ABLANK,INDSET-3                                      12  04463  D 05269 05273 3
           BEF1   *&13              CONDITION                           7  04475  R 04494 8
           MLCS   ABLANK,INDSET-2                                      12  04482  D 05269 05274 3
           BWL1   *&13              WRONG LENGTH RECORD                 7  04494  R 04513 -
           MLCS   ABLANK,INDSET-1                                      12  04501  D 05269 05275 3
                                                                                          S
           BNT1   *&13              NO TRANSFER                         7  04513  R 04532 B
           MLCS   ABLANK,INDSET                                        12  04520  D 05269 05276 3
           B      ERRORT            TO ERROR ROUTINE                    7  04532  J 05238
```

```
LABEL     OPCOD  OPERAND                                  CT  ADDRS  INSTRUCTION
*                NOT READY ROUTINE- CHANNEL 1
CK4NR1    BCE    TAPES1,2&X4,B      TAPE CH 1             12  04539  B 04606 00+02 B
          BCE    TAPES1,2&X4,U                            12  04551  B 04606 00+02 U
          MLCS   2&X4,SXRC          SET UNIT SEL CHAR IN INDEX REG  12  04563  D 00+02 00094 3
          BBE    0&X7,RDYON1&SXRC,M THAT UNIT WAS NOT READY LAST TIME  12  04575  W 00+MQ 01F!.0 GM
          MLCS   2&X4,RDYON1&SXRC   SET UNIT NOT READY NOW   12  04587  D 00+02 01F!.0 3
          B      NOBZY1             RETURN TO TEST REST OF STATUS IND  7  04599  J 04296
TAPES1    MLCS   3&X4,SXRA          SET TAPE DRIVE NO IN INDEX REG  12  04606  D 00+03 00074 3
          BBE    0&X7,TDSCH1&SXRA,M THAT UNIT WAS NOT READY BEFORE  12  04618  W 00+MQ 010K0 GM
          MLNS   3&X4,TDSCH1&SXRA   SET TD NO NOT READY NOW  12  04630  D 00+03 010K0 1
          B      NOBZY1             RETURN TO TEST REST OF STATUS IND  7  04642  J 04296
BZYON1    BCE    TPBZY1,2&X4,B      TAPE UNIT BUSY        12  04649  B 04686 00+02 B
          BCE    TPBZY1,2&X4,U                            12  04661  B 04686 00+02 U
          SW     BUSY1              UNIT BUSY - NOT TAPE   6  04673  , 01642
          B      DOVER1                                   7  04679  J 04692
TPBZY1    SW     TP1BZY             SET TAPE UNIT BUSY SWITCH  6  04686  , 01643
DOVER1    MLNA   X4,X1              SET ADDR OF I/O INST IN CH 1 RT  12  04692  D 00044 00029 /
          BCE    CPURTS,SYS1&13,    BR IF NO CHAN 2 ON SYSTEM  12  04704  B 03514 01269
          BOL2   CPURTS             TO CPU ROUTINES        7  04716  J 03514 2
          B      0&X2               TO CHANNEL 2 ROUTINES  7  04723  J 000!.0
```

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION

*                TEST CHANNEL STATUS INDICATORS FOR EACH I/O UNIT
*                SAVE NOT READY AND BUSY INDICATIONS
*                PREPARE ERROR MESSAGE FOR TYPEOUT
*                              CHANNEL 2

CKBA2     SBR    X2             STORE ADDR FOR RETURN      7  04730  G 00034 B
          BNR2   CK4NR2         CHECK FURTHER IF NOT READY 7  04737  X 05018 1
          BCB2   BZYON2         UNIT BUSY                  7  04744  X 05152 2
          SW     CH2SW          CHAN 2 READY - NOT READY SWITCH
                                                          6  04751  , 01641
        C CW     BUSY2          NO LONGER BUSY             6  04757  ¤ 01644
          CW     TP2BZY         SET TAPE UNIT NOT BUSY SWITCH
                                                          6  04763  ¤ 01645
                                                          7  04769  X 04783 GM
THEBA2  C BA2    *&8
          B      0&X2           BR TO CH2                  7  04776  J 000.0

          BW     ERRON2,CH1SW   CH 2 ERR BUT CH 1 IN USE   12 04783  V 05214 01640 1
          CW     ERRSW2&1       CLEAR CH 2 ERROR PENDING SWITCH
                                                          6  04795  ¤ 02066
          MLCA   BLANKS,WHAT    BLANK RIGHT HALF OF ERROR MSGE
                                                          12 04801  D 07501 05268 T
          MLCA   4&X5,WHAT-5    SET I/O INSTRUCTION IN ERROR MSGE
                                                          12 04813  D 00**4 05263 T
          BZN    *&13,4&X5,&    BR IF OP WAS BSP OR ERASE  12 04825  V 04849 00**4 B
          MLCA   9&X5,WHAT      SET I/O INSTRUCTION IN ERROR MSGE
                                                          12 04837  D 00**9 05268 T
          MLCS   CKBA2&7,BSP&5  SET OP CODE                12 04849  D 04737 05432 3
          MLCS   CKBA2&7,SKP&5                            12 04861  D 04737 05444 3
          MLCS   CKBA2&7,RWD&5                            12 04873  D 04737 05475 3
          MLCA   ALLIND,INDSET  SET ALL STATUS INDICATORS IN MSGE
                                                          12 04885  D 07507 05276 T
          BNR2   *&13           NOT READY                  7  04897  X 04916 1
          MLCS   ABLANK,INDSET-5                          12 04904  D 05269 05271 3
          BCB2   *&13           BUSY                       7  04916  X 04935 2
          MLCS   ABLANK,INDSET-4                          12 04923  D 05269 05272 3
          BER2   *&13           DATA CHECK                 7  04935  X 04954 4
          MLCS   ABLANK,INDSET-3                          12 04942  D 05269 05273 3
          BEF2   *&13           CONDITION                  7  04954  X 04973 8
          MLCS   ABLANK,INDSET-2                          12 04961  D 05269 05274 3
          BWL2   *&13           WRONG LENGTH RECORD        7  04973  X 04992 -
          MLCS   ABLANK,INDSET-1                          12 04980  D 05269 05275 3
          BNT2   *&13           NO TRANSFER                7  04992  X 05011 SB
          MLCS   ABLANK,INDSET                            12 04999  D 05269 05276 3
          B      ERRORT         TO ERROR ROUTINE           7  05011  J 05238
```

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION
*                NOT READY ROUTINE- CHANNEL 2

CK4NR2    BCE    TAPES2,2&X5,B              12  05018  B 05097 00**2 B
          BCE    TAPES2,2&X5,U              12  05030  B 05097 00**2 U
          MLCS   2&X5,SXRD                  12  05042  D 00**2 00099 3
          BBE    0&X8,RDYON2&SXRD,M G       12  05054  W 00'00 01FA0 M G
        C BW     *&13,CH1SW                 12  05066  V 05090 01640 1
          MLCS   2&X5,RDYON2&SXRD           12  05078  D 00**2 01FA0 3
        C B      THE8A2                     7   05090  J 04769

TAPES2    MLCS   3&X5,SXRB                  12  05097  D 00**3 00079 3
          BBE    0&X8,TDSCH2&SXRB,M G       12  05109  W 00'00 010C0 M G
          BW     *&13,CH1SW                 12  05121  V 05145 01640 1
          MLNS   3&X5,TDSCH2&SXRB           12  05133  D 00**3 010C0 1
        C B      THE8A2                     7   05145  J 04769

BZYON2    BCE    TP8ZY2,2&X5,B              12  05152  B 05189 00**2 B
          BCE    TP8ZY2,2&X5,U              12  05164  B 05189 00**2 U
          SW     BUSY2                      6   05176  , 01644
          B      DOVER2                     7   05182  J 05195
TP8ZY2    SW     TP2BZY                     6   05189  , 01645
DOVER2    MLNA   X5,X2                      12  05195  D 00049 00034 /
          B      CPURTS                     7   05207  J 03514

ERRON2    SW     ERRSW2&1                   6   05214  , 02066
          S      @7@,X2                     11  05220  S 07698 00034
          B      0&X1                       7   05231  J 000*0
```

```
LABEL     OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

*                COMMON ERROR ROUTINE FOR BOTH CHANNELS
*                CHECK TADS FOR TYPING - HALT ON ERROR

ERRCBT    BCE    CK4HLT,TAD0,1      BR IF NOT TYPING          12  05230  B 05278 01000 1
          B      TYP                                          7  05250  J 01514
          DCW    =* @               * INDICATES ERROR MESSAGE 2  05258
                 = @                FAILING INSTRUCTION - OP CODE 1  05259
                 @   @              X CONTROL FIELD           3  05262
WHAT      DCW    @       @          B ADDRESS AND D MODIFIER  6  05268
ABLANK    DCW    @ @                                          1  05269
                 @ @                                          1  05270
INDSET    DCW    @       @,G        STATUS INDICATOR SET      6  05276
CK4HLT    BCE    *&8,TAD2,1         BR IF HALT ON ERROR IS ON 12  05278  B 05297 01002 1
          B      *&2                BR IF HALT ON ERROR IS NOT ON 7  05290  J 05298
          H                         STOP ON ERROR             1  05297  .
          BCE    NRDYXT,INDSET-5,1  USE ANOTHER RETURN IF NOT READY 12  05298  B 05384 05271 1
          BCE    TAPEOP,WHAT-7,B                              12  05310  B 05341 05261 B
          BCE    TAPEOP,WHAT-7,U                              12  05322  B 05341 05261 U
          B      ERRXIT                                       7  05334  J 05365
TAPEOP    BCE    BSPSKP,INDSET-3,4  DATA CHECK ERROR          12  05341  B 05403 05273 4
          BCE    REWIND,INDSET-2,8  END OF FILE               12  05353  B 05458 05274 8
ERRXIT    BBE    O&X2,WHAT-8,-      RETURN TO CHANNEL 2 ROUTINES 12  05365  W 000.0 05260 -
          B      O&X1               RETURN TO CHANNEL 1 ROUTINES 7  05377  J 000+0

NRDYXT    BBE    O&X8,WHAT-8,-      RETURN TO NEXT ROUTINE ON NOT RDY 12  05384  W 00.00 05260 -
          B      O&X7                                         7  05396  J 00+M0
```

```
LABEL     OPCOD  OPERAND                    CT  ADDRS  INSTRUCTION
BSPSKP    MLCA   WHAT-6,BSP&3               12  05403  D 05262 05430 T
          MLCA   WHAT-6,SKP&3               12  05415  D 05262 05442 T
BSP       BSP    10                         5  05427  U %U0 B
          BAI    *-11                       7  05432  R 05427 GM
SKP       SKP    10                         5  05439  U %U0 E
          BAI    *-11                       7  05444  R 05439 GM
          B      ERRXIT                     7  05451  J 05365

REWIND    MLCA   WHAT-6,RWD&3               12  05458  D 05262 05473 T
RWD       RWD    10                         5  05470  U %U0 R
          BAI    *-11                       7  05475  R 05470 GM
          B      ERRXIT                     7  05482  J 05365

          TYPING ROUTINE  TYP1

TYP1      SBR    TYP2&5          STORE MESSAGE ADDRESS   7  05489  G 05508 B
          SBR    TYP3&8          STORE MESSAGE ADDRESS   7  05496  G 05549 B
TYP2      SCNRG  0,0             FIND RETURN ADDRESS    12  05503  D 00000 00000 Q
          SAR    TYP4&5          SET ADDRESS FOR EXIT    7  05515  G 05582 A
          BCE    TYP4,TAD0,1     BYPASS TYPING PER TAD 0 12  05522  B 05577 01000 1
          BAI    *&1                  RESET CH1 INTERLOCK 7  05534  R 05541 GM
TYP3      WCP    0               TYPE MESSAGE           10  05541  M %T0 00000 W
          BCB1   TYP3            TRY AGAIN IF BUSY       7  05551  R 05541 2
          BAI    *&1             RESET INTERLOCK         7  05558  R 05565 GM
          BCE    *&8,TAD2,1       BR TO HALT            12  05565  B 05584 01002 1
TYP4      B      0               RETURN TO MASTER PROGRAM 7 05577  J 00000
          H      *-12                                    6  05584  . 05577
```

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LABEL     OPCOD  OPERAND                          CT  ADDRS  INSTRUCTION

*                CHECK ON CHANNEL OPERATION IN BETWEEN EACH CPU
*                SUBROUTINE. KEEP CHANNELS IN OPERATION.

CKCHNS    SBR    X6                 ADDR OF RETURN TO NEXT CPU RT  7  05590  G 00054 B
          BCE    CPUOUT,TAD4,1      BR IF NOT USING OVERLAP       12  05597  B 05720 01004 1
          BCE    CPUOUT,SYS1&7,     BR IF OVERLAP NOT ON SYSTEM   12  05609  B 05720 01263
          BCE    CKONOL,TAD5,1      BR IF NOT USING PRIORITY      12  05621  B 05713 01005 1
          BCE    CKONOL,SYS1&8,     BR IF PRIORITY NOT ON SYSTEM  12  05633  B 05713 01264
CKBZY1    SW     BEPASW&1           RESET SWITCH FOR ALERT MODE    6  05645  , 03544
          BW     CPUOUT,BUSY1       LEAVE IF CHAN 1 WAS BUSY      12  05651  V 05720 01642 1
          BW     CPUOUT,TP1BZY      LEAVE IF CH 1 TAPE WAS BUSY   12  05663  V 05720 01643 1
          BW     CPUEND,BUSY2       LEAVE IF CHAN 2 WAS BUSY      12  05675  V 05749 01644 1
          BW     CPUEND,TP2BZY      LEAVE IF CH 2 TAPE WAS BUSY   12  05687  V 05749 01645 1
          BNQ    CPUOUT             LEAVE ON INQUIRY BY WAY OF CPUXIT  7  05699  J 05720 Q
          B      0&X6               BACK TO CPU ROUTINES           7  05706  J 00*.0

CKONOL C  BOL1   CH2BR2                                          7  05713  J 05734 1
CPUOUT    B      CPUXIT             TO CPU EXIT ROUTINE           7  05720  J 05763
          B      0&X1               BR BACK TO CHANNEL 1 ROUTINES  7  05727  J 000*0

CH2BR2 C  NOPWM                                                  1  05734  N
       C  B      CPUOUT             BR IF CHAN 2 NOT AVAILABLE    7  05735  J 05720
          BOL2   0&X6               RETURN TO CPU ROUTINES        7  05742  J 00*.0 2
CPUEND    B      CPUXIT             LEAVE BY WAY OF CPU EXIT      7  05749  J 05763
          B      0&X2               BR BACK TO CHANNEL 2 ROUTINES  7  05756  J 000.0

CPUXIT    SBR    CPUOVR&5                                         7  05763  G 05795 B
BXPA1     NOP                                                     1  05770  N
          BXPA   *&1                EXIT PRIORITY ALERT MODE      7  05771  Y 05778 X
          MLNA   X6,X3              SET CPU RT EXIT IN CPU RT INDXREG  12  05778  D 00054 00039 /
CPUOVR    B      0                  RETURN FROM WHENCE YOU CAME   7  05790  J 00000
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```
LABEL     OPCOD  OPERAND                                                  CT  ADDRS  INSTRUCTION
INTRPT    SBR    X3                STORE ADDR OF INTERRUPT                 7  05797  G 00039 B
          B      PRIORT            GO TO PRIORITY ROUTINE                  7  05804  J 05812
          DCW    @M@               INTERRUPT ROUTINE IS MOVED TO 101       1  05811

*                PRIORITY ROUTINE

PRIORT    SW     STOREO            TEST AND STORE CPU STATUS               6  05812  , 05946
          SW                                                               1  05818  ,
          SW                                                               1  05819  ,
          BZ     *&7               BR IF ZERO BALANCE IS ON                7  05820  J 05833 V
          CW     STOREO                                                    6  05827  ¤ 05946
          BE     TSTINT            BR IF EQUAL INDUCATOR IS ON             7  05833  J 05859 S
          CW     STOREQ                                                    6  05840  ¤ 05945
          BL     TSTINT            BR IF LOW  INDUCATOR IS ON              7  05846  J 05859 T
          CW     STORLO                                                    6  05853  ¤ 05944
TSTINT    S      @6@,X3            SET X3 BACK TO START OF OPERATION       11 05859  S 07699 00039
          BOPR1  0&X1              BACK TO CH 1 ROUTINE                    7  05870  Y 000*0 1
          BUPR1  0&X1              BACK TO CH 1 ROUTINE                    7  05877  Y 000*0 U
BOPR2     NOP                                                              1  05884  N
          BOPR2  0&X2              BACK TO CH 2 ROUTINE                    7  05885  Y 000'0 2
BUPR2     NOPWM                                                            1  05892  N
          BUPR2  0&X2              BACK TO CH 2 ROUTINE                    7  05893  Y 000'0 F
          BIPR   INTXIT            BRANCH ON AN INQUIRY PRIORITY REQ       7  05900  Y 05929 Q
          BA1    *&1               RESET CHANNEL 1 INTERLOCK               7  05907  R 05914 GM
BA2SW3    NOP                                                              1  05914  N
          BA2    *&1               RESET CHANNEL 2 INTERLOCK               7  05915  X 05922 GM
          B      INTERR            UNKNOWN INTERRUPT                       7  05922  J 01115

INTXIT    CW     BEPASW&1          DONT  ENTER CPU ROUTINES IN ALERT       6  05929  ¤ 03544
          B      CPURTS            TO CPU ROUTINES                         7  05935  J 03514

          DCW    @11@                                                      2  05943
STORLO           @0@                                                      1  05944
STOREQ           @1@                                                      1  05945
STOREO           @0@                                                      1  05946
```

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LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

                 INITIALIZATION-DONE 1ST PASS ONLY

SETUP     CS     199                                               6  05947  / 00199
          CS                          DOWN TO 0                    1  05953  /
          MRCW   START,1              SET UP RESET RESTART BRANCH  12  05954  D 02000 00001 TM
          MRCW                                                     1  05966  D
          SW     X1-4,X15-4           SET WMS IN INDEX REGS        11  05967  , 00025 00095
          MLWB   X15-4,X14-4           ALL THE WAY                 12  05978  D 00095 00090 M
          B      TYP                                               7  05990  J 01514
        C DCW    @ST03C@,G                                         5  06001
          MLCA   COLSEQ,END1          LOAD COL SEQ INTO WRITE WORK AREA 12 06003 D 07496 06831 T
          MLCB   END1,END1-64         FILL IT UP                  12  06015  D 06831 06767 L
          MLCA   COLSEQ,END2          LOAD COL SEQ INTO WRITE WORK AREA 12 06027 D 07496 07031 T
          MLCB   END2,END2-64         FILL IT UP                  12  06039  D 07031 06967 L
          CW     WAREA1&1                                          6  06051  ¤ 06701
          SAR    WRITE1               INDEX REG- ADDR OF PRINT AREA 1  7  06057  G 00084 A
          BCE    *&14,SYS1&3,2        CHECK FOR 132 CHARACTER BUFFER 12 06064 B 06089 01259 2
          CW     WAREA1&33                                         6  06076  ¤ 06733
          SAR    WRITE1               INDEX REG- ADDR OF PRINT AREA1  7  06082  G 00084 A
          CW     WAREA2&1                                          6  06089  ¤ 06901
          SAR    WRITE2                                            7  06095  G 00089 A
          BCE    *&14,SYS1&4,2        CHECK FOR 132 CHARACTER BUFFER 12 06102 B 06127 01260 2
          CW     WAREA2&33                                         6  06114  ¤ 06933
          SAR    WRITE2                                            7  06120  G 00089 A
          MRCWG  INTRPT,101           SET UP INTERRUPT ROUTINE    12  06127  D 05797 00101 DL
        C BCE    DUMYR2,SYS1&13,1     BR IF CHAN 2 AVAILABLE      12  06139  B 06186 01269 1
          CW     BA2SW1&1,BA2SW2&1    BA2 SAFE TO ISSUE           11  06151  ¤ 01015 03833
          CW     BA2SW3&1                                          6  06162  ¤ 05915
        C SW     CH2BR1&1,CH2BR2&1    TURN ON  BR TO CH 2 ROUTINES 11 06168  , 04026 05735
        C B      CK4OL                                             7  06179  J 06221
DUMYR2    R2     0,RAREA2             DUMMY READ TO TURN OFF READER EOF 10 06186 M ¤10 07352 RG
          BA2    *&1                                               7  06196  X 06203 M
          BCE    *&7,SYS1&9,          CHECK FOR PRIORITY EXT FEATURE 12 06203 B 06221 01265
          SW     BUPR2&1              CH 2 UNIT RECORD INTERRUPT    6  06215  , 05893
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LABEL       OPCOD  OPERAND                                                        CT  ADDRS  INSTRUCTION

CK4OL   C   BCE    CK4PRI,SYS1&7,1      BR TO CK FOR PRI IF OVERLAP AVAIL         12  06221  B 06266 01263 1
            CW     BOL21&1,BOPR2&1      DO NOT USE INSTRUCTIONS                   11  06233  ¤ 02317 05885
        C   CW     BOL11&1,BOL22&1      SET CHAN 1 & CHAN 2 BR OLAP OFF           11  06244  ¤ 03867 04067
        C   SW     OLSW1&1,OLSW2&1      SET TO BR - NO OVERLAP AVAILABLE          11  06255  , 03933 04133
CK4PRI      BCE    *&18,SYS1&8,1        BR IF PRIORITY ON SYSTEM                  12  06266  B 06295 01264 1
            CW     BXPA1&1,BXPA2&1                                                11  06278  ¤ 05771 03723
            CW     BEPASW&1             DO NOT ENTER ALERT MODE                    6  06289  ¤ 03544
            R      0,RAREA1             DUMMY READ TO TURN OFF READER EOF         10  06295  M %10 07152 R
                                                                                                     G
            BA1    *&1                                                             7  06305  R 06312 M
            S      SXRC                 ZERO INDEX REG USED FOR COUNTER            6  06312  S 00094
            S      SXRD                 ZERO INDEX REG USED FOR COUNTER            6  06318  S 00099
            CW     TP1BZY,TP2BZY        CLEAR TAPE BUSY SWITCHES                  11  06324  ¤ 01643 01645
            CW     ERRSW2&1             TURN OFF CH 2 ERROR SWITCH                 6  06335  ¤ 02066
```

```
LABEL      OPCOD  OPERAND                                               CT  ADDRS  INSTRUCTION

*                 SET UP TO ALTER FOR CHANNEL 1 UNOVERLAP

ALT4OP     B      I-A-R               ROUTINE TO SET I/O INSTS            7  06341  J 01403
           DCW    PTAPE2              ADDR TO START SCAN TO ALTER         5  06352  03060
                  PTAPE1              ADDR TO STOP  SCAN TO ALTER         5  06357  02606
           DC     @%@                 I/O SPECIFIC MODE CHARACTER -X1     1  06358

*                 SET UP TO ALTER FOR CHANNEL 2 UNOVERLAP

           B      I-A-R               ROUTINE TO SET I/O INSTS            7  06359  J 01403
           DCW    CPURTS              ADDR TO START SCAN TO ALTER         5  06370  03514
           DCW    PTAPE2              ADDR TO STOP  SCAN TO ALTER         5  06375  03060
           DCW    @¤@                                                     1  06376

           BCE    *&8,SYS1&7,1        CHECK SYS CARD FOR OVERLAP         12  06377  B 06396 01263 1
           B      CK4RDY                                                  7  06389  J 06444
           BCE    CK4RDY,TAD4,1       TAD SET FOR UNOVERLAP OPERATION    12  06396  B 06444 01004 1

*                 SET UP TO ALTER FOR CHANNEL 1 OVERLAP

           B      I-A-R               ROUTINE TO SET I/O INSTS            7  06408  J 01403
           DCW    PTAPE2              ADDR TO START SCAN TO ALTER         5  06419  03060
                  PTAPE1              ADDR TO STOP  SCAN TO ALTER         5  06424  02606
           DC     @@@                 I/O SPECIFIC MODE CHARACTER -X1     1  06425

*                 SET UP TO ALTER FOR CHANNEL 2 OVERLAP

           B      I-A-R               ROUTINE TO SET I/O INSTS            7  06426  J 01403
           DCW    CPURTS              ADDR TO START SCAN TO ALTER         5  06437  03514
           DCW    PTAPE2              ADDR TO STOP  SCAN TO ALTER         5  06442  03060
           DCW    @*@                                                     1  06443
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LABEL      OPCOD  OPERAND                  CT  ADDRS  INSTRUCTION

CK4RDY C   BCE    *&8,CHN1&2,1             12  06444  B 06463 01291 1
       C   B      CK4CH2                    7  06456  J 06554
       C   S      SXRA                      6  06463  S 00074
SETNR1     MLNS   SXRA,TDSCH1&SXRA         12  06469  D 00074 010K0 1
NXTON1     A      *-10,SXRA                11  06481  A 06481 00074
           BCE    CK4CH2,SXRA,0            12  06492  B 06554 00074 0
           MLNS   SXRA,*&4                 12  06504  D 00074 06519 1
           RWD    10                        5  06516  U %U0 R
           BNR1   SETNR1                    7  06521  R 06469 1G
           BA1    *-18                      7  06528  R 06516 M
           MLCS   ABLANK,TDSCH1&SXRA       12  06535  D 05269 010K0 3
           B      NXTON1                    7  06547  J 06481

CK4CH2 C   BCE    *&8,CHN2&2,1             12  06554  B 06573 01348 1
       C   B      WAITSW                    7  06566  J 06664

           S      SXRB                      6  06573  S 00079
SETNR2     MLNS   SXRB,TDSCH2&SXRB          12  06579  D 00079 010C0 1
NXTON2     A      *-10,SXRB                11  06591  A 06591 00079
       C   BCE    WAITSW,SXRB,0            12  06602  B 06664 00079 0
           MLNS   SXRB,*&4                 12  06614  D 00079 06629 1
           RWD    20                        5  06626  U ¤U0 R
           BNR2   SETNR2                    7  06631  X 06579 1G
           BA2    *-18                      7  06638  X 06626 M
           MLCS   ABLANK,TDSCH2&SXRB       12  06645  D 05269 010C0 3
           B      NXTON2                    7  06657  J 06591

WAITSW C   NOPWM                            1  06664  N
       C   B      SETOFF                    7  06665  J 06685
       C   SW     WAITSW&1                  6  06672  , 06665
       C   B      CK4RDY                    7  06678  J 06444

SETOFF C   CW     WAITSW&1                  6  06685  ¤ 06665
      **** B      START1                    7  06691  J 02007
           H                                1  06698  *
```

DEFINE PRECEDING BRANCH LENGTH

RETURN TO START OF TEST ****

GO SEE IF DRIVES ARE REWOUND YET

TURN ON WAIT SWITCH

GO TURN WAIT SW OFF

TURN OFF WAIT SWITCH

SET TO WAIT FOR TAPES TO REWIND

BR IF TAPE ON CHAN 2

SET DRIVE READY

TRY NEXT DRIVE NUMBER

SET DRIVE NOT READY

SET DRIVE NUMBER IN REWIND

READY-NOT READY TABLE COMPLETE

ADD 1 TO COUNTER

SET DRIVE NO IN TAPE TABLE

ZERO INDEX REG USED FOR COUNTER

CHECK CHAN 2

BR IF TAPE ON CHAN 1

```
LABEL     OPCOD  OPERAND                                          CT  ADDRS  INSTRUCTION

*                OUTPUT AREAS

          ORG    *&X00                                                06700
          ORG    *-1            STEP BACK ONE                         06699
          DA     1X133,G        WRITE AREA                            06699
                 1,1                                                  06699
WAREA1           2              START OF WRITE AREA                   06700
END1             133            END   OF WRITE AREA                   06831

          ORG    *&X00                                                06900
          ORG    *-1            STEP BACK ONE                         06899
          DA     1X133,G                                              06899
                 1,1                                                  06899
WAREA2           2              START OF WRITE AREA                   06900
END2             133            END   OF WRITE AREA                   07031

PAREA1    EQU    END1-79        PUNCH AREA CH1
PAREA2    EQU    END2-79        PUNCH AREA CH2

*                INPUT  AREAS

          ORG    *&X00                                                07100
TAREA1    DA     1X132,G        READ AREA FOR TAPE CH 1               07100

          ORG    *&X00                                                07300
TAREA2    DA     1X132,G        READ AREA FOR TAPE CH 2               07300

RAREA1    EQU    TAREA1&52      READ AREA CH 1-CARDS & PAPER TAPE
RAREA2    EQU    TAREA2&52      READ AREA CH 2-CARDS & PAPER TAPE
```

```
LABEL     OPCOD  OPERAND                                                  CT  ADDRS  INSTRUCTION

*                CONSTANTS AND DATA

FIVE      EQU    MULT1-15
TWELVE    EQU    ALLIND-4
          DCW    @ .□BTM&$*B,L-/,%SSM8#@.TMMABCDEFGHI.JKLMNOPQR*STUV@     50  07482
COLSEQ    DC     @WXYZ01234567890                                         14  07496
BLANKS    DCW    @     @           FIVE BLANKS                            5  07501
ALLIND    DCW    @12488A@          ALL STATUS INDICATORS                  6  07507
CPUCNT    DCW    0000              PASSES THRU CPU ROUTINES               4  07511

MULT1             @54EDNMVU.@S%B*B□@                                       16  07527
MULT2             @9999999999999991@                                       16  07543
PRODCT            @0545454545454545345454545454545F@                       33  07576
MULFLD            @                                 @                      33  07609
DIV1              @12345678898888888990                                    20  07629
DIV2              @123456789M@                                             10  07639
DIV3              @000000000099999999910012345678I@                        31  07670
BAR       DCW     @     @           STORE B ADDRESS REGISTER               5  07675
CTLFLD            @    @            EDIT CONTROL FIELD                     4  07679
BAROK             CTLFLD-4          CORRECT B ADDR AT END OF EDIT          5  07684  07675
          PST
          END     2000                                                                J02000
                  @ *$0@                                                   4  07688
                  @6.0@                                                    3  07691
                  @$6.0@                                                   4  07695
                  @17@                                                     2  07697
                  @7@                                                      1  07698
                  @6@                                                      1  07699

                                  END OF ASSEMBLY
```