Model 750-IPC

Foreground/Background Interface

282-T06-2L1-01

REVISION HISTORY		
ECO #	DATE	DESCRIPTION
0328	6/28/84	New ZETACO Cover

TABLE OF CONTENTS

1.0 INTRODUCTION

The 750-IPC Controller is a single board controller whose function is to expedite the transition between RDOS Foreground and Background.

Features of the 750-IPC include:

1) Selection of any Even, Odd Device Code Pair (i.e. 2,3 or 40,41 or 76,77).

2) Selection of any Mask Bits (Data 0 thru Data 15).

The controller occupies one slot in the CPU chassis.

2.0 INSTALLATION INSTRUCTIONS

2.1 UNPACKING

Upon receiving the Interface Package, unpack the contents and inspect the board for visual damage. The package contains:

1) Controller Board
2) Manual
3) Diagnostic Tape

If any damage is apparent, do not attempt to install the controller but notify the Shipper and Custom Systems immediately.

2.2 BOARD INSTALLATION

The controller board may be installed in any General I/O, Memory I/O or I/O Only slot of the Data General Nova or Eclipse Minicomputer.

Verify the Device Code and Mask Bit selection are correct (these are Switch Selectable).

Install the controller in the desired slot, component side up and lock into position with the release levers.

If with the selection of the I/O slot, a vacant slot or slots exist between the controller and the board below it, the DCHP (Data Channel Priority) and the INTP (Interrupt Priority) signals must be physically jumpered on the computer backpanel to maintain priority interrupt continuity. Install one end of a wire-wrap jumper to the DCHP-OUT signal at Pin 93 at the "A" connector occupied by the device below the controller. Connect the remaining end to the DCHP-IN signal at Pin 94 of the "A" connector occupied by the controller, bridging the vacant slot or slots. Similarly, connect the INTP-OUT signal (Pin A-95) from the lower device to the INTP-IN signal at Pin A-96 of the controller. This will complete the priority interrupt continuity to the card. If vacant slots exist between the controller and the device above the controller, perform similar strapping of the DCHP and INTP signals to maintain interrupt priority.

CAUTION: Be sure NO existing cabling or devices are connected to the backplane of the slot the 750-IPC is to be installed in.

3.0 CONFIGURATION (OPTIONS)

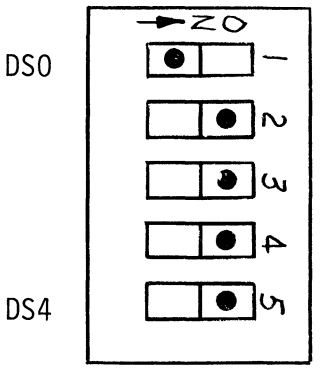
3.1 DEVICE CODE SELECTION

The five position switch at location D2 selects the Even Device Code of the required Even-Odd, Device Code Pair. Use the Table to set the desired Device Code.

DEVICE CODE TABLE

DEVICE CODE	(DS0) S1	(DS1) S2	(DS2) S3	(DS3) S4	(DS4) S5
0X	ON	ON	ON	-	-
1X	ON	ON	OFF	-	-
2X	ON	OFF	ON	-	-
3X	ON	OFF	OFF	-	-
4X	OFF	ON	ON	-	-
5X	OFF	ON	OFF	-	-
6X	OFF	OFF	ON	-	-
7X	OFF	OFF	OFF	-	-
X(0 & 1)	-	-	-	ON	ON
X(2 & 3)	-	-	-	ON	OFF
X(4 & 5)	-	-	-	OFF	ON
X(6 & 7)	-	-	-	OFF	OFF

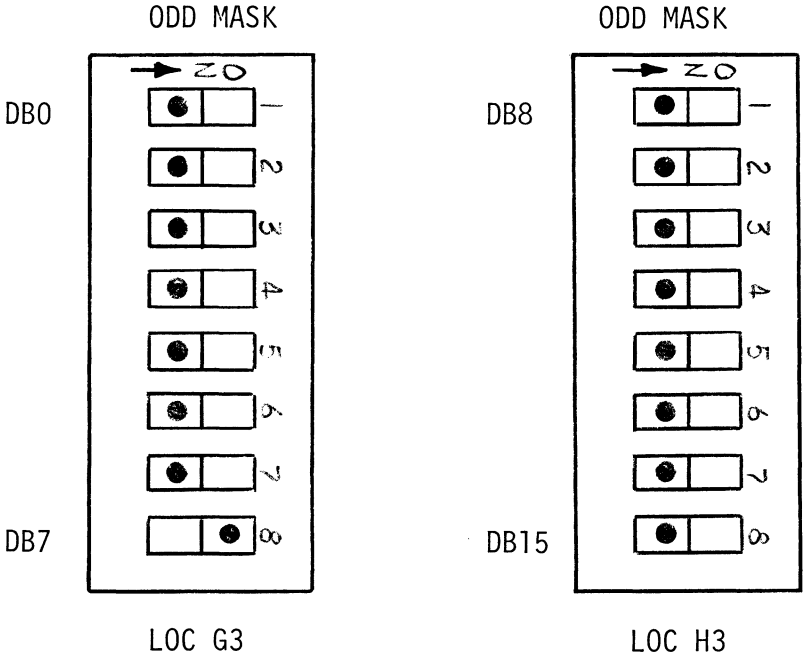
- = Don't Care



Switch is shown with Position 2, 3, 4 and 5 ON which equals Device Code Selection of 40, 41.

3.2 MASK BIT SELECTION

Switches at Location J3 and K3 select 1 of the 16 possible Mask Bits associated with the Even Device Code and switches at Locations G3 and H3 select 1 of the 16 possible Mask Bits associated with the Odd Device Code. Only one switch position can be ON for the J3, K3 Mask Bit Select Switches, and only one switch position can be ON for the G3, H3 Mask Bit Select Switches. See drawing for further definition.



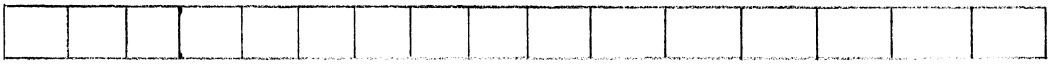
DB0 = Data Bit 0, DB15 = Data Bit 15
Mask Bit 7 shown selected

4.0 PROGRAMMING NOTES

The Model 750 Inter-Program Communications Device is used with Data General RDOS to provide a software controlled signal between the foreground and background partitions for the purpose of indicating without delay the completion of any task.

The Device is an I/O Interrupt Generating Device. The Start Command initiates the interrupt sequence, and the Clear Command clears the interrupt. The following Instruction Formats explain the Commands and what results are achieved.

.DOA XX Load Register (Even or Odd Device Code)



Load Bits 0 to 15 into Load Register

.DIA XX Read Register (Even or Odd Device Code)

Read Bits 0 to 15 from Register. DIA reads what DOA Command stored in the Register.

.START (ODD DEVICE CODE)

a) Sets Odd Done F/F
b) Sets Odd INTR F/F
c) Sets INTR F/F if not Masked

An INTA Command returns Bits 10 thru 15 (Device Code) of the Interrupting Device, initiated by the Start Command.

.START (EVEN DEVICE CODE)

a) Sets the Even Busy F/F
b) Sets the Even INTR F/F
c) Sets the INTR F/F if not Masked

An INTA Command returns Bits 10 thru 15 (Device Code) of the Interrupting Device, initiated by the Start Command.

.CLEAR (ODD DEVICE CODE)

a) Clears Odd Done F/F
b) Clears Odd INTR F/F

.CLEAR (EVEN DEVICE CODE)

a) Clears Even Busy F/F
b) Clears Even INTR F/F

.PULSE (ODD DEVICE CODE)

a) Clears Odd Done F/F

.PULSE (EVEN DEVICE CODE)

a) Clears Even Busy F/F

.DOC (ODD DEVICE CODE)

a) Clears Odd INTR F/F

.DOC (EVEN DEVICE CODE)

a) Clears Even INTR F/F

.IORST

a) Clears Odd, Even Mask F/F
b) Clears Odd Done F/F, Even Busy F/F
c) Clears Odd INTR F/F, Even INTR F/F

5.0 SPECIFICATIONS

Power Requirements -

Power is supplied by the minicomputer power supplies.

The board requires only +5 Volt DC.

+5 VDC Current = 1 Amp

Environmental -

Operating Temperature	10 C to 40 C degrees
Operating Humidity	10% to 90% Non-condensing
Non-Operating Temperature	-40 C to 55 C degrees
Non-Operating Humidity	10% to 90%

6.0 DIAGNOSTICS

A diagnostic tape is provided with the 750-IPC which contains Stand-Alone Diagnostics to test the controller board.

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Please give us your comments.

Please use this form to send us your comments regarding this Technical Manual. Your input is greatly appreciated! Problems will be promptly addressed and action taken as necessary. If you wish a written reply, please furnish your name and mailing address. Thank you.

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TECHNICAL MANUAL TITLE_____

DOCUMENT NUMBER_____REVISION_____

ERRORS IN MANUAL:

SUGGESTIONS FOR IMPROVING EITHER THE MANUAL OR THE PRODUCT:

NO POSTAGE
NECESSARY
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IN THE
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POSTAGE WILL BE PAID BY ADDRESSEE

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6850 Shady Oak Road
Eden Prairie, MN 55344

```
 0001  FBDIA    AOS ASSEMBLER REV 04.20         10:02:49 01/10/84
01               ;
02               ;
03               ;
04               ;*****************************************************************
05               ;
06               ;
07               ; DESCRIPTION:  DIAGNOSTIC PROGRAM FOR AOS FOREGROUND/BACKGROUND
08               ;               COMMUNICATION BOARD
09               ;
10               ; CUSTOM SYSTEMS INC. 1984
11               ;*****************************************************************
                         .TITL   FBDIAG
13       000001          .DUSR   X=1
14               ;1.     PROGRAM NAME FBDIAG.SR
15               ;
16               ;2. REVISION HISTORY
17               ;
18               ;       REV.      DATE
19               ;        00     01/09/84
20               ;
21               ;3.     MACHINE REQUIREMENTS:
22               ;3.1     NOVA/ECLIPSE FAMILY PROCESSOR
23               ;3.2     MODEL 750 FOREGROUND/BACKGROUND BOARD
24               ;3.2     CONSOLE DEVICE
25               ;
26               ;4.      SUMMARY
27               ;        THE FOREGROUND/BACKGROUND BOARD DIAGNOSTIC PERFORMS A GATE BY
28               ;        GATE TEST OF THE BOARD. THE DIAGNOSTIC TESTS THE SETTING AND
29               ;        CLEARING OF THE DONE, BUSY, GOO INTR, EVEN INTR, AND INTR FF'S.
30               ;        IT ALSO TESTS BOTH DATA REGISTERS FOR ALL DATA PATTERNS.
31               ;
```

```
 0002  PSDIA
01       000060          NOMMC  0
02              ;5.      DEBUGGER MAY BE ENTERED VIA 'D'
03              ;           OR PROGRAM TERMINATION
04              ;
05              ;6.      SWITCHES:
06                       S%WPD 6.1
07              ;
08              ;
09              ;7.      CONTROL CHARACTERS:
10              ;        CNTRL R - RESTART PROGRAM. SWITCHES MAINTAINED.
11              ;        CNTRL D - RESTART PROGRAM. SWITCHES RE-INITIALIZED.
12              ;        CNTRL O - SEND PROGRAM TO UCTRL DEBUGGER.
13
14                       .MACRO TMESS
15                       LDA     %.0!SWP%EG
16                       LDA     1,040
17                       AND#    0,1,SZR         ;SW1 A ON
18                       JMP      +4             ;YES, ALWAYS PRINT
19                       LDA     0,PAS%S
20                       MOV#    0,0,SZR         ;FIRST PASS
21                       JMP      +3             ;NO, DON'T PRINT
22                       JSR     @IME%S
23                       ^1
24              %
25       000012          1=10.
26
27       000000           LOC    0
28 00000 000000 LOC0:    0
29 00001 000400 LOC1:    0               ;IDUMM
30 00002 000200          DTO%SB
31 00003 002002          JMP     @.-1
32 00004 000000          0
33 00005 000000          0
34 00006 002600          IDUMM:  JMP     @@
35
36       000040          .LOC    40
37       000045          .LOC    45
38 00045 001760          EOS%
39       000050          .LOC    50
40 00050 000010          .BLK    10
41 00060 000004          .BLF    4
42
43 00064 061180 %DOAS:   DOA%    0,0     ;LOADS ACO INTO DATA REG AND SETS DONE OR BUSY AND INTR FF'S
44 00065 061600 %OUA0:   DOA     0,0     ;LOADS ACO INTO DATA REG
45 00066 064600 %D1AC:   D1AC    1,0     ;LOADS DATA REG INTO AC1 AND CLEARS DONE OR BUSY AND INTR FF'S
46 00067 064400 %D1A1:   D1A     1,0     ;LOADS DATA REG INTO AC1
47 00070 063000 %DOC0:   DOC     0,0     ;CLEARS INTR FF DOES NOT AFFECT DONE OR BUSY FF'S
48 00071 063500 %SKP2:   SKPBZ   0       ;SKPBZ INSTR. FOR TESTING EVEN CODE
49 00072 063400 %SKPN:   SKPBN   0       ;SKPBN INSTR. FOR TESTING EVEN CODE
50 00073 063700 %SKD2:   SKPDZ   0       ;SKPDZ INSTR. FOR TESTING ODD CODE
51 00074 063600 %SKDN:   SKPDN   0       ;SKPDN INSTR. FOR TESTING ODD CODE
52 00075 060100 %NIOS:   NIOS    0       ;NIOS INSTR. START SETS DONE OR BUSY AND INTR FF'S
53 00076 060300 %NIOP:   NIOP    0       ;NIOP INTR. CLEARS DONE OR BUSY FF DOES NOT AFFECT INTR FF'S
54 00077 060200 %NIOC:   NIOC    0       ;NIOC INTR. CLEARS DONE OR BUSY AND INTR FF'S
55 00100 000000 DC1:     0               ;DEVICE CODE OF BOARD
56 00101 000000 DC2:     0               ;DEVICE CODE OF OTHER GROUND
57 00102 000000 %STDC:   0               ;DEVICE CODE CURRENTLY BEING TESTED
58 00103 000000 MASKE:   0               ;MASK BIT FOR EVEN ADDRESS
59 00104 000000 MASKO.   0               ;MASK BIT FOR ODD ADDRESS
60 00105 000606  IDUMM. IDUMM
```

```
 0003  PRINT
04
02 00106 003331 MULT:   MUL?
03 00107 003511 DIVD:   DIV?
04 00110 002310 OUTLN:  PC??    ;LOCATION OF 4 SPACES AFTER NUMBER OUTPUT
05
06 00111 000000 DATA:   0       ;WRITE DATA
07 00112 000000 DATA0:  0
08 00113 000001 DATA1:  1
09 00114 000000 CHNG:   0
10 00115 000000 TEM:    0
11              ;HLORESSES
12
13              P?GRU   BBG1,K,J,1,200,?0000,1
14
15 00233 003167 IOD1?:  UD1?J
16 00234 000200 RES?T:  JMP     200
17
18
19 00235 000000 IOM?0:  0
20 00236 002?7? IT1D:   ?11D
21 00237 002143 IT??:   ?11?
22 00240 002645 ITTA:   T1N?H
23       006231 LOOP%=  JSR@    ICY?C           ;DELAYED LOOP
24       006230 EHALT=JSR@      IERR?
25       000401 NOP=401
26 00241 000003 C2:     3
27 00242 000004 C4:     4
28 00243 000005 C5:     5
29 00244 000011 C9:     9
30 00245 000040 C40:    40
31 00246 000076 C76:    76
32 00247 000144 C144:   144
33 00250 070000 C70K:   70000
34 00251 100000 C100K:  100000
35 00252 177774 CM4:    -4
36 00253 177767 CM9 :   -9
37 00254 177400 CM256.: -256.
38 00255 177000 CM512.: -512
39       000500         .LOC    500
40
41
```

```
'0004  FBD1A
01
02                ;=============================================================
03                ;MAIN PROGRAM CODE
04                ;=============================================================
05
06       000000             .NOMAC  0                   ;ALWAYS SHOW OUR STUFF
07
08                BEG1:
09                           DMESS   DIRT                ;TITLE MESSAGE
10 00500 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
11 00501 004773              DIRT                        ;ADDR. OF MESSAGE
12                           DMESS   MSLOR               ;LF,CR
13 00502 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
14 00503 003766              MSLOR                       ;ADDR. OF MESSAGE
15                DEV1:
16                           DMESS   MS002
17 00504 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
18 00505 004052              MS002                       ;ADDR. OF MESSAGE
19 00506 006237              JSR     @1TT1               ;GET DEVICE CODE FOR BOARD
20 00507 000775              JMP     DEV1                ;TRY AGAIN IF END
21 00510 125220              MOV2R   1,1
22 00511 125120              MOV2L   1,1                 ;MAKE IT AN EVEN DEVICE CODE
23 00512 044100              STA     1,DC1
24 00513 131400              INC     1,2                 ;OTHER DEVICE CODE IS ONE GREATER
25 00514 050101              STA     2,DC2
26                           DMESS   MS004
27 00515 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
28 00516 004130              MS004                       ;ADDR. OF MESSAGE
29 00517 024100              LDA     1,DC1               ;DISPLAY DEVICE CODE 1
30 00520 006222              JSR     @1ZOC?1
31 00521 044102              STA     1,TS1DC             ;TEST DEVICE CODE 1 FIRST
32                           DMESS   MS005
33 00522 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
34 00523 004154              MS005                       ;ADDR. OF MESSAGE
35 00524 024101              LDA     1,DC2               ;DISPLAY DEVICE CODE 2
36 00525 006223              JSR     @1ZOC?1
37                           DMESS   MSLOR
38 00526 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
39 00527 003766              MSLOR                       ;ADDR. OF MESSAGE
40                GMSKE:     DMESS   MS000
41 00530 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
42 00531 003770              MS000                       ;ADDR. OF MESSAGE
43 00532 006236              JSR     @1TTD               ;GET EVEN MASK BIT
44 00533 000775              JMP     GMSKE
45 00534 124000              COM     1,1
46 00535 102621              SUB2R   0,0,SKP
47 00536 101220 EMMB:        MOV2R   0,0
48 00537 125404              INC     1,1,S2R             ;MAKE MASK FROM OCTAL NUMBER
49 00540 000776              JMP     EMMB
50 00541 040103              STA     0,MASKE             ;EVEN MASK
51                GMSKO:     DMESS   MS001
52 00542 006215              JSR     @1MES?              ;DISPLAY A MESSAGE
53 00543 004021              MS001                       ;ADDR. OF MESSAGE
54 00544 006236              JSR     @1TTD               ;GET ODD MASK BIT
55 00545 000775              JMP     GMSKO
56 00546 124000              COM     1,1
57 00547 102621              SUB2R   0,0,SKP
58 00550 101220 OMMB:        MOV2R   0,0
59 00551 125404              INC     1,1,S2R             ;MAKE MASK
60 00552 000776              JMP     OMMB
```

```
 0065  PB01A
01 00553 040104         STA     0,MASK0
02 00554 102400 G0:     SUB     0,0
03 00555 040203         STA     0,PASS          ;ZERO PASS COUNT
04 00556 020105 G02:    LDA     0,.IDUM
05 00557 040001         STA     0,LOC1          ;SETUP DUMMY VECTOR
06 00560 020250         LDA     0,C70K          ;DELAY FOR INPUT
07 00561 040211         STA     0,ERR24
08 00562 024100         LDA     1,DC1
09 00563 030071         LDA     2,XSB2          ;XSKPB2 CONTAINS INSTR. SKPBZ
10 00564 133000         ADD     1,2             ;PUT DEVICE CODE INTO INSTRUCTION
11 00565 050405         STA     2,B0BZ          ;STORE SKPB2 IN NEXT LOC.
12 00566 006226 B0:     JSR@    IENT?
13 00567 000012         1
14 00570 062677         IORST                   ;RESET I/O
15 00571 030401         LDA     2,B0BZ          ;FOR SHOW
16 00572 063500 B0BZ:   SKPBZ   0               ;EXECUTE I)
17 00573 006230         EHALT
18 00574 006231         LOOPX
19
20 00575 024101         LDA     1,DC2
21 00576 030073         LDA     2,XSD2          ;XSKPD2 CONTAINS INSTR. SKPDZ
22 00577 133000         ADD     1,2             ;PUT DEVICE CODE IN INSTRUCTION
23 00600 050405         STA     2,D0DZ          ;STORE SKPDZ
24 00601 006226 D0:     JSR@    IENT?
25 00602 000012         1
26 00603 062677         IORST
27 00604 030401         LDA     2,D0D2          ;FOR SHOW
28 00605 063700 D0DZ:   SKPDZ   0               ;EXECUTE I)
29 00606 006230         EHALT
30 00607 006231         LOOPX
31
32
33                      TMESS   MP000
34 00610 022213         LDA     0,@ISWR?EG
35 00611 024245         LDA     1,C40
36 00612 107414         AND#    0,1,SZR         ;SWT H ON
37 00613 000404         JMP     .+4             ;YES, ALWAYS PRINT
38 00614 020203         LDA     0,PASS
39 00615 101014         MOV#    0,0,SZR         ;FIRST PASS
40 00616 000403         JMP     .+3             ;NO, DON'T PRINT
41 00617 006215         JSR     @IMES?
42 00620 004264         MP000
43
44 00621 024100         LDA     1,DC1           ;EVEN DEVICE CODE
45 00622 030075         LDA     2,XNIOS         ;NIOS TO PROPER DEVICE CODE
46 00623 133000         ADD     1,2
47 00624 050407         STA     2,A1S
48 00625 030072         LDA     2,XSBN
49 00626 133000         ADD     1,2
50 00627 050407         STA     2,A1BN
51 00630 006226 A1:     JSR@    IENT?
52 00631 000012         1
53 00632 062677         IORST
54 00633 060100 A1S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE HERE
55 00634 024777         LDA     1,A1S           ;FOR SHOW
56 00635 030401         LDA     2,A1BN
57 00636 063400 A1BN:   SKPBN   0               ;SKPBN TO EVEN DEVICE CODE
58 00637 006230         EHALT
59 00640 006231         LOOPX
60
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```
 0006  PB01A
01 00641 024101          LDA     1,DC2
02 00642 030075          LDA     2,XNIOS
03 00643 133000          ADD     1,2
04 00644 050407          STA     2,A2S
05 00645 030074          LDA     2,XSDN
06 00646 133000          ADD     1,2
07 00647 050407          STA     2,A2DN
08 00650 006226 A2:      JSR@    IENT?
09 00651 000012          1
10 00652 062677          IORST
11 00653 060100 A2S:     NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
12 00654 024777          LDA     1,A2S           ;FOR SHOW
13 00655 030401          LDA     2,A2DN
14 00656 063600 A2DN:    SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
15 00657 006230          EHALT
16 00660 006231          LOOPX
17
18                       TMESS   MP001
19 00661 022213          LDA     0,@ISWR?EQ
20 00662 024245          LDA     1,C40
21 00663 107414          AND#    0,1,SZR         ;SWT 8 ON
22 00664 000404          JMP     .+4             ;YES, ALWAYS PRINT
23 00665 020203          LDA     0,PASS%
24 00666 101014          MOV#    0,0,SZR         ;FIRST PASS
25 00667 000403          JMP     .+3             ;NO, DON'T PRINT
26 00670 006215          JSR     @TMES?
27 00671 004322          MP001
28
29 00672 024100          LDA     1,DC1           ;EVEN DEVICE CODE
30 00673 030075          LDA     2,XNIOS         ;NIOS TO PROPER DEVICE CODE
31 00674 133000          ADD     1,2
32 00675 050412          STA     2,A3S
33 00676 030072          LDA     2,XSBN
34 00677 133000          ADD     1,2
35 00700 050410          STA     2,A3BN
36 00701 030071          LDA     2,XSBZ
37 00702 133000          ADD     1,2
38 00703 050411          STA     2,A3BZ
39 00704 006226 A3:      JSR@    IENT?
40 00705 000012          1
41 00706 062677          IORST
42 00707 060100 A3S:     NIOS    0               ;NIOS TO EVEN DEVICE CODE HERE
43 00710 063400 A3BN:    SKPBN   0               ;SKPBN TO EVEN DEVICE CODE HERE
44 00711 000777          JMP     .-1             ;WAIT FOR BUSY TO SET
45 00712 062677 A31R:    IORST
46 00713 020774          LDA     0,A3S           ;FOR SHOW
47 00714 024776          LDA     1,A31R
48 00715 030401          LDA     2,A3BZ
49 00716 063500 A3BZ:    SKPBZ   0               ;SKPBZ TO EVEN DEVICE HERE
50 00717 006230          EHALT
51 00720 006231          LOOPX
52
53 00721 024101          LDA     1,DC2
54 00722 030075          LDA     2,XNIOS
55 00723 133000          ADD     1,2
56 00724 050412          STA     2,A4S
57 00725 030074          LDA     2,XSDN
58 00726 133000          ADD     1,2
59 00727 050410          STA     2,A4DN
60 00730 030073          LDA     2,XSDZ
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```
 0007  FED1A
01 00731 133000          ADD     1,2
02 00732 050413          STA     2,A4D2
03
04 00733 006226 A4:      JSR@    IENT?
05 00734 000012          1
06 00735 062677          IORST
07 00736 060100 A4S:     NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
08 00737 063600 A4DN:    SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
09 00740 000777          JMP     .-1             ;WAIT FOR DONE SET
10 00741 062677 A4IR:    IORST
11 00742 020774          LDA     0,A4S           ;FOR SHOW
12 00743 024776          LDA     1,A4IR
13 00744 030401          LDA     2,A4D2
14 00745 063700 A4D2:    SKPBZ   0               ;SKPBZ TO ODD DEVICE CODE GOES HERE
15 00746 006230          EHALT
16 00747 006231          LOOPX
17
18                       TMESS   MF002
19 00750 022213          LDA     0,@ISWR?EG
20 00751 024245          LDA     1,C40
21 00752 107414          AND#    0,1,SZR         ;SWT A ON
22 00753 000404          JMP     .+4             ;YES, ALWAYS PRINT
23 00754 020203          LDA     0,PASS
24 00755 101014          MOV#    0,0,SZR         ;FIRST PASS
25 00756 000403          JMP     .+3             ;NO, DON'T PRINT
26 00757 006215          JSR     @TMES?
27 00760 004345          MF002
28 00761 024100          LDA     1,DC1           ;EVEN DEVICE CODE
29 00762 030075          LDA     2,XNIOS         ;NIOS TO PROPER DEVICE CODE
30 00763 133000          ADD     1,2
31 00764 050415          STA     2,A6S
32 00765 030072          LDA     2,XSBN
33 00766 133000          ADD     1,2
34 00767 050413          STA     2,A5BN
35 00770 030077          LDA     2,XNIOC
36 00771 133000          ADD     1,2
37 00772 050412          STA     2,A5C
38 00773 030071          LDA     2,XSBZ
39 00774 133000          ADD     1,2
40 00775 050413          STA     2,A5BZ
41 00776 006226 A5:      JSR@    IENT?
42 00777 000012          1
43 01000 062677          IORST
44 01001 060100 A5S:     NIOS    0               ;NIOS TO EVEN DEVICE CODE HERE
45 01002 063400 A5BN:    SKPBN   0               ;SKPBN TO EVEN DEVICE CODE HERE
46 01003 000777          JMP     .-1             ;WAIT FOR BUSY TO SET
47 01004 060200 A5C:     NIOC    0               ;NIOC TO EVEN DEVICE CODE HERE
48 01005 020774          LDA     0,A5S           ;FOR SHOW
49 01006 024776          LDA     1,A5C
50 01007 030401          LDA     2,A5BZ
51 01010 063500 A5BZ:    SKPBZ   0               ;SKPBZ TO EVEN DEVICE HERE
52 01011 006230          EHALT
53 01012 006231          LOOPX
54
55 01013 024101          LDA     1,DC2
56 01014 030075          LDA     2,XNIOS
57 01015 133000          ADD     1,2
58 01016 050415          STA     2,A6S
59 01017 030074          LDA     2,XSDN
60 01020 133000          ADD     1,2
```

```
 0006  FBD1A
01 01021 050413          STA     2,A6DN
02 01022 030077          LDA     2,XN10C
03 01023 133000          ADD     1,2
04 01024 050412          STA     2,A6C
05 01025 030073          LDA     2,XSDZ
06 01026 133000          ADD     1,2
07 01027 050413          STA     2,A6DZ
08
09 01030 006226 A6.      JSR@    IENT?
10 01031 000012          I
11 01032 062677          IORST
12 01033 060100 A6S:     NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
13 01034 063600 A6DN:    SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
14 01035 000777          JMP     .-1             ;WAIT FOR DONE SET
15 01036 060200 A6C:     NIOC    0               ;NIOC TO ODD DEVICE CODE GOES HERE
16 01037 020774          LDA     0,A6S           ;FOR SHOW
17 01040 024776          LDA     1,A6C
18 01041 030401          LDA     2,A6DZ
19 01042 063700 A6DZ:    SKPDZ   0               ;SKPDZ TO ODD DEVICE CODE GOES HERE
20 01043 006230          EHALT
21 01044 006231          LOOPX
22
23                       TMESS   MF003
24 01045 022213          LDA     0,@ISWR?EG
25 01046 024245          LDA     1,C40
26 01047 107414          AND#    0,1,SZR         ;SWT A ON
27 01050 000404          JMP     .+4             ;YES. ALWAYS PRINT
28 01051 020203          LDA     0,PASS
29 01052 101014          MOV#    0,0,SZR         ;FIRST PASS
30 01053 000403          JMP     .+3             ;NO, DON'T PRINT
31 01054 006215          JSR     @TMES?
32 01055 004273          MF003
33
34 01056 024100          LDA     1,DC1           ;EVEN DEVICE CODE
35 01057 030075          LDA     2,XN10S         ;NIOS TO PROPER DEVICE CODE
36 01060 133000          ADD     1,2
37 01061 050415          STA     2,A7S
38 01062 030072          LDA     2,XSBN
39 01063 133000          ADD     1,2
40 01064 050413          STA     2,A7BN
41 01065 030076          LDA     2,XN10P
42 01066 133000          ADD     1,2
43 01067 050412          STA     2,A7P
44 01070 030071          LDA     2,XSBZ
45 01071 133000          ADD     1,2
46 01072 050413          STA     2,A7BZ
47 01073 006226 A7:      JSR@    IENT?
48 01074 000012          I
49 01075 062677          IORST
50 01076 060100 A7S:     NIOS    0               ;NIOS TO EVEN DEVICE CODE HERE
51 01077 063400 A7BN:    SKPBN   0               ;SKPBN TO EVEN DEVICE CODE HERE
52 01100 000777          JMP     .-1             ;WAIT FOR BUSY TO SET
53 01101 060300 A7P:     NIOP    0               ;NIOP TO EVEN DEVICE CODE HERE
54 01102 020774          LDA     0,A7S           ;FOR SHOW
55 01103 024776          LDA     1,A7P
56 01104 030401          LDA     2,A7BZ
57 01105 063500 A7BZ:    SKPBZ   0               ;SKPBZ TO EVEN DEVICE HERE
58 01106 006230          EHALT
59 01107 006231          LOOPX
60
```

```
 0009  FBD1A
01 01110 024101          LDA     1,DC2
02 01111 030075          LDA     2,XNIOS
03 01112 133000          ADD     1,2
04 01113 050415          STA     2,A8S
05 01114 030074          LDA     2,XSDN
06 01115 133000          ADD     1,2
07 01116 050413          STA     2,A8DN
08 01117 030076          LDA     2,XNIOP
09 01120 133000          ADD     1,2
10 01121 050412          STA     2,A8P
11 01122 030073          LDA     2,XSDZ
12 01123 133000          ADD     1,2
13 01124 050413          STA     2,A8DZ
14
15 01125 006226 A8:      JSR@    IENT?
16 01126 000012          1
17 01127 062677          IORST
18 01130 060100 A8S:     NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
19 01131 063600 A8DN:    SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
20 01132 000777          JMP     .-1             ;WAIT FOR DONE SET
21 01133 060300 A8P:     NIOP    0               ;NIOP TO ODD DEVICE CODE GOES HERE
22 01134 020774          LDA     0,A8S           ;FOR SHOW
23 01135 024776          LDA     1,A8P
24 01136 030401          LDA     2,A8DZ
25 01137 063700 A8DZ:    SKPDZ   0               ;SKPDZ TO ODD DEVICE CODE GOES HERE
26 01140 006230          EHALT
27 01141 006231          LOOPX
28
29                       TMESS   MF004
30 01142 022213          LDA     0,@1SWR?EB
31 01143 024245          LDA     1,C40
32 01144 107414          AND#    0,1,SZR         ;SWT A ON
33 01145 000404          JMP      +4             ;YES, ALWAYS PRINT
34 01146 020203          LDA     0,PASS
35 01147 101014          MOV#    0,0,SZR         ;FIRST PASS
36 01150 000403          JMP     .+3             ;NO, DON'T PRINT
37 01151 006215          JSR     @TMES?
38 01152 004420          MF004
39
40 01153 006226 A9:      JSR@    IENT?
41 01154 000012          1
42 01155 062677 A91R:    IORST
43 01156 024777          LDA     1,A91R          ;FOR SHOW
44 01157 030401          LDA     2,A91A
45 01160 061477 A91A:    INTA    0               ;GET ANY DEVICE'S INT CODE
46 01161 101014          MOV#    0,0,SZR         ;NONE SHOULD BE THERE
47 01162 006230          EHALT
48 01163 006231          LOOPX
49
50 01164 024100          LDA     1,DC1
51 01165 030075          LDA     2,XNIOS
52 01166 133000          ADD     1,2
53 01167 050404          STA     2,A10S
54 01170 006226 A10:     JSR@    IENT?
55 01171 000012          1
56 01172 062677          IORST
57 01173 060300 A10S:    NIOP    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
58 01174 000401          NOP
59 01175 000401          NOP
60 01176 000401          NOP
```

```
 0010  FB01A
01 01177 024100          LDA     1,DC1           ;EVEN DEVICE CODE
02 01200 030401          LDA     2,A101A         ;FOR SHOW
03 01201 061477 A101A:   INTA    0               ;GET DEVICE CODE
04 01202 106414          SUB#    0,1,SZR         ;SAME?
05 01203 006236          EHALT                   ;NO
06 01204 006231          LOOPX
07
08 01205 024101          LDA     1,DC2
09 01206 030075          LDA     2,XNIOS
10 01207 133000          ADD     1,2
11 01210 050404          STA     2,A11S
12 01211 006226 A11:     JSR@    IENT?
13 01212 000012          I
14 01213 062677          IORST
15 01214 060100 A11S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
16 01215 000401          NOP
17 01216 000401          NOP
18 01217 000401          NOP
19 01220 024101          LDA     1,DC2           ;ODD DEVICE CODE
20 01221 030401          LDA     2,A11IA         ;FOR SHOW
21 01222 061477 A11IA:   INTA    0               ;GET DEVICE CODE
22 01223 106414          SUB#    0,1,SZR         ;SAME?
23 01224 006230          EHALT                   ;NO
24 01225 006231          LOOPX
25
26                       TMESS   MF005
27 01226 022213          LDA     0,@ISWR?ED
28 01227 024245          LDA     1,C40
29 01230 107414          AND#    0,1,SZR         ;SWT A ON
30 01231 000404          JMP     .+4             ;YES, ALWAYS PRINT
31 01232 020003          LDA     0,PASS
32 01233 101014          MOV#    0,0,SZR         ;FIRST PASS
33 01234 000403          JMP     .+3             ;NO, DON'T PRINT
34 01235 006215          JSR     @TMES?
35 01236 004451          MF005
36 01237 024100          LDA     1,DC1
37 01240 030075          LDA     2,XNIOS
38 01241 133000          ADD     1,2
39 01242 050406          STA     2,A12S
40 01243 006226 A12:     JSR@    IENT?
41 01244 000012          I
42 01245 062677          IORST
43 01246 102400          SUB     0,0
44 01247 040000          STA     0,LOC0          ;CLEAR LOC 0
45 01250 060100 A12S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
46 01251 060177          INTEN
47 01252 000401          NOP
48 01253 000401          NOP
49 01254 000401          NOP
50 01255 030072          LDA     2,A12S          ;FOR SHOW
51 01256 020000          LDA     0,LOC0          ;LOC 0 INT RETURN
52 01257 101015          MOV#    0,0,SNR         ;WERE WE THERE?
53 01260 006230          EHALT                   ;NO
54 01261 006231          LOOPX
55
56 01262 024101          LDA     1,DC2
57 01263 030075          LDA     2,XNIOS
58 01264 133000          ADD     1,2
59 01265 050406          STA     2,A13S
60 01266 006226 A13:     JSR@    IENT?
```

```
 0011  FB01A
01 01267 000012          1
02 01270 062677          IORST
03 01271 102400          SUB     0,0
04 01272 040000          STA     0,LOC0          ;CLEAR LOC 0
05 01273 060100 A13S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
06 01274 060177          INTEN
07 01275 000401          NOP
08 01276 000401          NOP
09 01277 000401          NOP
10 01300 030772          LDA     2,A13S          ;FOR SHOW
11 01301 020000          LDA     0,LOC0          ;LOC 0
12 01302 101015          MOV#    0,0,SNR         ;WERE WE THERE?
13 01303 006230          EHALT                   ;NO
14 01304 006231          LOOPX
15
16                       TMESS   MF006
17 01305 022213          LDA     0,@1SWRTEG
18 01306 024245          LDA     1,C40
19 01307 107414          AND#    0,1,SZR         ;SWT A ON
20 01310 000404          JMP      +4             ;YES, ALWAYS PRINT
21 01311 020203          LDA     0,PASTS
22 01312 101014          MOV#    0,0,SZR         ;FIRST PASS
23 01313 000403          JMP     .+3             ;NO, DON'T PRINT
24 01314 006215          JSR     @TMESS
25 01315 004477          MF006
26 01316 024100          LDA     1,DC1
27 01317 030075          LDA     2,XNIOS
28 01320 133000          ADD     1,2
29 01321 050411          STA     2,A14S
30 01322 030077          LDA     2,XNIOC
31 01323 133000          ADD     1,2
32 01324 050407          STA     2,A14C
33 01325 006226 A14:     JSR@    IENT?
34 01326 000012          I
35 01327 062677          IORST
36 01330 102400          SUB     0,0
37 01331 040000          STA     0,LOC0          ;CLEAR LOC 0
38 01332 060100 A14S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
39 01333 060200 A14C:    NIOC    0               ;NIOC TO EVEN DEVICE CODE GOES HERE
40 01334 060177          INTEN
41 01335 000401          NOP
42 01336 000401          NOP
43 01337 000401          NOP
44 01340 024772          LDA     1,A14S          ;FOR SHOW
45 01341 030772          LDA     2,A14C
46 01342 020000          LDA     0,LOC0          ;LOC 0 INT RETURN
47 01343 101014          MOV#    0,0,SZR         ;WERE WE THERE?
48 01344 006230          EHALT                   ;NO
49 01345 006231          LOOPX
50
51 01346 024101          LDA     1,DC2
52 01347 030075          LDA     2,XNIOS
53 01350 133000          ADD     1,2
54 01351 050411          STA     2,A15S
55 01352 030077          LDA     2,XNIOC
56 01353 133000          ADD     1,2
57 01354 050407          STA     2,A15C
58 01355 006226 A15:     JSR@    IENT?
59 01356 000012          I
60 01357 062677          IORST
```

```
 0012  FBD1A
01 01360 102400          SUB     0,0
02 01361 040000          STA     0,LOC0          ;CLEAR LOC 0
03 01362 060100 A15S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
04 01363 060200 A15C:    NIOC    0               ;NIOC TO ODD DEVICE CODE GOES HERE
05 01364 060177          INTEN
06 01365 000401          NOP
07 01366 000401          NOP
08 01367 000401          NOP
09 01370 024772          LDA     1,A15S          ;FOR SHOW
10 01371 030772          LDA     2,A15C
11 01372 020000          LDA     0,LOC0          ;LOC 0
12 01373 101014          MOV#    0,0,SZR         ;WERE WE THERE?
13 01374 006230          EHALT                   ;NO
14 01375 006231          LOOPX
15
16                       TMESS   MF007
17 01376 022213          LDA     0,@ISWR?EG
18 01377 024245          LDA     1,C40
19 01400 107414          AND#    0,1,SZR         ;SWT A ON
20 01401 000404          JMP     .+4             ;YES, ALWAYS PRINT
21 01402 026203          LDA     0,PASS
22 01403 101014          MOV#    0,0,SZR         ;FIRST PASS
23 01404 000403          JMP     .+3             ;NO, DON'T PRINT
24 01405 006215          JSR     @TMES?
25 01406 004526          MF007
26 01407 024100          LDA     1,DC1
27 01410 030075          LDA     2,XNIOS
28 01411 133000          ADD     1,2
29 01412 050411          STA     2,A16S
30 01413 030070          LDA     2,XDOC0
31 01414 133000          ADD     1,2
32 01415 050407          STA     2,A16DC
33 01416 006226 A16:     JSR@    IENT?
34 01417 000012          I
35 01420 062677          IORST
36 01421 102400          SUB     0,0
37 01422 040000          STA     0,0             ;CLEAR LOC 0
38 01423 060100 A16S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
39 01424 063000 A16DC:   DOC     0,0             ;DOC TO EVEN DEVICE CODE GOES HERE
40 01425 060177          INTEN
41 01426 000401          NOP
42 01427 000401          NOP
43 01430 000401          NOP
44 01431 024772          LDA     1,A16S          ;FOR SHOW
45 01432 030772          LDA     2,A16DC
46 01433 020000          LDA     0,LOC0          ;LOC 0 INT RETURN
47 01434 101014          MOV#    0,0,SZR         ;WERE WE THERE?
48 01435 006230          EHALT                   ;NO
49 01436 006231          LOOPX
50
51 01437 024101          LDA     1,DC2
52 01440 030075          LDA     2,XNIOS
53 01441 133000          ADD     1,2
54 01442 050411          STA     2,A17S
55 01443 030070          LDA     2,XDOC0
56 01444 133000          ADD     1,2
57 01445 050407          STA     2,A17DC
58 01446 006226 A17:     JSR@    IENT?
59 01447 000012          I
60 01450 062677          IORST
```

```
 0012  .EDIT
01 01451 102400          SUB     0,0
02 01452 040060          STA     0,LOC0          ;CLEAR LOC 0
03 01453 060100 A17S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
04 01454 063000 A17DC:   DOC     0,0             ;DOC TO ODD DEVICE CODE GOES HERE
05 01455 060177          INTEN
06 01456 000401          NOP
07 01457 000401          NOP
08 01460 000401          NOP
09 01461 024772          LDA     1,A17S          ;FOR SHOW
10 01462 030772          LDA     2,A17DC
11 01463 020060          LDA     0,LOC0          ;LOC 0
12 01464 101014          MOV#    0,0,SZR         ;WERE WE THERE?
13 01465 006230          EHALT                   ;NO
14 01466 006231          LOOPX
15
16                       TMESS   MF000
17 01467 022213          LDA     0,@ISWR?EG
18 01470 024245          LDA     1,C40
19 01471 107414          AND#    0,1,SZR         ;SW7 A ON
20 01472 000404          JMP     .+4             ;YES, ALWAYS PRINT
21 01473 020203          LDA     0,PASS%
22 01474 101014          MOV#    0,0,SZR         ;FIRST PASS
23 01475 000403          JMP     .+3             ;NO, DON'T PRINT
24 01476 006215          JSR     @!MES?
25 01477 004551          MF000
26 01500 024100          LDA     1,DC1
27 01501 030075          LDA     2,XNIOS
28 01502 133000          ADD     1,2
29 01503 050415          STA     2,A18S
30 01504 030072          LDA     2,XSBN
31 01505 133000          ADD     1,2
32 01506 050413          STA     2,A18BN
33 01507 050424          STA     2,AA18BN
34 01510 030070          LDA     2,XDOC0
35 01511 133000          ADD     1,2
36 01512 050411          STA     2,A18DC
37 01513 006226 A18:     JSR@    IENT?
38 01514 000012          1
39 01515 062677          IGRS1
40 01516 102400          SUB     0,0
41 01517 040060          STA     0,LOC0          ;CLEAR LOC 0
42 01520 060100 A18S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
43 01521 063400 A18BN:   SKPBN   0               ;SKPBN TO EVEN DEVICE CODE GOES HERE
44 01522 000777          JMP     .-1             ;WAIT FOR BUSY TO SET
45 01523 063000 A18DC:   DOC     0,0             ;DOC TO EVEN DEVICE CODE GOES HERE
46 01524 060177          INTEN
47 01525 000401          NOP
48 01526 000401          NOP
49 01527 000401          NOP
50 01530 020770          LDA     0,A18S          ;FOR SHOW
51 01531 024772          LDA     1,A18DC
52 01532 030401          LDA     2,AA18BN
53 01533 063400 AA18BN:  SKPBN   0               ;SKPBN TO EVEN DEVICE CODE GOES HERE
54 01534 006230          EHALT
55 01535 006231          LOOPX
56
57 01536 024101          LDA     1,DC2
58 01537 030075          LDA     2,XNIOS
59 01540 133000          ADD     1,2
60 01541 050415          STA     2,A19S
```

```
 0014  FED1A
01 01542 030074          LDA     2,XSDN
02 01543 133000          ADD     1,2
03 01544 050413          STA     2,A19DN
04 01545 050424          STA     2,AA19DN
05 01546 030070          LDA     2,XDOC0
06 01547 133000          ADD     1,2
07 01550 050411          STA     2,A19DC
08 01551 006226 A19:     JSR@    IENT?
09 01552 000012          I
10 01553 062677          IORST
11 01554 102400          SUB     0,0
12 01555 040000          STA     0,LOC0          ;CLEAR LOC 0
13 01556 060100 A19S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
14 01557 063600 A19DN.   SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
15 01560 000777          JMP     .-1             ;WAIT FOR DONE TO SET
16 01561 063000 A19DC:   DOC     0,0             ;DOC TO ODD DEVICE CODE GOES HERE
17 01562 060177          INTEN
18 01563 000401          NOP
19 01564 000401          NOP
20 01565 000401          NOP
21 01566 020770          LDA     0,A19S          ;FOR SHOW
22 01567 024772          LDA     1,A19DC
23 01570 030401          LDA     2,AA19DN
24 01571 063600 AA19DN.  SKPDN   0               ;SKPDN TO ODD DEVICE CODE GOES HERE
25 01572 006230          EHALT
26 01573 006231          LOOPX
27
28                       TMESS   MF009
29 01574 022213          LDA     0,@ISWR?EG
30 01575 024245          LDA     1,C40
31 01576 107414          AND#    0,1,SZR         ;SW1 A ON
32 01577 000404          JMP     .+4             ;YES, ALWAYS PRINT
33 01600 020203          LDA     0,PASS
34 01601 101014          MOV#    0,0,SZR         ;FIRST PASS
35 01602 000403          JMP     .+3             ;NO, DON'T PRINT
36 01603 006215          JSR     @!MES?
37 01604 004577          MF009
38 01605 024100          LDA     1,DC1
39 01606 030075          LDA     2,XNIOS
40 01607 133000          ADD     1,2
41 01610 050410          STA     2,A20S
42 01611 000402          JMP     A20
43 01612 001630 .A20L:   A20L
44
45 01613 006226 A20:     JSR@    IENT?
46 01614 000012          I
47 01615 062677          IORST
48 01616 020774          LDA     0,.A20L
49 01617 040001          STA     0,LOC1          ;SET INT VECTOR TO ADDRESS OF A20L
50 01620 060100 A20S.    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
51 01621 030777          LDA     2,A20S          ;FOR SHOW
52 01622 060177          INTEN
53 01623 000401          NOP
54 01624 000401          NOP                     ;WAIT FOR INT TO SEND US TO A20L
55 01625 000401          NOP
56 01626 000401          NOP
57 01627 006230          EHALT                   ;NO INTERRUPT TO SEND US TO A20L
58 01630 006231 A20L.    LOOPX
59
60 01631 024101          LDA     1,DC2
```

```
 0015  FB01A
01 01632 030075          LDA     2,XNIOS
02 01633 133000          ADD     1,2
03 01634 050410          STA     2,A21S
04 01635 000402          JMP     A21
05 01636 001654 .A21L:   A21L
06
07 01637 006226 A21.     JSR@    IENT?
08 01640 000012          I
09 01641 062677          IORST
10 01642 020774          LDA     0, A21L
11 01643 040001          STA     0,LOC1          ;SET INT VECTOR TO A21L ADDRESS
12 01644 060100 A21S.    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
13 01645 030777          LDA     2,A21S          ;FOR SHOW
14 01646 060177          INTEN
15 01647 000401          NOP                     ;WAIT FOR INT TO SEND US TO A21L
16 01650 000401          NOP
17 01651 000401          NOP
18 01652 000401          NOP
19 01653 006230          EHALT                   ;NO INTERRUPT TO SEND US TO A21L
20 01654 006231 A21L:    LOOPX
21
22 01655 024100          LDA     1,.IDUMM
23 01656 044001          STA     1,LOC1          ;RESTORE DUMMY VECTOR
24 01657 024100          LDA     1,DC1
25 01660 030075          LDA     2,XNIOS
26 01661 133000          ADD     1,2
27 01662 050410          STA     2,A22S
28 01663 006226 A22.     JSR@    IENT?
29 01664 000012          1
30 01665 062677          IORST
31 01666 102400          SUB     0,0
32 01667 040000          STA     0,LOC0          ;CLEAR LOC 0
33 01670 020103          LDA     0,MASKE
34 01671 062077          MSKO    0               ;SET MASK ON EVEN DEVICE CODE
35 01672 060100 A22S:    NIOS    0               ;NIOS TO EVEN DEVICE CODE GOES HERE
36 01673 060177          INTEN
37 01674 000401          NOP
38 01675 000401          NOP
39 01676 000401          NOP
40 01677 030773          LDA     2,A22S          ;DEVICE CODE FOR SHOW
41 01700 024000          LDA     1,LOC0          ;LOC 0 INT RETURN
42 01701 125014          MOV#    1,1,SZR         ;WERE WE THERE?
43 01702 006230          EHALT                   ;YES
44 01703 006231          LOOPX
45
46 01704 024101          LDA     1,DC2
47 01705 030075          LDA     2,XNIOS
48 01706 133000          ADD     1,2
49 01707 050410          STA     2,A23S
50 01710 006226 A23:     JSR@    IENT?
51 01711 000012          I
52 01712 062677          IORST
53 01713 102400          SUB     0,0
54 01714 040000          STA     0,LOC0          ;CLEAR LOC 0
55 01715 020104          LDA     0,MASKO
56 01716 062077          MSKO    0               ;SET ODD DEVICE CODE MASK
57 01717 060100 A23S:    NIOS    0               ;NIOS TO ODD DEVICE CODE GOES HERE
58 01720 060177          INTEN
59 01721 000401          NOP
60 01722 000401          NOP
```

```
 0016  PBD1A
01 01723 000401          NOP
02 01724 030773          LDA     2,A23S          ;FOR SHOW
03 01725 024000          LDA     1,LOC0          ;LOC 0
04 01726 125014          MOV#    1,1,SZR         ;WERE WE THERE?
05 01727 006230          EHALT                   ;YES
06 01730 006231          LOOPX
07
08 01731 062677          IORST
09 01732 020247          LDA     0,C144          ;DELAY SPEED UP
10 01733 040211          STA     0,ERR?4
11               DCLOOP:
12                       DMESS   MS006           ;STARTING WRITE/READ LOOP
13 01734 006215          JSR     @1MES?          ;DISPLAY A MESSAGE
14 01735 004200          MS006                   ;ADDR. OF MESSAGE
15 01736 024102          LDA     1,TSTDC         ;ON THIS DEVICE CODE
16 01737 006223          JSR     @1ZOC?1
17                       DMESS   MSLOR
18 01740 006215          JSR     @1MES?          ;DISPLAY A MESSAGE
19 01741 003766          MSLOR                   ;ADDR. OF MESSAGE
20 01742 102400          SUB     0,0             ;W/R PATTERN
21 01743 040111          STA     0,DATA          ;START AT ZERO
22 01744 024102          LDA     1,TSTDC
23 01745 030065          LDA     2,XDOA0         ;XDOA0 HOLDS INSTR. DOA 0,0
24 01746 133000          ADD     1,2             ;PUT TEST DEV. CODE IN INSTR.
25 01747 050410          STA     2,A0OA          ;PUT DOA 0,TESTDC IN WRITE/READ LOOP
26 01750 030067          LDA     2,XDIA1         ;XDIA1 HOLDS INSTR. DIA 1,0
27 01751 133000          ADD     1,2             ;PUT TEST DEV. CODE IN INSTR.
28 01752 050406          STA     2,A01A          ;PUT DIA 1,TESTDC IN WRITE/READ LOOP
29 01753 006226 A24:     JSR@    IENT?
30 01754 000001          1
31 01755 020111 WRLOOP:  LDA     0,DATA          ;GET DATA TO WRITE
32 01756 126400          SUB     1,1             ;CLEAR IN REG
33 01757 061000 A0OA:    DOA     0,0             ;WRITE PATTERN TO DEVICE (DOA)
34 01760 064400 A01A:    DIA     1,0             ;READ IT BACK INTO AC0 (DIA)
35 01761 030777          LDA     2,A01A          ;GET PRESENT DEVICE CODE FOR SHOW
36 01762 106414          SUB#    0,1,SZR         ;SKIP IF THEY MATCH
37 01763 006230          EHALT
38 01764 006231          LOOPX
39 01765 010111          ISZ     DATA            ;INCREMENT PATTERN, IF ZERO - DONE
40 01766 000765          JMP     A24             ;NEXT PATTERN
41                       DMESS   MS007           ;TEST SUCCESSFUL
42 01767 006215          JSR     @1MES?          ;DISPLAY A MESSAGE
43 01770 004232          MS007                   ;ADDR. OF MESSAGE
44                       DMESS   MSLOR
45 01771 006215          JSR     @1MES?          ;DISPLAY A MESSAGE
46 01772 003766          MSLOR                   ;ADDR. OF MESSAGE
47               NEXTDC:
48 01773 024102          LDA     1,TSTDC
49 01774 020101          LDA     0,DC2
50 01775 040102          STA     0,TSTDC         ;READY DEVICE CODE 2 TO BE NEXT TEST
51 01776 106414          SUB#    0,1,SZR         ;DONE IF ALREADY TESTED DEVICE CODE 2
52 01777 000735          JMP     DCLOOP          ;OTHERWISE, RUN PATTERNS ON DEVICE 2
53 02000 020100          LDA     0,DC1
54 02001 040102          STA     0,TSTDC
55                       DMESS   MS003           ;SAY WE'RE DONE
56 02002 006215          JSR     @1MES?          ;DISPLAY A MESSAGE
57 02003 004077          MS003                   ;ADDR. OF MESSAGE
58
59
60 02004 062677 A25:     IORST
```

```
 0017  ^EDIA
01                      DMESS   MSLCR
02 02005 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
03 02006 003766         MSLCR                   ;ADDR. OF MESSAGE
04                      DMESS   MF010
05 02007 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
06 02010 004630         MF010                   ;ADDR. OF MESSAGE
07                      DMESS   MSLCR
08 02011 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
09 02012 003766         MSLCR                   ;ADDR. OF MESSAGE
10 02013 020437         LDA     0,.INTM
11 02014 040001         STA     0,LOC1          ;SET UP INT VECTOR
12 02015 020100         LDA     0,DC1
13 02016 024064         LDA     1,XDOAS
14 02017 107000         ADD     0,1
15 02020 044403         STA     1,A25D
16 02021 102400         SUB     0,0
17 02022 040111         STA     0,DATA
18 02023 061100 A25D:   DOAS    0,0             ;DOAS 0 HERE
19 02024 060177         INTEN                   ;LET THEM GO
20 02025 000400         JMP     .               ;WAIT HERE
21 02026 000777         JMP     .-1             ;DON'T LET THEM GET AWAY
22
23 02027 062677 A26:    IORST
24                      DMESS   MSLCR
25 02030 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
26 02031 003766         MSLCR                   ;ADDR. OF MESSAGE
27                      DMESS   MF011
28 02032 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
29 02033 004657         MF011                   ;ADDR. OF MESSAGE
30                      DMESS   MSLCR
31 02034 006215         JSR     @1MES?          ;DISPLAY A MESSAGE
32 02035 003766         MSLCR                   ;ADDR. OF MESSAGE
33 02036 020414         LDA     0,.INTM
34 02037 040001         STA     0,LOC1          ;SET UP INT VECTOR
35 02040 020101         LDA     0,DC2
36 02041 024064         LDA     1,XDOAS
37 02042 107000         ADD     0,1
38 02043 044403         STA     1,A26D
39 02044 102400         SUB     0,0
40 02045 040111         STA     0,DATA
41 02046 061100 A26D:   DOAS    0,0             ;DOAS 0 HERE
42 02047 060177         INTEN                   ;LET THEM GO
43 02050 000400         JMP     .               ;WAIT HERE
44 02051 000777         JMP     .-1             ;DON'T LET THEM GET AWAY
45 02052 002053 .INTM:  INTM
46 02053 061477 INTM:   INTA    0
47 02054 024100         LDA     1,DC1
48 02055 106415         SUB#    0,1,SNR         ;EVEN UNIT
49 02056 000412         JMP     INT0            ;YES
50 02057 024101         LDA     1,DC2           ;ODD UNIT
51 02060 106415         SUB#    0,1,SNR         ;
52 02061 000415         JMP     INT1            ;YES
53 02062 024077         LDA     1,XNIOC         ;
54 02063 107000         ADD     0,1
55 02064 044401         STA     1,INIOC         ;NIOC FOR ANY OTHER DEVICE
56 02065 060200 INIOC:  NIOC    0               ;HERE
57 02066 060177 INTR:   INTEN
58 02067 002000         JMP     @0              ;RETURN FROM INT
59
60 02070 030111 INT0:   LDA     2,DATA          ;GET OLD DATA SENT
```

```
 0018  FED1A
01 02071 010111          ISZ     DATA
02 02072 000412          JMP     REND            ;NOT DONE, READ AND SEND MORE
03                       DMESS   MF012
04 02073 006215          JSR     @IMES?          ;DISPLAY A MESSAGE
05 02074 004706          MF012                   ;ADDR. OF MESSAGE
06 02075 000732          JMP     A26
07 02076 030111 INT1:    LDA     2,DATA          ;GET OLD DATA SENT
08 02077 010111          ISZ     DATA
09 02100 000404          JMP     REND            ;NOT DONE, READ AND SEND MORE
10                       DMESS   MF013
11 02101 006215          JSR     @IMES?          ;DISPLAY A MESSAGE
12 02102 004724          MF013                   ;ADDR. OF MESSAGE
13 02103 000421          JMP     END
14
15 02104 024066 REND:    LDA     1,XD1AC
16 02105 107000          ADD     0,1
17 02106 044401          STA     1,.DIA          ;MAKE DIAC
18 02107 064600 .DIA:    DIAC    1,0             ;DIAC 1 HERE
19 02110 062677          IORST
20 02111 132415          SUB#    1,2,SNR
21 02112 000404          JMP     INTC
22                       DMESS   MSERR           ;DATA ERROR UNDER INT'S
23 02113 006215          JSR     @IMES?          ;DISPLAY A MESSAGE
24 02114 004742          MSERR                   ;ADDR. OF MESSAGE
25 02115 002233          JMP     @IODT?          ;BAD NEWS
26
27 02116 024064 INTC:    LDA     1,XDOAS
28 02117 107000          ADD     0,1
29 02120 044402          STA     1,.DOAS
30 02121 020111          LDA     0,DATA          ;DATA
31 02122 061100 .DOAS:   DOAS    0,0             ;DOAS 0 HERE
32 02123 000743          JMP     INTR
33
34 02124 062677 END:     IORST
35 02125 020105          LDA     0,.IDUM
36 02126 040001          STA     0,LOC1          ;RESTORE DUMMY VECTOR
37                       DMESS   MPAS
38 02127 006215          JSR     @IMES?          ;DISPLAY A MESSAGE
39 02130 004767          MPAS                    ;ADDR. OF MESSAGE
40 02131 024203          LDA     1,PAS?S
41 02132 006220          JSR     @IPDE?C
42                       DMESS   MSLCR
43 02133 006215          JSR     @IMES?          ;DISPLAY A MESSAGE
44 02134 003766          MSLCR                   ;ADDR. OF MESSAGE
45 02135 010203          ISZ     PAS?S
46 02136 000401          NOP
47 02137 002401          JMP     @.+1
48 02140 000556          G02
```

```
!0019  FBD1A
01       000001         .NOMAC  Y
02
03              ;=============================================================
04              ;OCTAL AND DECIMAL INPUT ROUTINES AND MESSAGES
05              ;=============================================================
06
07 02141 000000 XXX:    0                       ;DUMMY ADDRESS FOR END
08                                              ;OF TESTING
09              ;THE FOLLOWING ROUTINES REPLACE THE OCTAL AND DECIMAL
10              ;INPUT ROUTINES TO SEARCH FOR ^O, ^R OR ^D  AND JUMP TO
11              ;THE APPROPRIATE PLACE IF ONE OF THESE CONTROL CHARS
12              ;IS STRUCK.
13       000000         .TXTM   0
14
15
16              ;OCTAL INPUT ROUTINE
17 02142 000000         0
18 02143 054777 TTII:   STA     3, -1
19 02144 050430         STA     2,TTS2          ;SAVE AC2
20 02145 006224         JSR@    ITI?O           ;GET CHARACTER
21 02146 004404         JSR     TTII1
22 02147 010773         ISZ     TTII-1
23 02150 030424 TTII2:  LDA     2,TTS2
24 02151 002771         JMP@    TTII-1          ;RETURN+2
25
26              ;ROUTINE LOOKS FOR: ^O, ^R, OR ^D
27 02152 030417 TTII1:  LDA     2,TTCO
28 02153 142415         SUB#    2,0,SNR         ;IS IT CONTROL O?
29 02154 006233         JSR@    IODT?           ;YES
30 02155 030415         LDA     2,TTCR          ;OR CONTROL R?
31 02156 142415         SUB#    2,0,SNR
32 02157 000407         JMP     CNTRR           ;YES
33 02160 030413         LDA     2,TTCD
34 02161 142415         SUB#    2,0,SNR         ;CONTROL D ?(RESTART WITH SW REG CLEAR)
35 02162 000402         JMP     CNTRD           ;   YES
36 02163 001401         JMP     1,3             ;   NO
37              ;
38              CNTRD:
39 02164 152400         SUB     2,2
40 02165 052213         STA     2,@ISWR?EG      ;CLEAR SW REG
41 02166 152400 CNTRR:  SUB     2,2
42 02167 050203         STA     2,PAS?S
43 02170 000234         JMP     RES?T           ;AND RESTART
44
45 02171 000017 TTCO:   17
46 02172 000022 TTCR:   22
47 02173 000004 TTCD:   4
48 02174 000000 TTS2:   0
49
50
51              ;DECIMAL INPUT ROUTINE
52 02175 054745 TTID:   STA     3,TTII-1        ;DECIMAL INPUT ROUTINE
53 02176 050776         STA     2,TTS2          ;KEEP AC2
54 02177 006225         JSR@    ITI?D           ;GET DECIMAL
55 02200 004752         JSR     TTII1
56 02201 010741         ISZ     TTII-1          ;
57 02202 000746         JMP     TTII2
58
59
60
```

```
 0020  FBDIA
01                    0^D10   2
02       000401 BDDDD=  401
03 03760 000000 EGGS:   0                      ;AUTO RUN SWITCH
04 03761 000000         0                      ;DEVICE CODE
05 03762 000000         0                      ;CAT SWITCH
06 03763 000000         0                      ;# OF PASSES
07 03764 000000         0                      ;RETURN ADDRESS
08 03765 000000 SWREG:  0                      ;SWITCH REGISTER
09 03766 006412 MSLCR:  .TXT    !<12><15>!
10 03770 006412 MS000:  .TXT    !<12><15>WHAT IS THE EVEN DEVICE CODE MASK BIT SET FOR? !
11 04021 006412 MS001:  .TXT    !<12><15>WHAT IS THE ODD DEVICE CODE MASK BIT SET FOR? !
12 04052 006412 MS002:  .TXT    !<12><15>WHAT DEVICE CODE IS THE BOARD SET FOR? !
13 04077 006412 MS003:  .TXT    !<12><15>BOTH DEVICES DATA REGISTERS HAVE BEEN TESTED.  !
14 04130 006412 MS004:  .TXT    !<12><15>EVEN DEVICE CODE FOR FIRST GROUND IS !
15 04154 006412 MS005:  .TXT    !<12><15>ODD DEVICE CODE FOR SECOND GROUND IS !
16 04200 006412 MS006:  .TXT    !<12><15>ABOUT TO OUTPUT AND INPUT BIT PATTERNS ON DEVICE !
17 04232 006412 MS007:  .TXT    !<12><15>ALL PATTERNS OUTPUT MATCHED INPUT FOR THIS DEVICE!
18 04264 006412 MF000:  .TXT    !<12><15>TESTING START PULSE SETS DONE (ODD) AND BUSY (EVEN) FF'S.!
19 04322 006412 MF001:  .TXT    !<12><15>TESTING IORST CLEARS DONE AND BUSY.!
20 04345 006412 MF002:  .TXT    !<12><15>TESTING CLEAR PULSE CLEARS DONE AND BUSY.!
21 04373 006412 MF003:  .TXT    !<12><15>TESTING IOP PULSE CLEARS DONE AND BUSY.!
22 04420 006412 MF004:  .TXT    !<12><15>TESTING INTA READS DEVICE CODE WHEN IT SHOULD.!
23 04451 006412 MF005:  .TXT    !<12><15>TESTING INTERRUPT OCCURS WHEN IT SHOULD.!
24 04477 006412 MF006:  .TXT    !<12><15>TESTING CLEAR PULSE CLEARS INTERRUPT FF'S.!
25 04526 006412 MF007:  .TXT    !<12><15>TESTING DOC CLEARS INTERRUPT FF'S.!
26 04551 006412 MF008:  .TXT    !<12><15>TESTING DOC DOES NOT CLEAR DONE AND BUSY.!
27 04577 006412 MF009:  .TXT    !<12><15>TESTING MSKO (MASK OUT) CAN DISABLE INTERRUPTS.!
28 04630 006412 MF010:  .TXT    !<12><15>TESTING EVEN DEVICE CODE UNDER INTERRUPTS.!
29 04657 006412 MF011:  .TXT    !<12><15>TESTING ODD DEVICE CODE UNDER INTERRUPTS.!
30 04705 006412 MF012:  .TXT    !<12><15>EVEN DEVICE CODE COMPLETE.!
31 04724 006412 MF013:  .TXT    !<12><15>ODD DEVICE CODE COMPLETE.!
32 04742 006412 MSERR:  .TXT    *<12><15>DATA ERROR RUNNING UNDER INTERRUPTS!!!*
33 04767 006412 MPAS:   .TXT    !<12><15>PASS !
34 04773 006412 DIRT:   .TXT    !<12><15>RD05 FOREGROUND/BACKGROUND COMMUNICATIONS BOARD DIAGNOSTICS REV.  00!
35       000000         .NOLOC  0
36                END
**00000 TOTAL ERRORS, 00000 FIRST PASS ERRORS
```

A0IA	001760	16/28	16/34#	16/35
A00A	001757	16/25	16/33#	
A1	000630	5/51#		
A10	001170	9/54#		
A10IA	001201	10/02	10/03#	
A10S	001173	9/53	9/57#	
A11	001211	10/12#		
A11IA	001222	10/20	10/21#	
A11S	001214	10/11	10/15#	
A12	001243	10/40#		
A12S	001250	10/39	10/45#	10/50
A13	001266	10/60#		
A13S	001273	10/59	11/05#	11/10
A14	001325	11/33#		
A14C	001333	11/32	11/39#	11/45
A14S	001332	11/29	11/38#	11/44
A15	001355	11/58#		
A15C	001363	11/57	12/04#	12/10
A15S	001362	11/54	12/03#	12/09
A16	001416	12/37#		
A16DC	001424	12/32	12/39#	12/45
A16S	001423	12/29	12/38#	12/44
A17	001446	12/58#		
A17DC	001454	12/57	13/04#	13/10
A17S	001453	12/54	13/03#	13/09
A18	001513	13/37#		
A18BN	001521	13/32	13/43#	
A18DC	001523	13/26	13/45#	13/51
A18S	001520	13/29	13/42#	13/50
A19	001551	14/08#		
A19DC	001561	14/07	14/16#	14/22
A19DN	001557	14/03	14/14#	
A19S	001556	13/60	14/13#	14/21
A1BN	000636	5/50	5/56	5/57#
A1S	000633	5/47	5/54#	5/55
A2	000650	6/08#		
A20	001613	14/42	14/45#	
A20L	001630	14/43	14/58#	
A20S	001620	14/41	14/50#	14/51
A21	001637	15/04	15/07#	
A21L	001654	15/05	15/20#	
A21S	001644	15/03	15/12#	15/13
A22	001663	15/28#		
A22S	001672	15/27	15/35#	15/40
A23	001710	15/50#		
A23S	001717	15/49	15/57#	16/02
A24	001753	16/29#	16/40	
A25	002004	16/60#		
A25D	002023	17/15	17/18#	
A26	002027	17/23#	18/06	
A26D	002046	17/38	17/41#	
A2DN	000656	6/07	6/13	6/14#
A2S	000652	6/04	6/11#	6/12
A3	000704	6/39#		
A3BN	000710	6/35	6/43#	
A3B2	000716	6/38	6/48	6/49#
A3IR	000712	6/45#	6/47	
A3S	000707	6/32	6/42#	6/46
A4	000733	7/04#		

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A4DN  000737      6/59   7/08#
A4D2  000745      7/02   7/13   7/14#
A4IR  000741      7/10#  7/12
A4S   000736      6/56   7/07#  7/11
A5    000776      7/41#
A5BN  001002      7/34   7/45#
A5B2  001010      7/40   7/50   7/51#
A5C   001004      7/37   7/47#  7/49
A5S   001001      7/31   7/44#  7/48
A6    001030      8/09#
A6C   001036      8/04   8/15#  8/17
A6DN  001034      8/01   8/13#
A6D2  001042      8/07   8/18   8/19#
A6S   001033      7/58   8/12#  8/16
A7    001073      8/47#
A7BN  001077      8/40   8/51#
A7B2  001105      8/46   8/56   8/57#
A7P   001101      8/43   8/53#  8/55
A7S   001076      8/37   8/50#  8/54
A8    001125      9/15#
A8DN  001131      9/07   9/19#
A8D2  001137      9/13   9/24   9/25#
A8P   001133      9/10   9/21#  9/23
A8S   001130      9/04   9/18#  9/22
A9    001153      9/40#
A9IA  001160      9/44   9/45#
A9IR  001155      9/42#  9/43
AA18B 001533     13/33  13/52  13/53#
AA19D 001571     14/04  14/23  14/24#
AC0?  003555     20/03#
AC1?  003556     20/03#
AC2?  003557     20/03#
AC3?  000207      3/14#  20/02
B0    000566      5/12#
B0B2  000572      5/11   5/15   5/16#
BDDD  000401     20/02#  20/03
BEG1  000500      3/14   4/08#
BGN?A 000202      3/14#
C100K 000251      3/34#
C10?0 002642     19/60#
C144  000247      3/32#  16/09
C1B?6 003712     20/03#
C2    000241      3/26#
C4    000242      3/27#
C40   000245      3/30#  5/25   6/20   7/20   8/25   9/31  10/28
                 11/18  12/18  13/18  14/30
C5    000243      3/28#
C70K  000250      3/33#  5/06
C76   000246      3/31#
C9    000244      3/29#
CAC?0 002227     19/60#
CAR?  003550     20/03#
CHA?3 002242     19/60#
CHC?1 002230     19/60#
CHE?% 002246     19/60#
CHNG  000114      3/09#
CHR?E 002226     19/60#
CHR?2 002355     19/60#
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CM256 000254        3/37#
CM4   000252        3/35#
CM512 000255        3/38#
CM9.  000253        3/36#
CNTRD 002164       19/33   19/38#
CNTRR 002166       19/32   19/41#
CRL?F 002252        3/14   19/60#
CYC?2 003501       20/03#
CYC?I 003442       20/03#
CYC?J 003424        3/14   20/03#
CYC?X 003415        3/14   20/03#
D0    000601        5/24#
D0D2  000605        5/23    5/27    5/29#
DATA  000111        3/06#  16/21   16/31   16/39   17/17   17/40   17/60
                   18/01   18/07   18/08   18/30
DATA0 000112        3/07#
DATA1 000113        3/08#
DC1   000100        2/55#   4/23    4/29    5/08    5/44    6/29    7/28
                    8/24    9/50   10/01   10/26   11/26   12/26   13/26
                   14/38   15/24   16/53   17/12   17/47
DC2   000101        2/56#   4/25    4/35    5/20    6/01    6/53    7/55
                    9/01   10/08   10/19   10/56   11/51   12/51   13/57
                   14/60   15/46   16/49   17/35   17/50
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DCO?I 002317       19/60#
DEC?I 002320       19/60#
DET?B 002360       19/60#
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DIV?  003511        3/03   20/03#
DIV?0 003512       20/03#
DIV?U 003515       20/03#
DME55 000143  MD    4/09    4/12    4/16    4/26    4/32    4/37    4/40
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                   18/22   18/27   18/42
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D?IAG 025272  MD   20/02
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                   14/25   14/57   15/19   15/43   16/05   16/37
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ERR?2 003647       20/03#
ERR?3 003676       20/03#
ERR?4 000211        3/14#   5/07   16/10   20/03
ERR?5 003705       20/03#
ERR?6 003611       20/03#
ERR?A 003630       20/03#
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ERR?J 003560        3/14   20/03#
ERR?N 003654       20/03#
ERT?N 003552       20/03#
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GMSKO 000542       4/51#   4/55
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GO2   000556       5/04#  18/48
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HEL?P 000201       3/14#  20/03
I     000012       2/25#   5/13    5/25    5/52    6/09    6/40    7/05
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                  14/09   14/46   15/08   15/29   15/51
I12?1 003132      19/60#  20/02
ICRL? 000216       3/14#  19/60   20/02   20/03
ICYC? 000227       3/14#  20/03
ICY?C 000231       3/14#   3/23
IDUMM 000006       2/34#   2/68
IEGG? 000212       3/14#  20/03
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                  14/08   14/45   15/07   15/28   15/50   16/29
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IINP? 000214       3/14#  20/03
IINR? 003163      20/02#
IMES? 000215       3/14#   4/10    4/13    4/17    4/27    4/33    4/38
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                  16/42   16/45   16/56   17/02   17/05   17/08   17/25
                  17/28   17/31   18/04   18/11   18/23   18/38   18/43
                  20/02   20/03
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IN1?2 003134      19/60#  20/02
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IN1?5 003135      19/60#  20/02
IN2?  003024      19/60#
IN3?  002701      19/60#
IN3?3 002711      19/60#
IN4?  003065      19/60#
IN5?  002751      19/60#
IN6?  002765      19/60#
IN6?0 003133      19/60#  20/02
INB?A 003127      19/60#  20/02
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INM?  003041      19/60#
INP?1 002717      19/60#
INP?I 002722      19/60#
INP?J 002725      19/60#
INP?K 003355       3/14   20/02#
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INS?H 003120      19/60#  20/02
INS?V 003101      19/60#  20/02
INS?X 003162      20/02#
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INT1  002076      17/52   18/07#
INTC  002116      18/21   18/27#
INTM  002053      17/45   17/46#
INTR  002066      17/57#  18/32
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INT?E 002714      19/60#
INT?R 002716      19/60#
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IOM?0 000235       3/19#  19/60   20/03
IPDC? 000221       3/14#  19/60   20/02   20/03
IPDE? 000220       3/14#  18/41
IPDC? 000222       3/14#  20/02   20/03
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ITI?O 000224       3/14#  19/20
ITPS? 000232       3/14#  19/60   20/02
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ITR?C 003546      20/03#
ITR?W 000206       3/14#  20/03
ITR?Y 003545      20/03#
ITTA  000240       3/22#
ITTD  000236       3/20#   4/43    4/54
ITTI  000237       3/21#   4/19
ITYP? 000217       3/14#  19/60
IZOC? 000223       3/14#   4/28    4/35   16/16   20/02   20/03
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K12?  002261      19/60#
K15?  002262      19/60#
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                  15/32   15/41   15/54   16/03
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                  18/36
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MF004 004420        9/38   20/22#
MF005 004451       10/35   20/23#
MF006 004477       11/25   20/24#
MF007 004526       12/25   20/25#
MF008 004551       13/25   20/26#
MF009 004577       14/37   20/27#
MF010 004630       17/06   20/28#
MF011 004657       17/29   20/29#
MF012 004705       18/05   20/30#
MF013 004724       18/12   20/31#
MFHS  004767       18/39   20/33#
MS000 003770        4/42   20/10#
MS001 004021        4/53   20/11#
MS002 004052        4/18   20/12#
MS003 004077       16/57   20/13#
MS004 004130        4/28   20/14#
MS005 004154        4/34   20/15#
MS006 004200       16/14   20/16#
MS007 004232       16/43   20/17#
MSERR 004742       18/24   20/32#
MSLCR 003766        4/14    4/39   16/19   16/46   17/03   17/09   17/26
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O?D1P 023134  MC   20/01
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P377? 002224       19/60#
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PC1?2 002636       19/60#
PC1?S 002637       19/60#
PC4?0 002507       19/60#
PC6?0 002356       19/60#
PC7?  002510        3/04   19/60#
PCR?V 002352       19/60#
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POC?T 002267        3/14   19/60#
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TPS?P	002376		3/14	19/60#						
TP??	003351		20/02#							
TS1?	002516		19/60#							
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TTCR	002172		19/30	19/46#						
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0029 FBD1A

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