IDENTIFICATION

Product Code:	Maindec-08-D71A-D
Product Name:	680 DCS Expanded Static Test
Date Created:	May 15, 1967
Maintainer:	Diagnostic Group
Author:	E. Kenney

1 ABSTRACT

The 680 DCS Expanded Static Test consists of two independent test sequences intended to verify correct operation of the IOT instructions and control logic associated with the 680 Data Communications System. Test failures will result in a processor halt at a halt location associated with the failing test. Each test halt is interpreted as to failing test sequence, suggested failure source (where possible), and program restart instructions.

2 REQUIREMENTS

2.1 Storage

Test	Starting Address	End Address	
Line Clock Test	0200	0513	(Section 4)
IOT and Control Test	0674	2706	(Section 5)

2.2 Equipment

Minimum configuration PDP-8
Minimum configuration 680 DCS (i.e., 681 Data Line Interface and 685 Multiplexer Control)

3 PROGRAM LOADING

a. If the Binary Loader is resident in memory proceed to step b. Otherwise load the Binary Loader into memory.

b. Set the AC switch register to 7777 and depress the LOAD ADDRESS key. Then depress the START key.

c. Place the 680 DCS Expanded Static Test in the keyboard reader and turn the reader on.

d. When the binary program tape has been completely read into memory, the AC should contain zero indicating correct program tape checksum.

4 LINE CLOCK TEST

4.1 General Description

The line clock test verifies correct execution of the three IOT instructions associated with a specified clock number, and correct operation of the logic associated with each clock.

The three IOT Instructions are listed below:

IOT	Octal Value	Operation
TTXSKP	64Y1	Skip if specified clock flag is set
TTXON	64Y4	Reset and enable specified clock flag
TTXOFF	64Y2	Reset and disable specified clock flag

NOTE: X = 1, 2, 3, or 4 and Y = 2, 3, 4, or 5, respectively

With SR 2 set, the time intervals in microseconds of eight successive clock interrupts will be typed on the Model 33 Teleprinter.

The following chart lists the correct interrupt time intervals for various clock speeds:

Crystal Frequency	Line Baud Rate	Bit Time	Interrupt Time Interval (μsec)
14.08 kc	110	9.09 ms	1136
9.6 kc	75	13.3 ms	1665
6.4 kc	50	20.0 ms	2500
5.76 kc	45	22.2 ms	2780

NOTE: The interrupt time intervals will be reported within a tolerance of 1 percent.

The following example is the interrupt time interval report for clock no. 1 (110 baud):

```
CLOCK 1
1132   1124   1132   1132   1124   1132   1132   1132
```

4.2 Operating Procedure

a. Set SR to 0200 and depress LOAD ADDRESS

b. Select number of clock to be tested (SR 9, 10, and 11):
Clock No. 1 - SR 11 set; SR 9 and 10 reset
Clock No. 2 - SR 10 set; SR 9 and 11 reset
Clock No. 3 - SR 10 and 11 set; SR 9 reset
Clock No. 4 - SR 9 set; SR 10 and 11 reset

c. Select desired program control according to the following Switch Register Summary.

SR0 Set - Halt when error occurs
Reset - Bypass halt and continue to cycle

SR1 Set - Normal test sequence consists of
1. Reset and disable all clocks (TTXOFF)
2. Reset and enable specified clock (TTXON)
3. Enter Interrupt timer loop and wait for clock interrupt
4. Verify interrupt from specified clock and repeat steps 2 and 3, indefinitely (Interrupt time intervals are not stored or reported.)

Reset - Normal test sequence consists of
1. Reset and disable all clocks (TTXOFF)
2. Reset and enable specified clock (TTXON)
3. Enter interrupt time loop and wait for clock interrupt
4. Verify interrupt from specified clock and store interrupt time interval Repeat steps 2, 3, and 4, eight times
5. After eight clock interrupts, reset and disable clock and return to interrupt timer loop to verify correct execution of the TTXOFF instruction
6. When the interrupt timer expires (4MS), the eight stored interrupt time intervals may be typed (SR 2 set) and the test sequence is restarted at step 1 (SR 3 reset)

SR2 Set - Type eight successive clock interrupt time intervals
Reset - Bypass type routine

SR3 Set - Halt at completion of clock test (step 6)
Reset - Continuously cycle through steps 1-6

SR4 Set - Ring bell if error is detected
Reset - Bypass bell

d. Depress START. Clock test will now cycle. Note: Since the program stores the clock number specified in SR 9, 10, and 11 each time it recycles, the number of the clock to be tested may be changed while the clock test is cycling.

4.3 Description of Clock Test Error Halts

All clock test halts are referenced by an absolute octal memory address (halt location), and a mnemonic tag (halt tag). The Description of Halt associated with each program halt provides a statement of conditions leading to the halt and the program sequence following depression of CONTINUE.

NOTE: Except where otherwise specified, selection of bypass error halt (SR0 Reset) will result in the program sequence described for Continue.

Halt Location	Halt Tag	Description of Halt
206	ECT1	Operator selected nonexistent clock number (i.e., neither clock no. 1, 2, 3, or 4 was specified). Select desired clock number and depress CONTINUE. (SR 0 will not cause this halt to be bypassed.)
072	ECT2	Interrupt resulting from incorrect clock flag. AC contains number of clock causing error. Depress CONTINUE to reset and disable all clock flags, enable the clock specified by SR 9, 10, and 11, and restart clock test. Note: If error halts are bypassed (SR 0 reset) the clock causing the error will be reset and disabled and the clock test will continue.
134	ECT3	Interrupt resulting from source other than the 680 clock flags (1, 2, 3, and 4) or the Model 33 Teleprinter flag. Depress CONTINUE to restart clock test at location 200.
257	ECT4	Specified clock did not generate an interrupt within 4 ms after being enabled. Depress CONTINUE to restart clock test at location 200.

Halt Location	Halt Tag	Description of Halt
466	ECT5	Specified clock generated an interrupt within 4 ms after being disabled. Depress CONTINUE to reset and disable clock and reenter interrupt timer.
512	ECT	End of clock test (SR 3 set). Depress CONTINUE to restart clock test at location 200.

5 IOT AND CONTROL TEST

5.1 General Description

The IOT and control test is divided into 3 groups of related subtests involving:

a. 681 and 685 device selection (40 and 41, respectively).

b. IOT instructions (listed below) line selection register (LSR) and control logic associated with the 685.

IOT	Octal Value	Operation
TTCL	6411	Clear the LSR to 0
TTSL	6412	Load LSR from AC and clear AC to 0 (AC 5-11 inclusive or to LSR 0-6)
TTRL	6414	Load AC from LSR (LSR 0-6 inclusive OR to AC 5-11)
TTINCR	6401*	Increment the LSR by 1

*Decoded in 681

c. IOT instructions (listed below) and control logic associated with the 681 Data Line Interface.

IOT	Octal Value	Operation
TTI	6402	Transfer data from the 681 to the computer's MB register
TTO	6404	Transfer data from the AC to the 685

Execution of the IOT and control test does not require any connection of input data lines to output data lines. (Line no. 177 will be addressed during any tests requiring a mark level on the input data line.)

5.2 Operating Procedure

a. Set SR to 0674 and depress LOAD ADDRESS.

b. Select desired program control according to the following Switch Register Summary:

SR0 Set - Halt when error occurs
Reset - Disregard error, bypass halt and continue to cycle

SR1 Set - Scope mode (don't test for error, loop in current test)
Reset - Normal test cycle

SR2 Set - Verify mode (test for errors, cycle in current test)
Reset - Cycle through all tests

SR3 Set - Halt at completion of all tests
Reset - Repeat all tests

SR4 Set - Ring bell if error is detected
Reset - Bypass bell

SR5 Set - Ring bell after 680 complete test cycles (approximately 10 sec.)
Reset - Bypass bell

c. Depress START - The IOT and control test will be executed

5.3 Description of IOT and Control Test Error Halts

All test halts are referenced by an absolute octal memory address (halt location) and a mnemonic tag (halt tag). The Description of Halt associated with each program halt provides a statement of conditions leading to the halt and the program sequence following depression of CONTINUE.

NOTE: All 680 clocks are disabled during execution of the IOT and control test; the interrupt system is enabled (ION).

a. All error halts are listed below their associated subtest mnemonic and starting address.

NOTE: DST = 681-685 Device selection test group
LSR = 685 Line selection register test group
TS681 = 681 IOT and control test group

Octal Location	Halt Tag	Description of Halt
160	BADINT	Interrupt occurred from source other than the Model 33 Teleprinter flag. Depress CONTINUE to clear and disable all 680 clock flags and return to the particular test in progress. (Note: The return address is stored in location 0)
		Test DSTA - (location 674)
722	ERDST1	AC before execution = 4000; the 685 is addressed via IOT 6414 (TTRL). Expected contents of AC = 4000; actual results are displayed in the AC IOT 6414 should affect AC 5-11 only. If resulting AC = 2000, IOT 6414 may have been decoded in 681 as IOT 6404 Depress CONTINUE to repeat test DSTA

Octal Location	Halt Tag	Description of Halt
		Test DSTB - (location 724)
746	ERDST2	AC before execution = 0000; the 681 is addressed via IOT 6404 (TTO). Expected contents of AC = 0000; actual results are displayed in the AC If AC 5-11 ≠ 0, IOT 6404 may have been decoded in 685 as IOT 6414 Depress CONTINUE to repeat test DSTB
		Test LSRA - (location 1000)
1017	ERLSR1	AC before execution = 7777; the 685 is addressed via IOT 6412 (TTSL). Expected contents of AC = 0000; actual results are displayed in the AC IOT 6412 should clear the AC to 0 at IOP2 time Depress CONTINUE to repeat test LSRA
		Test LSRB - (location 1023)
1044	ERLSR2	AC before execution = 7777; the 685 is addressed via IOT 6411 (TTCL). Expected contents of AC = 7777; actual results are displayed in the AC IOT 6411 should not effect the AC Depress CONTINUE to repeat test LSRB
		Test LSRC - (location 1046)
1067	ERLSR3	AC before execution = 7777; the 685 is addressed via IOT 6414 (TTRL). Expected contents of AC = 7777; actual results are displayed in the AC The inclusive OR transfer of the LSR to AC should not affect the contents of the AC (regardless of the contents of the LSR) Depress CONTINUE to repeat test LSRC
		Test LSRD - (location 1071)
1113	ERAC1	IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA
1121	ERLSR4	With the AC preset to 7777, IOT 6412 (TTSL) is issued to load the LSR with 177 and clear the AC to 0 With the AC = 0000, IOT 6414 (TTRL) is issued to load the AC with the contents of the LSR. Expected contents of AC = 0177; actual results are displayed in the AC. Error could be a result of incorrect execution of IOT 6412 or IOT 6414, or both Depress CONTINUE to repeat test LSRD

Octal Location	Halt Tag	Description of Halt
		Test LSRE - (location 1125)
1156	ERAC2	IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA
1164	ERLSR5	The LSR is loaded with 177 twice, via two sequential IOT 6412 instructions (TTSL). With the AC = 0000, IOT 6414 (TTRL) is issued to load the AC with the contents of LSR. Expected contents of LSR and AC = 0177; actual results are displayed in the AC. Error indicates problem in inclusive OR gating of LSR flip-flops Depress CONTINUE to repeat test LSRE
		Test LSRF - (location 1200)
1227	ERAC3	IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA
1235	ERLSR6	The LSR is sequentially loaded with 177 and 000 via two IOT 6412 (TTSL) instructions With the AC = 0000, IOT 6414 (TTRL) is issued to load the AC with the contents of the LSR. Expected contents of LSR and AC = 0177; actual results are displayed in the AC Error indicates problem in inclusive OR gating of LSR flip-flops Depress CONTINUE to repeat test LSRF
		Test LSRG - (location 1240)
1262	ERAC4	IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA
1267	ERLSR7	The LSR is loaded with 177 via IOT 6412 (TTSL). IOT 6411 (TTCL) and 6414 (TTRL) are sequentially issued to reset the LSR to 0 and transfer the LSR to the AC Expected contents of LSR and AC = 000; actual results are displayed in the AC Error indicates incorrect execution of IOT 6411 (TTCL) Depress CONTINUE to repeat test LSRG
		Test LSRH - (location 1271)
1315	ERAC5	IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA

Octal Location	Halt Tag	Description of Halt
1323	ERLSR8	The LSR is cleared to 0 via IOT 6411 (TTCL). With the AC = 0125, IOT 6412 (TTSL) is issued to set LSR 0, 2, 4, and 6 to 1. IOT 6414 (TTRL) is then issued to load the AC with the contents of the LSR Expected contents of LSR and AC = 125; actual results are displayed in the AC Depress CONTINUE to repeat test LSRH
1353	ERAC6	Test LSRI - (location 1327) IOT 6412 (TTSL) associated with this subtest failed to clear the AC Depress CONTINUE to reexecute test LSRA
1361	ERLSR9	The LSR is cleared to 0 via IOT 6411 (TTCL). With the AC = 0052, IOT 6412 (TTSL) is issued to set LSR 1, 3 and 5 to 1. IOT 6414 (TTRL) is then issued to load the AC with the contents of the LSR Expected contents of LSR and AC = 052; actual results are displayed in the AC Depress CONTINUE to repeat test LSRI
		Test LSRJ - (location 1400)
1431	ELSR10	The LSR is sequentially cleared, loaded and read for all bit configurations (000-177) via IOT 6417 The expected contents of LSR and AC following execution of IOT 6417 are displayed in the AC Depress CONTINUE to cause the actual results to be displayed in the AC Depress CONTINUE again to repeat test LSRJ with the failing bit configuration Note: Selection of scope mode (SR1) causes the error check to be bypassed and the current bit configuration to be cycled continuously Selection of verify mode (SR2) allows the error check to be performed and all bit configurations (000-177) to be cycled continuously
		Test LSRK - (location 1441)
1500	ELSR11	The LSR is initially cleared to 0 via IOT 6411 (TTCL) The LSR is now incremented from 001 through 000, via successive IOT 6401 (TTINCR) instructions. The contents of the LSR are read and compared following each IOT 6401 instruction The expected contents of the LSR are displayed in the AC Depress CONTINUE to cause the actual results to be displayed in the AC Depress CONTINUE again to repeat test LSRK for the failing bit configuration

Octal Location	Halt Tag	Description of Halt
		Note: Selection of scope mode (SR1) causes the error check to be bypassed and the current bit configuration to be cycled continuously Selection of verify mode (SR2) allows the error check to be performed and the LSR to be continuously incremented from 001 through 000
		TS681A - (location 1600)
		The 681 Data line Interface is addressed via IOT 6400 (NOP). The 681 should take no action and the next instruction in sequence should be executed.
1625	ERTTO1	The instruction immediately following IOT 6400 was not executed Error could be a result of incorrect generation of skip enable Depress CONTINUE to repeat test TS681A
1631	ERTTO2	Two instructions immediately following IOT 6400 were not executed Error indicates that IOT 6400 was incorrectly interpreted as IOT 6402 (TTI) Depress CONTINUE to repeat test TS681A
1635	ERTTO3	The link bit was cleared to 0 indicating that IOT 6400 was incorrectly interpreted as IOT 6404 (TTO) Depress CONTINUE to repeat test TS681A
		TS681B - (location 1641)
		With the AC = 0000 and the Link = 1, IOT 6404 (TTO) is issued. Following execution of IOT 6404 the AC and Link should contain 0.
1663	ERTTO4	The Link contained 1 following execution of IOT 6404 The resulting contents of the AC and Link are displayed Check operation of zero Link and RAR in the 681 Depress CONTINUE to repeat test TS681B
1670	ERTTO5	The Link was reset but AC0 was set to 1. The resulting contents of the Link and AC are displayed Check operation of zero Link Depress CONTINUE to repeat test TS681B
		TS681C - (location 1672)
1715	ERTTO6	With the AC = 4001 and Link = 1, IOT 6404 (TTO) is issued. If IOT 6404 is executed correctly the Link will be cleared to 0, AC 11 will be inhibited from shifting into the Link and AC 0-10 will be shifted one place to the right. The expected test results are AC = 2000 and Link = 0; the actual test results are displayed

Octal Location	Halt Tag	Description of Halt
1723	ERTTO7	Link was not reset to 0. Assuming TS681B was executed correctly, this error indicates failure of Link rotate disable Depress CONTINUE to repeat test TS681C AC did not contain 2000 indicating incorrect execution of RAR Depress CONTINUE to repeat test TS681C TS681D - (location 1727) With the AC = 5252 and Link = 0, IOT 6404 (TTO) is issued. Expected test results are AC = 2525 and Link = 0. The actual test results are displayed
1751	ERTTO8	Link was set to 1. Check for incorrect execution of CML Depress CONTINUE to repeat test TS681D
1760	ERTTO9	AC did not contain 2525 following execution of IOT 6404. Check execution of RAR Depress CONTINUE to repeat test TS681D TS681E - (location 2000) This test verifies correct execution format of IOT 6402 (TTI) IOT 6402 instruction format: Location A (6402) TTI Instruction A+1 (LSW) Line Status Word A+2 (CAW) Character Assembly Word A+3 (XXXX) Next Instruction in Sequence A+4 (XXXX)
2020	ERTTI1	The contents of A+1 were incorrectly interpreted as an instruction. Check for generation of the S cycle and its associated control functions (e.g., TTSET, PC→MA, Enable, Spec. cycle) Depress CONTINUE to repeat test TS681E
2024	ERTTI2	Location A+1 was correctly interpreted as the LSW but A+2 was incorrectly interpreted as an instruction. Check for correct operation of skip bus in enable during the S cycle Depress CONTINUE to repeat test TS681E
2030	ERTTI3	The instruction in location A+4 was the first instruction executed after completion of the TTI instruction. Since A+3 was not executed check for incorrect (extra) skip enable during the S cycle Depress CONTINUE to repeat test TS681E

Octal Location	Halt Tag	Description of Halt
		TS681F - (location 2034) See IOT 6402 format (pg. 10) With the LSW and CAW preset to 2000, IOT 6402 (TTI) is issued Correct execution of IOT 6402 should result in the contents of LSW shifted one position to the right with LSW0 = 0 (resulting LSW = 1000). The CAW should be unmodified (resulting CAW = 2000) Note: The LSR is loaded with 177 before the test is executed
2073	ERTTI4	Resulting LSW ≠ 1000. Actual results are displayed in the AC. Check operation of shift MB Depress CONTINUE to repeat test TS681F
2104	ERTTI5	The LSW was shifted correctly but LSW0 = 1 indicates a start level on the Teletype data in lead. Check operation of MB0 shift enable. (Resulting LSW is displayed in the AC) Depress CONTINUE to repeat test TS681F
2115	ERTTI6	LSW 9, 10, and 11 were ≠ 0 following execution of IOT 6402 indicating incorrect execution of count MB Depress CONTINUE to repeat test TS681F
2121	ERTTI7	Resulting LSW ≠ 1000. Actual results are displayed in the AC. Check for a combination of the above three error conditions Depress CONTINUE to repeat test TS681F
2127	ERTTI8	CAW was modified; results are displayed in the AC Check for incorrect generation of C cycle. (C cycle should be executed only when LSW0 = 1 and LSW 9, 10, and 11 = 0, 1, 1, respectively) Depress CONTINUE to repeat test TS681F TS681G - (location 2200) See IOT 6402 format (pg. 10) With the CAW preset to 4000 and the LSW present to the condition required for entry into the C cycle (LSW = 4003), IOT 6402 (TTI) is issued. Correct execution of IOT 6402 should result in LSW = 4004 and CAW = 6000 Note: The LSR is preloaded with 177
2234	ERTTI9	LSW ≠ 4004. Check operation of count MB, shift MB and MB0 shift enable. (The actual LSW results are displayed in the AC) Depress CONTINUE to repeat test TS681G

Octal Location	Halt Tag	Description of Halt
2246	ETTI10	CAW ≠ 6000. (Actual CAW results are displayed in the AC). Check C cycle execution (e.g., shift MB, MB0 shift enable, TTSET, etc.) Depress CONTINUE to repeat test TS681G
2252	ETTI11	CAW ≠ 6000, contents of location A+3 were modified (Actual results of CAW are displayed in the AC) Check for incorrect skip enable during the S cycle Depress CONTINUE to repeat test TS681G TS681H - (location 2262) See IOT 6402 format, (pg. 10) IOT 6402 (TTI) is issued with successive LSW counts of 4, 5, 6, 7, 0, 1 and 2 (i.e., 4004 - 4002) The LSW and CAW are examined after each TTI execution to insure correct execution of count MB and correct LSW count interpretation Note: The LSR is preloaded with 177
2340	ETTI12	LSW0 was reset to 0 (resulting LSW is displayed in AC) Check operation of S cycle MB shift Depress CONTINUE to repeat test TS681H
2347	ETTI13	The LSW count was not correct following execution of IOT 6402. The expected contents of the LSW are displayed in the AC Depress CONTINUE to display the actual LSW results Depress CONTINUE again to retest failing count
2361	ETTI14	The CAW was modified indicating incorrect entry into C cycle. (Expected contents of CAW = 4000, actual CAW results displayed in AC) Depress CONTINUE to retest failing count Note: Selection of scope mode (SR1) causes the error check to be bypassed and the current LSW count to be cycled continuously Selection of verify mode (SR2) allows error check to be performed and LSW counts 4 through 2 to be continuously tested TS681I - (location 2400) This test verifies correct operation of MB0 (1) shift enable and MB1-11 (1) shift
2440	ERMBS1	Incorrect MB shift results. Expected results are displayed in the AC Depress CONTINUE to display the actual MB shift results in the AC Depress CONTINUE again to retest failing MB shift Note: Selection of scope mode (SR1) causes the MB shift error check to be bypassed and the current MB shift configuration to be cycled continuously

Octal Location	Halt Tag	Description of Halt
		Selection of verify mode (SR2) allows the MB shift error check to be performed and the full MB shift test to be cycled continuously TS681J - (location 2456) This test verifies correct operation of MB1-11 (0) shift
2517	ERMBS2	Incorrect MB shift results. Expected results are displayed in the AC Depress CONTINUE to display the actual MB shift results in the AC Depress CONTINUE again to retest failing MB shift (See note for TS681I) TS681K - (location 2600) This test verifies correct operation of MB shift via a shift pattern of alternate 1s and 0s
2654	ERMBS3	Incorrect MB shift results. Expected results are displayed in the AC Depress CONTINUE to display the actual MB shift results in the AC Depress CONTINUE again to retest failing MB shift (See note for TS681I)
2674	ENDTST	End of Static Test. Depress CONTINUE to repeat all tests.

6 MISCELLANEOUS

It is suggested that the IOT and Control Test be run with appropriate voltage margins before attempting to execute the 680 DCS Data and Control Test (MAINDEC-08-D72A-D).

7 PROGRAM LISTING

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/680 DCS EXPANDED STATIC TEST

/IOT INSTRUCTION DEFINITIONS

TT1OFF=6422
TT2OFF=6432
TT3OFF=6442
TT4OFF=6452

TT1ON=6424
TT2ON=6434
TT3ON=6444
TT4ON=6454

TT1SKP=6421
TT2SKP=6431
TT3SKP=6441
TT4SKP=6451
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```
/SWITCH REGISTER SETTINGS FOR IOT AND CONTROL TEST:
/
/SR0  -  HALT ON ERROR
/SR1  -  SCOPE MODE (DON'T TEST FOR ERROR, LOOP IN CURRENT TEST)
/SR2  -  VERIFY MODE (TEST FOR ERRORS, LOOP IN CURRENT TEST)
/SR3  -  HALT AT COMPLETION OF STATIC TEST
/SR4  -  SIGNAL ERROR WITH BELL
/SR5  -  SIGNAL COMPLETION OF 4096 TEST CYCLES:
/
/SWITCH REGISTER SETTINGS FOR 680 CLOCK TEST:
/SR0  -  HALT ON ERROR
/SR1  -  SCOPE MODE
/SR2  -  TYPE 8 SUCCESSIVE INTERRUPT TIME INTERVALS, (SR1 RESET)
/SR3  -  HALT AT COMPLETION OF CLOCK TEST
/SR4  -  SIGNAL ERROR WITH BELL



            /PAGE ZERO:  CONSTANTS AND SUBROUTINES

            *0
0000  0000    0
0001  3010  INTRPT,     DCA KEEPAC                    /STORE AC
0002  7010    RAR
0003  3011    DCA STORL                           /STORE LINC
0004  5142    JMP CHTPTR                        /TEST FOR TELEPRINTER FLAG

0005  0345  CLSUBR,     JMPCL1-1
0006  0000  COUNT,      0             /CONTAINS CLOCK INTERRUPT COUNT IN MSEC
0007  0000  FSTPAS,     0             /EQUALS ZERO TO SIGNIFY 1ST CLOCK INTERRUPT
0010  0000  KEEPAC,     0
0011  0000  STORL,      0
0012  0000  INTSTA,     0
0013  0200  MSKSR4,     0200
0014  0207  BELL,       0207
0015  4000  MSKSR0,     4000
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                *0020
                /DECODE SWITCH REGISTER 0
0020  0000    SR0,        0
0021  7604      CLA OSR
0022  0015      AND MSKSR0
0023  7640      SZA CLA
0024  2020      ISZ SR0                   /ADD ONE TO RETURN ADDRESS IF SR0 IS SET
0025  7604      CLA OSR
0026  0013      AND MSKSR4
0027  7640      SZA CLA                   /RING BELL?
0030  5032      JMP .+2                   /YES
0031  5420      JMP I SR0                           /NO
0032  6002      IOF
0033  1014      TAD BELL
0034  6046      TLS
0035  6041      6041                      /SKIP ON TELEPRINTER FLAG
0036  5035      JMP .-1
0037  7300      CLA CLL
0040  6001      ION
0041  5420      JMP I SR0

                /DECODE SWITCH REGISTER 1
0042  0000    SR1,        0
0043  7604      CLA OSR
0044  0050      AND MSKSR1
0045  7640      SZA CLA
0046  2042      ISZ SR1                   /ADD ONE TO RETURN ADDRESS IF SR1 IS SET
0047  5442      JMP I SR1
0050  2000    MSKSR1,     2000

                /DECODE SWITCH REGISTER 2
0051  0000    SR2,        0
0052  7604      CLA OSR
0053  0057      AND MSKSR2
0054  7640      SZA CLA
0055  2051      ISZ SR2                   /ADD ONE TO RETURN ADDRESS IF SR2 IS SET
0056  5451      JMP I SR2
0057  1000    MSKSR2,     1000

                /DECODE SWITCH REGISTER 3
0060  0000    SR3,        0
0061  7604      CLA OSR
0062  0066      AND MSKSR3
0063  7640      SZA CLA
0064  2060      ISZ SR3                   /ADD ONE TO RETURN ADDRESS IF SR3 IS SET
0065  5460      JMP I SR3
0066  0400    MSKSR3,     0400
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```
                /COME HERE IF WRONG CLOCK INTERRUPTS

                /CLOCK1 IN ERROR
0067  4020  ERCL1,      JMS SR0                 /DO WE WISH TO HALT? (SR0 SET)
0070  5074    JMP .+4                 /DON'T HALT
0071  1126    TAD ONE
0072  7402  ECT2,       HLT                     /HALT AND DISPLAY ERROR CLOCK NUMBER
0073  5477    JMP I ARSTRT          /RE-INITIALIZE CLOCK TEST
0074  6422    TT1OFF                  /RESET AND DISABLE CLOCK FLAG1
0075  5500    JMP I AINTON          /RETURN TO TIMER
0076  6232  ACLFLG,     CLRFLG
0077  6200  ARSTRT,     SELECT
0100  6233  AINTON,     INTON-1

                /CLOCK2 IN ERROR
0101  4020  ERCL2,      JMS SR0                 /DO WE WISH TO HALT? (SR0 SET)
0102  5106    JMP .+4                 /DON'T HALT
0103  1127    TAD TWO
0104  5072    JMP ECT2                /HALT AND DISPLAY ERROR CLOCK NUMBER
0105  5477    JMP I ARSTRT          /RE-INITIALIZE CLOCK TEST
0106  6432    TT2OFF                  /RESET AND DISABLE CLOCK FLAG2
0107  5500    JMP I AINTON          /RETURN TO TIMER

                /CLOCK3 IN ERROR
0110  4020  ERCL3,      JMS SR0                 /DO WE WISH TO HALT? (SR0 SET)
0111  5115    JMP .+4                 /DON'T HALT
0112  1130    TAD THREE
0113  5072    JMP ECT2                /HALT AND DISPLAY ERROR CLOCK NUMBER
0114  5477    JMP I ARSTRT          /RE-INITIALIZE CLOCK TEST
0115  6442    TT3OFF                  /RESET AND DISABLE CLOCK FLAG 3
0116  5500    JMP I AINTON          /RETURN TO TIMER

                /CLOCK4 IN ERROR
0117  4020  ERCL4,      JMS SR0                 /DO WE WISH TO HALT? (SR0 SET)
0120  5124    JMP .+4                 /DON'T HALT
0121  1131    TAD FOUR
0122  5072    JMP ECT2                /HALT AND DISPLAY ERROR CLOCK NUMBER
0123  5477    JMP I ARSTRT          /RE-INITIALIZE CLOCK TEST
0124  6452    TT4OFF                  /RESET AND DISABLE CLOCK FLAG 4
0125  5500    JMP I AINTON          /RETURN TO TIMER

0126  0001  ONE,        0001
0127  0002  TWO,        0002
0130  0003  THREE,      0003
0131  0004  FOUR,       0004
```

```
                /INTERRUPT FROM UNDETERMINED SOURCE
0132  4020  NOFLAG,     JMS SR0                     /DO WE WISH TO HALT?
0133  5477    JMP I ARSTRT          /DON'T HALT
0134  7402  ECT3,       HLT                         /UNDETERMINED INTERRUPT SOURCE
0135  5477    JMP I ARSTRT

0136  0000  TIMOUT,     0                           /CLOCK INTERRUPT AND TIME-OUT STATUS
0137  0000  CLOCK,      0                           /CONTAINS NUMBER OF CLOCK BEING TESTE
0140  0000  STORAC,     0
0141  0000  AUXAC,      0

0142  6041  CHTPTR,     TSF                         /SKIP IF TELEPRINTER FLAG SET
0143  5153    JMP CHKINT
0144  6042    TCF                         /CLEAR TELEPRINTER FLAG

                /RESUME NORMAL PROGRAM SEQUENCE
0145  7300  RNPS,       CLA CLL
0146  1011    TAD STORL
0147  7004    RAL                         /RESTORE LINC BIT
0150  1010    TAD KEEPAC                        /RESTORE AC
0151  6001    ION
0152  5400    JMP I INTRPT-1

                /TEST INTERRUPT STATUS
0153  1136  CHKINT,     TAD TIMOUT
0154  7500    SMA                         /SKIP IF INTERRUPT ERROR HAS OCCURRED
0155  5405    JMP I CLSURR          /TEST FOR SPECIFIED CLOCK FLAG
0156  4020    JMS SR0                     /HALT ON ERROR?
0157  5161    JMP .+2                     /NO
0160  7402  RADINT,     HLT                         /HALT DUE TO INTERRUPT ERROR

                /CLEAR AND DISABLE ALL 680 CLOCK FLAGS
0161  6422    TT1OFF
0162  6432    TT2OFF
0163  6442    TT3OFF
0164  6452    TT4OFF
0165  5145    JMP RNPS
```

```
                /680 DCS EXPANDED STATIC TEST

                /LINE CLOCK TEST

                *200

                /OPERATOR MUST SPECIFY CLOCK NUMBER 1, 2, 3 OR 4

0200  7604  SELECT,     CLA OSR                    /BRING S.R. INTO A.C.
0201  0342    AND MASK1                            /DISREGARD AC0-AC8
0202  3137    DCA Z CLOCK          /STORE CLOCK SELECTION
0203  1137    TAD Z CLOCK
0204  7440    SZA                       /VERIFY THAT CLOCK 1-4 IS SELECTED
0205  5210    JMP .+3
0206  7402  ECT1,       HLT                        /OPERATOR SELECTED NON EXISTANT CLOCK
0207  5200    JMP SELECT
0210  1343    TAD M5
0211  7500    SMA                       /SKIP ON MINUS AC
0212  5206    JMP .-4

                /OPERATOR SELECTED EXISTANT CLOCK-PROCEED WITH TEST

                /SET UP CLOCK SUBROUTINE ADDRESS POINTER
0213  7300  RESTRT,     CLA CLL
0214  1345    TAD JMPADD
0215  1137    TAD Z CLOCK
0216  3005    DCA Z CLSUBR         /CLSUBR NOW POINTS TO CORRECT CLOCK
                                   /SUBROUTINE
0217  3136    DCA Z TIMOUT         /RESET TIME-OUT ADDRESS POINTER
0220  3007    DCA FSTPAS                /RESET FIRST PASS INDICATOR

                /RESET AND DISABLE ALL CLOCK FLAGS, (64X2)

0221  6422    TT1OFF
0222  6432    TT2OFF
0223  6442    TT3OFF
0224  6452    TT4OFF

                /ENABLE SELECTED CLOCK

0225  1137    TAD Z CLOCK
0226  7106    CLL RTL
0227  7004    RAL
0230  1352    TAD ALLCLK
0231  3232    DCA CLRFLG
0232  6424  CLRFLG,     6424                       /THIS INSTRUCTION IS MODIFIED TO ENABLE
0233  1007    TAD Z FSTPAS         /SPECIFIED CLOCK
0234  6001  INTON,      ION                        /ENABLE THE INTERRUPT SYSTEM
0235  7640    SZA CLA
0236  5241    JMP TIMER+1          /DON'T RESET COUNT IF FSTPAS IS ONE
0237  5240    JMP TIMER
```

```
                /CLOCK INTERRUPT TIMER

0240  3006  TIMER,      DCA COUNT                          /RESET INTERRUPT TIMER
0241  1354    TAD M412
0242  3353    DCA PASS                  /PRESET INTERRUPT TIME OUT COUNTER
0243  1006  ADD,        TAD COUNT
0244  1355    TAD TIME                  /TIME EQUALS 15 MICROSECONDS (DECIMAL)
0245  3006    DCA COUNT
0246  7000    NOP
0247  2353    ISZ PASS                  /GO TO TIME OUT ROUTINE IF PASS EQUALS 0
0250  5243    JMP ADD

                /COME HERE IF INTERRUPT TIME OUT RESULTS

0251  6002    IOF                       /DISABLE INTERRUPT SYSTEM
0252  1136    TAD Z TIMOUT          /EXAMINE TIME OUT STATUS INDICATOR
0253  7440    SZA
0254  5744    JMP I AEXIT           /TIME OUT EXPECTED

                /TIMEOUT NOT EXPECTED

0255  4020    JMS Z SR0                          /DO WE HALT ON ERRORS? (S.R.0 SET)
0256  5213    JMP RESTRT                /NO! RESTART TEST
0257  7402  ECT4,       HLT                    /NO INTERRUPT FROM SELECTED CLOCK
                /OPERATOR MAY RESTART TEST BY DEPRESSING CONTINUE
0260  5213    JMP RESTRT

                /INTERRUPT SUBROUTINE-CLOCK1
0261  6431  CLOCK1,     TT2SKP                 /SKIP IF WRONG CLOCK FLAG SET (CLOCK
0262  5264    JMP .+2
0263  5101    JMP Z ERCL2           /CLOCK 2 FLAG SET
0264  6441    TT3SKP                    /SKIP IF WRONG CLOCK FLAG SET, (CLOCK 3)
0265  5267    JMP .+2
0266  5110    JMP Z ERCL3           /CLOCK 3 FLAG SET
0267  6451    TT4SKP                    /SKIP IF WRONG CLOCK FLAG SET, (CLOCK 4)
0270  5272    JMP .+2
0271  5117    JMP Z ERCL4           /CLOCK 4 FLAG SET
                /VERIFY THAT SPECIFIED CLOCK CAUSED INTERRUPT
0272  6421    TT1SKP
0273  5132    JMP Z NOFLAG          /NO CLOCK FLAG SET
0274  5741    JMP I CLOKOK          /INTERRUPT CAUSED BY CORRECT CLOCK
```

```
                /INTERRUPT SUBROUTINE - CLOCK 2
01275  6421     CLOCK2,     TT1SKP                    /SKIP IF WRONG CLOCK FLAG SET, (CLOCK1)
01276  5300       JMP .+2
01277  5067       JMP Z ERCL1          /CLOCK 1 FLAG SET
01300  6441       TT3SKP                    /SKIP IF WRONG CLOCK FLAG SET (CLOCK 3)
01301  5303       JMP .+2
01302  5110       JMP Z ERCL3          /CLOCK 3 FLAG SET
01303  6451       TT4SKP                    /SKIP IF WRONG CLOCK FLAG SET (CLOCK 4)
01304  5306       JMP .+2
01305  5117       JMP Z ERCL4          /CLOCK 4 FLAG SET
                /VERIFY THAT SPECIFIED CLOCK CAUSED INTERRUPT
01306  6431       TT2SKP
01307  5132       JMP Z NOFLAG         /NO CLOCK FLAG SET
01310  5741       JMP I CLOKOK         /INTERRUPT CAUSED BY CORRECT CLOCK

                /INTERRUPT SUBROUTINE - CLOCK 3
01311  6421     CLOCK3,     TT1SKP                    /SKIP IF WRONG CLOCK FLAG SET, (CLOCK 1
01312  5314       JMP .+2
01313  5067       JMP Z ERCL1          /CLOCK 1 FLAG SET
01314  6431       TT2SKP                    /SKIP IF WRONG CLOCK FLAG SET, (CLOCK 2)
01315  5317       JMP .+2
01316  5101       JMP Z ERCL2          /CLOCK 2 FLAG SET
01317  6451       TT4SKP                    /SKIP OF WRONG CLOCK FLAG SET (CLOCK 4)
01320  5322       JMP .+2
01321  5117       JMP Z ERCL4          /CLOCK 4 FLAG SET
                /VERIFY THAT SPECIFIED CLOCK CAUSED INTERRUPT
01322  6441       TT3SKP
01323  5132       JMP Z NOFLAG         /NO CLOCK FLAG SET
01324  5741       JMP I CLOKOK         /INTERRUPT CAUSED BY CORRECT CLOCK

                /INTERRPT SUBROUTINE - CLOCK 4
01325  6421     CLOCK4,     TT1SKP                    /SKIP IF WRONG CLOCK FLAG SET (CLOC  )
01326  5330       JMP .+2
01327  5067       JMP Z ERCL1          /CLOCK 1 FLAG SET
01330  6431       TT2SKP                    /SKIP IF WRONG CLOCK FLAG SET (CLOCK 2)
01331  5333       JMP .+2
01332  5101       JMP Z ERCL2          /CLOCK 2 FLAG SET
01333  6441       TT3SKP                    /SKIP IF WRONG CLOCK FLAG SET (CLOCK 3)
01334  5336       JMP .+2
01335  5110       JMP Z ERCL3          /CLOCK 3 FLAG SET
                /VERIFY THAT SPECIFIED CLOCK CAUSED INTERRUPT
01336  6451       TT4SKP
01337  5132       JMP Z NOFLAG         /NO CLOCK FLAG SET
01340  5741       JMP I CLOKOK         /INTERRUPT CAUSED BY CORRECT CLOCK

01341  0400   CLOKOK,     COMCLK
```

```
0342  0007  MASK1,       0007
0343  7773  M5,          -5
0344  0470  AEXIT,       EXIT

            /INTERRUPT ADDRESS POINTER
0345  0345  JMPADD,      JMPCL1-1

            /JUMP TO SPECIFIED CLOCK SUBROUTINE
0346  5261  JMPCL1,      JMP CLOCK1
0347  5275    JMP CLOCK2
0350  5311    JMP CLOCK3
0351  5325    JMP CLOCK4

0352  6414  ALLCLK,      6414
0353  0000  PASS,        0                          /NO INTERRUPT TIME OUT COUNTER
0354  7366  M412,        -412
0355  0017  TIME,        17                         /OCTAL TIME, IN MICROSECONDS, REQUIRED
                                    /FOR ONE TIMER LOOP
```

```
                *400
                /INTERRUPT ROUTINE - ALL CLOCKS
0400    7300    COMCLK,     CLL CLA
0401    1136      TAD Z TIMOUT          /CHECK CLOCK INTERRUPT STATUS
0402    7640      SZA CLA
0403    5264      JMP INTERR                  /JUMP TO ERROR ROUTINE
0404    1007      TAD Z FSTPAS          /IS THIS THE 1ST INTERRUPT?
0405    7640      SZA CLA
0406    5217      JMP NORMAL                  /THIS IS NOT THE 1ST INTERRUPT

                /FIRST INTERRUPT FROM SPECIFIED CLOCK
0407    1234      TAD M10
0410    3237      DCA INTCNT                  /PRESET PASS COUNTER
0411    1241      TAD ATABLE
0412    3240      DCA STORE                             /PRESET ADDRESS OF COUNT STORAGE
0413    2007      ISZ Z FSTPAS
0414    1235      TAD P142                    /PRESET COUNT BEFORE RE-ENTERING TIMER
0415    3006      DCA Z COUNT
0416    5476      JMP I Z ACLFLG        /RETURN TO INTERRUPT TIMER

                /COME HERE FOR NORMAL INTERRUPT PASS
0417    4042    NORMAL,     JMS Z SR1                               /SCOPE MODE? (SR1 SET)
0420    5223      JMP .+3                   /NO
0421    3006      DCA Z COUNT           /YES; ENABLE AND CLEAR CLOCK FLAG AND
0422    5476      JMP I Z ACLFLG        /RETURN TO TIMER

0423    2240      ISZ STORE
0424    1006      TAD Z COUNT
0425    3640      DCA I STORE           /STORE INTERRUPT TIME INTERVAL
0426    2237      ISZ INTCNT                  /IS THIS THE EIGHTH INTERRUPT PASS?
0427    5231      JMP .+2                     /NO
0430    5252      JMP LSTPAS                  /YES, DISABLE CLOCK FLAG
0431    1236      TAD P161
0432    3006      DCA Z COUNT           /PRESET COUNT BEFORE RE-ENTERING TIMER
0433    5476      JMP I Z ACLFLG        /RETURN TO TIMER

                /PG2 - CONSTANTS AND VARIABLES
0434    7770    M10,        -10
0435    0142    P142,       0142
0436    0161    P161,       0161
0437    0000    INTCNT,     0
0440    0000    STORE,      0
0441    0441    ATABLE,     TIMTBL-1

0442    0000    TIMTBL,     0                           /INTERRUPT TIME INTERVALS FOR EIGHT
0443    0000      0                         /SUCCESSIVE PASSES WILL BE STORED IN
0444    0000      0                         /THIS TABLE
0445    0000      0
0446    0000      0
0447    0000      0
0450    0000      0
0451    0000      0
```

```
                /COME HERE FOR EIGHTH INTERRUPT PASS
01452  2136     LSTPAS,     ISZ Z TIMOUT        /UPDATE INTERRUPT AND TIME-OUT STATUS
01453  1137       TAD Z CLOCK
01454  7106       CLL RTL
01455  7004       RAL
01456  1263       TAD TTXOFF
01457  3260       DCA .+1
01460  6422     DISABL,     TT1OFF                    /INSTRUCTION IS MODIFIED FOR SPECIFIED CLOCK
01461  3006       DCA Z COUNT          /RESET INTERRUPT TIMER
01462  5500       JMP I Z AINTON       /RETURN TO TIMER

01463  6412     TTXOFF,     6412

                /COME HERE IF INTERRUPT OCCURS AFTER
                /CLOCK HAS BEEN DISABLED

01464  4020     INTERR,     JMS Z SR0                          /DO WE HALT ON ERROR? (SR.0 SET)
01465  5260       JMP DISABLE          /NO.  DISABLE CLOCK AND CONTINUE
01466  7402     ECT5,       HLT                        /INTERRUPT FROM SPECIFIED CLOCK AFTER
                                      /CLOCK HAD BEEN DISABLED
01467  5260       JMP DISABLE

                /EXIT FROM CLOCK TEST
01470  4051     EXIT,       JMS Z SR2                          /DO WE TYPE?
01471  5310       JMP NOTYPE               /NO
                /TYPE INTERRUPT TIME INTERVALS
01472  1234       TAD M10
01473  3237       DCA INTCNT               /PRESET PASS COUNTER
01474  1241       TAD ATABLE
01475  3240       DCA STORE                          /PRESET ADDRESS OF COUNT STORAGE
01476  6046       TLS                      /INITIALIZE TTY
01477  4314       JMS CRLF
01500  4332       JMS HEADER
01501  4314       JMS CRLF
01502  2240     GETNXT,     ISZ STORE
01503  1640       TAD I STORE          /GET TIME TO BE TYPED
01504  4763       JMS I ADEC                 /CONVERT TIME TO DECIMAL AND TYPE
01505  2237       ISZ INTCNT
01506  5302       JMP GETNXT
01507  4314       JMS CRLF

                /ALL TIMES ARE NOW TYPED
01510  4060     NOTYPE,     JMS SR3                    /DO WE REPEAT CLOCK TEST? (SR3 RESET)
01511  5477       JMP I ARSTRT         /YES, REPEAT
01512  7402     ECT,        HLT                        /END OF 680 CLOCK TEST
01513  5477       JMP I ARSTRT         /DEPRESS CONTINUE TO REPEAT CLOCK TEST
```

```
                    /SEND CR AND LF
0514  0000  CRLF,       0
0515  1322    TAD CR
0516  4324    JMS TYPE
0517  1323    TAD LF
0520  4324    JMS TYPE
0521  5714    JMP I CRLF

0522  0215  CR,         215
0523  0212  LF,         212
```

```
                /TRANSMIT SUBROUTINE
0524  0000      TYPE,       0
0525  6041        TSF
0526  5325        JMP .-1
0527  6046        TLS                         /TRANSMIT CONTENTS OF AC4-AC11
0530  7300        CLA CLL
0531  5724        JMP I TYPE
                /TYPE CLOCK NUMBER
0532  0000      HEADER,     0
0533  1352        TAD ALETTR
0534  3353        DCA GETLTR
0535  1137        TAD Z CLOCK
0536  1362        TAD ASCI
0537  3361        DCA LETTR+5
0540  1351        TAD M6
0541  3350        DCA FINISH
0542  1753        TAD I GETLTR            /PLACE ASCI CHARACTER IN AC
0543  4324        JMS TYPE
0544  2353        ISZ GETLTR
0545  2350        ISZ FINISH                  /HAS THE LAST CHAR BEEN TYPED
0546  5342        JMP .-4                     /NO, TYPE NEXT
0547  5732        JMP I HEADER            /YES, RETURN TO MAIN PROGRAM

0550  0000      FINISH,     0

0551  7772      M6,         -6
0552  0554      ALETTR,     LETTR
0553  0000      GETLTR,     0

0554  0303      LETTR,      0303                    /C
0555  0314        0314                      /L
0556  0317        0317                      /O
0557  0303        0303                      /C
0560  0313        0313                      /K
1561  0000        0000                      /1,2,3, OR 4

1562  0260      ASCI,       0260
0563  0600      ADEC,       DEC
```

```
                PAUSE

                /680 DCS EXPANDED STATIC TEST  -  TAPE 2
                *600

                /OCTAL TO DECIMAL CONVERSION ROUTINE

0600  0000  DEC,       0
0601  3222    DCA WORK                    /STORE OCTAL TIME
0602  3223    DCA ANSR
0603  1224    TAD ADBAKA
0604  3225    DCA PUTBAK
0605  1226    TAD ASUBTR
0606  3227    DCA AWAY
0607  4241    JMS CONVRT                  /TYPE THOUSANDS
0610  4241    JMS CONVRT                  /TYPE HUNDREDS
0611  4241    JMS CONVRT                  /TYPE TENS
0612  1222    TAD WORK
0613  1230    TAD ASCII
0614  4632    JMS I ATYPE           /TYPE UNITS
0615  1231    TAD SPACE
0616  4632    JMS I ATYPE
0617  1231    TAD SPACE
0620  4632    JMS I ATYPE           /TYPE TWO SPACES
0621  5600    JMP I DEC                         /GO GET NEXT OCTAL TIME

0622  0000  WORK,       0
0623  0000  ANSR,       0
0624  0633  ADBAKA,     ADBAK
0625  0000  PUTBAK,     0
0626  0636  ASUBTR,     SUBTR
0627  0000  AWAY,       0
0630  0260  ASCII,      0260
0631  0240  SPACE,      0240
0632  0524  ATYPE,      TYPE

0633  1750  ADBAK,      1750                    /+1000
0634  0144    0144                  /+100
0635  0012    0012                  /+12
0636  6030  SUBTR,      6030                    /-1000
0637  7634    7634                  /-100
0640  7766    7766                  /-10
```

```
0641  6000  CONVRT,     0
0642  1222     TAD WORK
0643  1627     TAD I AWAY              /SUBTRACT 1000, 100, OR 10
0644  7420     SNL
0645  5251     JMP .+4
0646  2223     ISZ ANSR
0647  7100     CLL
0650  5243     JMP .-5
0651  1625     TAD I PUTBAK        /ADD BACK 1000, 100, OR 10
0652  3222     DCA WORK                /STORE REMAINDER
0653  1223     TAD ANSR
0654  1230     TAD ASCII                       /CONVERT RESULTS TO ASCI CODE
0655  4632     JMS I ATYPE
0656  3223     DCA ANSR                /CLEAR ANSR.
0657  2227     ISZ AWAY
0660  2225     ISZ PUTBAK
0661  5641     JMP I CONVRT
```

```
                *674

                /IOT INSTRUCTION DEFINITIONS

                TTCL=6411               /CLEAR LSR TO ZERO. (685)
                TTSL=6412               /INCLUSIVE OR AC5-11 WITH LSR0-6 (685)
                TTRL=6414               /INCLUSIVE OR LSR0-6 WITH AC6-11 (685)

                TTINCR=6401         /INCREMENT LSR BY 1 (681 AND 685)

                TTI=6402                /RECEIVE DATA (681)
                TTO=6404                /TRANSMIT DATA (681)


                /681-685 DEVICE SELECTION TEST. (TEST DST)
                /DSTA
0674  7300    ST685,      CLA CLL                 /VERIFY THAT DEV. SEL. 41 DOES NOT
                                        /SELECT 681
0675  1351      TAD C4000
0676  3136      DCA Z TIMOUT          /PRESET INTERRUPT STATUS
0677  6001      ION
0700  1351      TAD C4000
0701  6414      TTRL                  /SELECT 685. AC0 SHOULDN'T BE AFFECTED
0702  0352      AND C6000
0703  3140      DCA Z STORAC          /STORE CONTENTS OF AC
0704  4042      JMS Z SR1                       /SCOPE REPEAT? (SR1 SET)
0705  5307      JMP .+2               /NO
0706  5274      JMP ST685                       /YES
0707  1140      TAD Z STORAC
0710  1353      TAD M4000                       /DOES AC EQUAL 4000?
0711  7440      SZA
0712  5316      JMP ERDSTA            /NO
0713  4051      JMS Z SR2                       /YES, VERIFY REPEAT? (SR2 SET)
0714  5324      JMP DSTB              /NO
0715  5274      JMP ST685                       /YES, RPEAT DSTA

                /DSTA FAILED
0716  4020    ERDSTA,     JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
0717  5313      JMP .-4               /NO
0720  7100      CLL
0721  1140      TAD Z STORAC          /YES
0722  7402    ERDST1,     HLT                     /IOT 6414 SHOULD NOT EFFECT AC0
0723  5274      JMP ST685                       /REPEAT DSTA
```

```
                /DSTB
0724  7300  DSTB,     CLA CLL                 /VERIFY THAT DEV. SEL. 40 DOES NOT
                                    /SELECT 685
0725  1354    TAD C177
0726  6412    TTSL                      /LOAD ONES INTO LSR
0727  7300    CLA CLL
0730  6404    TTO                       /SHOULD LEAVE AC EQUAL TO ZERO
0731  3140    DCA # STORAC          /STORE AC
0732  4042    JMS # SR1                       /SCOPE REPEAT? (SR1 SET)
0733  5335    JMP .+2                   /NO
0734  5324    JMP DSTB                  /YES
0735  1140    TAD # STORAC          /DOES AC EQUAL ZERO?
0736  7440    SZA
0737  5343    JMP ERDSTB                /NO
0740  4051    JMS # SR2                       /YES; VERIFY REPEAT? (SR2 SET)
0741  5350    JMP EXDST                       /NO
0742  5324    JMP DSTB                  /REPEAT DSTB

                /DSTB FAILED
0743  4020  ERDSTB,    JMS # SR0                       /HALT ON ERROR? (SR0 SET)
0744  5340    JMP .-4                   /NO
0745  1140    TAD # STORAC          /YES
0746  7402  ERDST2,    HLT                     /AC=0 BEFORE IOT 6404 WAS EXECUTED
0747  5324    JMP DSTB                  /REPEAT DSTB

0750  5755  EXDST,     JMP I ALSRTS        /ENTER LINE SEL. REG. TEST

0751  4000  C4000,     4000
0752  6000  C6000,     6000
0753  4000  M4000,     -4000
0754  0177  C177,      0177
0755  1000  ALSRTS,    LSRTST

                /RING BELL AFTER 680 TEST CYCLES IF SR5 IS SET
0756  7604  RING,      CLA OSR
0757  0374    AND MSKSR5
0760  7650    SNA CLA
0761  5274    JMP ST685                       /SR5 RESET

0762  2375    ISZ RNGCNT
0763  1375    TAD RNGCNT
0764  1376    TAD M1253
0765  7640    SZA CLA
0766  5274    JMP ST685
0767  3375    DCA RNGCNT
0770  1373    TAD BELCHA
0771  6046    TLS                       /RING BELL
0772  5274    JMP ST685

0773  0207  BELCHA,    0207
0774  0100  MSKSR5,    0100
0775  0000  RNGCNT,    0
0776  6525  M1253,     -1253
```

```
                *1000

                /685 LINE SELECTION REGISTER TEST (LSRTST)
                /TEST LSRA
1000  7340  LSRTST,     CLL CLA CMA          /7777 TO AC
1001  6412    TTSL                       /AC SHOULD BE CLEARED TO ZERO
1002  3140    DCA Z STORAC         /STORE AC
1003  4042    JMS Z SR1                          /SCOPE REPEAT? (SR1 SET)
1004  5206    JMP .+2                    /NO
1005  5200    JMP LSRTST                 /YES
1006  1140    TAD Z STORAC         /DOES AC EQUAL ZERO?
1007  7440    SZA
1010  5214    JMP ERLSRA                 /NO
1011  4051    JMS Z SR2                          /YES; VERIFY REPEAT? (SR2 SET)
1012  5223    JMP LSRB                   /NO, ENTER NEXT TEST
1013  5200    JMP LSRTST                 /YES, REPEAT TEST LSRA

                /TEST LSRA FAILED
1014  4020  ERLSRA,     JMS Z SR0                          /HALT ON ERROR? (SR0 SET)
1015  5211    JMP .-4                    /NO
1016  1140    TAD Z STORAC
1017  7402  ERLSR1,     HLT                        /IOT 6412 DID NOT CLEAR AC TO 0
1020  5200    JMP LSRTST                 /REPEAT TEST LSRA

1021  7777  C7777,      7777
1022  0001  M7777,      -7777

                /TEST LSRB
1023  7340  LSRB,       CLL CLA CMA          /7777 TO AC
1024  6411    TTCL                       /AC SHOULD NOT BE AFFECTED
1025  3140    DCA Z STORAC         /STORE AC
1026  4042    JMS Z SR1                          /SCOPE MODE? (SR1 SET)
1027  5231    JMP .+2                    /NO
1030  5223    JMP LSRB                   /YES
1031  1140    TAD Z STORAC
1032  1222    TAD M7777                          /DOES AC EQUAL 7777?
1033  7440    SZA
1034  5240    JMP ERLSRB                 /NO
1035  4051    JMS Z SR2                          /YES; VERIFY REPEAT? (SR2 SET)
1036  5246    JMP LSRC                   /NO, ENTER NEXT TEST
1037  5223    JMP LSRB                   /YES, REPEAT LSRB

                /TEST LSRB FAILED
1040  4020  ERLSRB,     JMS Z SR0                          /HALT ON ERROR? (SR0 SET)
1041  5235    JMP .-4                    /NO
1042  7100    CLL
1043  1140    TAD Z STORAC
1044  7402  ERLSR2,     HLT                        /AC = 7777 BEFORE IOT 6411 WAS EXECUTED
1045  5223    JMP LSRB
```

```
                /TEST LSRC - READ LSR INTO AC, (INCLUSIVE OR)
1046  7240  LSRC,       CLA CMA                         /7777 TO AC
1047  6414    TTRL                        /AC SHOULD NOT BE AFFECTED
1050  3140    DCA Z STORAC
1051  4042    JMS Z SR1                               /SCOPE REPEAT? (SR1 SET)
1052  5254    JMP .+2                     /NO
1053  5246    JMP LSRC                    /YES
1054  1140    TAD Z STORAC
1055  1222    TAD M7777                               /DOES AC EQUAL 7777?
1056  7440    SZA
1057  5263    JMP ERLSRC                  /NO
1060  4051    JMS Z SR2                               /YES; VERIFY REPEAT? (SR2 SET)
1061  5271    JMP LSR0                    /NO, ENTER NEXT TEST
1062  5246    JMP LSRC                    /YES, REPEAT TEST LSRC

                /TEST LSRC FAILED
1063  4020  ERLSRC,     JMS Z SR0                               /HALT ON ERROR? (SR0 SET)
1064  5260    JMP .-4
1065  7100    CLL
1066  1140    TAD Z STORAC
1067  7402  ERLSR3,     HLT                             /AC = 7777 BEFORE IOT 6414 WAS EXECUTE
1070  5246    JMP LSRC
```

```
                /TEST LSRD - TRY TO LOAD AND READ LSR
1071  7340      LSRD,       CLL CLA CMA          /7777 TO AC
1072  6412        TTSL                       /AC5-11 TO LSR, THEN RESET AC
1073  7440        SZA                        /WAS AC RESET TO ZERO?
1074  5311        JMP ERACD                            /NO
1075  6414      DCNTNU,     TTRL                       /YES, NOW READ LSR INTO AC5-11
1076  3140        DCA Z STORAC
1077  4042        JMS Z SR1                            /SCOPE REPEAT? (SR1 SET)
1100  5302        JMP .+2                    /NO
1101  5271        JMP LSRD                   /YES
1102  1140        TAD Z STORAC
1103  1324        TAD M177                   /DOES AC EQUAL 0177?
1104  7440        SZA
1105  5315        JMP ERLSRD                 /NO
1106  4051      DNEXT,      JMS Z SR2                        /YES, VERIFY REPEAT? (SR2 SET)
1107  5325        JMP LSRE                   /NO, ENTER NEXT TEST
1110  5271        JMP LSRD                   /YES, REPEAT TEST LSRD

                /TTSL INSTRUCTION DID NOT CLEAR AC
1111  4020      ERACD,      JMS Z SR0                        /HALT ON ERROR? (SR0 SET)
1112  5275        JMP DCNTNU                 /NO
1113  7402      ERAC1,      HLT                        /HALT, NO AC INTERPRETATION
1114  5200        JMP LSRTST                 /REPEAT TEST LSRA

                /TEST LSRD FAILED
1115  4020      ERLSRD,     JMS Z SR0                        /HALT ON ERROR? (SR0 SET)
1116  5306        JMP DNEXT                          /NO
1117  7100        CLL
1120  1140        TAD Z STORAC
1121  7402      ERLSR4,     HLT                        /AC AND LSR SHOULD EQUAL 177
1122  5271        JMP LSRD                   /REPEAT TEST LSRD

1123  0177    C177,       0177
1124  7601    M177,       -0177
```

```
                /TEST LSRE - CHECK LSR INCLUSIVE OR LOADING
1125  7300      LSRE,       CLA CLL
1126  1323        TAD C1770
1127  6412        TTSL                        /AC5-11 TO LSR, THEN RESET AC
1130  3141        DCA ≠ AUXAC           /STORE AC
1131  1323        TAD C1770
1132  6412        TTSL
1133  7440        SZA                         /WAS AC RESET?
1134  5354        JMP FRACE                         /NO
1135  1141        TAD ≠ AUXAC           /WAS AC RESET BY 1ST TTSL?
1136  7440        SZA
1137  5354        JMP FRACE                         /NO
1140  6414      ENEXT1,     TTRL                    /AC WAS RESET, NOW READ LSR
1141  3140        DCA ≠ STORAC          /STORE RESULTS OF READ
1142  4042        JMS ≠ SR1                         /SCOPE REPEAT? (SR1 SET)
1143  5345        JMP .+2                   /NO
1144  5325        JMP LSRE                  /YES
1145  1140        TAD ≠ STORAC
1146  1324        TAD M177                  /DOES AC EQUAL 0177?
1147  7440        SZA
1150  5360        JMP FRLSRE                /NO
1151  4051      ENEXT2,     JMS ≠ SR2                         /YES, VERIFY REPEAT? (SR2 SF
1152  5766        JMP I ALSRF           /NO, ENTER NEXT TEST
1153  5325        JMP LSRE                  /YES, REPEAT TEST LSRE

                /AC NOT RESET BY TTSL
1154  4020      FRACE,      JMS ≠ SR0                         /HALT ON ERROR? (SR0 SET)
1155  5340        JMP ENEXT1                    /NO
1156  7402      FRAC2,      HLT
1157  5200        JMP LSRTST                /YES, REPEAT LSRA

                /TEST LSRE FAILED
1160  4020      FRLSRE,     JMS ≠ SR0                         /HALT ON ERROR? (SR0 SET)
1161  5351        JMP ENEXT2                /NO
1162  7100        CLL
1163  1140        TAD ≠ STORAC
1164  7402      FRLSR5,     HLT                       /AC AND LSR SHOULD EQUAL 177
1165  5325        JMP LSRE

1166  1200      ALSRF,      LSRF
```

```
                *1200

                /TEST LSRF - SUCCESSIVELY LOAD LSR WITH 177 AND 000.
1200  7340  LSRF,       CLL CLA CMA          /7777 TO AC
1201  6412    TTSL                         /AC5-11 TO LSR
1202  3141    DCA I AUXAC            /STORE AC
1203  6412    TTSL                         /AC5-11 (0) TO LSR
1204  7440    SZA                          /IS AC STILL ZERO
1205  5225    JMP ERACF                          /NO
1206  1141    TAD I AUXAC            /WAS AC RESET BY 1ST TTSL?
1207  7440    SZA
1210  5225    JMP ERACF                          /NO
1211  6414  FNEXT1,     TTRL                    /AC PROPERLY RESET, NOW READ LSR
1212  3140    DCA I STORAC           /STORE READ RESULT
1213  4042    JMS I SR1                          /SCOPE REPEAT? (SR1 SET)
1214  5216    JMP .+2                      /NO
1215  5200    JMP LSRF                     /YES
1216  1140    TAD I STORAC
1217  1237    TAD M177A                          /DOES AC EQUAL 177?
1220  7440    SZA                          /SKIP IF EQUAL
1221  5231    JMP ERLSRF                   /NO
1222  4051  FNEXT2,     JMS I SR2                          /VERIFY REPEAT? (SR2 SET)
1223  5240    JMP LSRG                     /NO
1224  5200    JMP LSRF                     /YES

                /AC NOT RESET BY TTSL
1225  4020  ERACF,      JMS I SR0                          /HALT ON ERROR? (SR0 SET)
1226  5211    JMP FNEXT1                   /NO
1227  7402  ERAC3,      HLT
1230  5766    JMP I ALSRA            /REPEAT TEST LSRA

                /TEST LSRF FAILED
1231  4020  ERLSRF,     JMS I SR0                          /HALT ON ERROR?
1232  5222    JMP FNEXT2                   /NO
1233  7100    CLL
1234  1140    TAD I STORAC
1235  7402  ERLSR6,     HLT                          /AC AND LSR SHOULD EQUAL 177
1236  5200    JMP LSRF                     /REPEAT TEST LSRF

1237  7601  M177A,      -177
```

```
                /TEST LSRG - TRY TO CLEAR LSR
1240  7340  LSRG,       CLL CLA CMA          /7777 TO AC
1241  6412    TTSL                         /AC5-11 TO LSR
1242  7440    SZA                          /WAS AC CLEARED TO ZERO?
1243  5260    JMP FRACG                              /NO
1244  6411  GNEXT1,     TTCL                         /RESET LSR TO ZERO
1245  6414    TTRL                         /READ CONTENTS OF LSR
1246  3140    DCA I STORAC          /STORE READ RESULTS
1247  4042    JMS I SR1                              /SCOPE REPEAT? (SR1 SET)
1250  5252    JMP .+2                      /NO
1251  5240    JMP LSRG                     /YES
1252  1140    TAD I STORAC
1253  7440    SZA                          /DOES AC EQUAL ZERO?
1254  5264    JMP ERLSRG                   /NO
1255  4051  GNEXT2,     JMS I SR2                                /VERIFY REPEAT? (SR2 SET)
1256  5271    JMP LSRH                     /NO
1257  5240    JMP LSRG                     /YES

                /AC NOT RESET BY TTSL
1260  4020  FRACG,      JMS I SR0                                /HALT ON ERROR? (SR0 SET)
1261  5244    JMP GNEXT1                   /NO
1262  7402  FRAC4,      HLT
1263  5766    JMP I ALSRA           /REPEAT TEST LSRA

                /TEST LSRG FAILED
1264  4020  ERLSRG,     JMS I SR0                                /HALT ON ERROR? (SR0 SET)
1265  5255    JMP GNEXT2                   /NO
1266  1140    TAD I STORAC
1267  7402  ERLSR7,     HLT                          /IOT 6411 DID NOT CLEAR LSR
1270  5240    JMP LSRG                     /REPEAT TEST LSRG
```

```
                /TEST LSRH - SET LSR 0, 2, 4 AND 6 TO ONE

1271  6411  LSRH,       TTCL                        /RESET LINE SELECTION REG
1272  7300    CLA CLL
1273  1325    TAD C125
1274  6412    TTSL                      /AC5-11 TO LSP
1275  7440    SZA                       /DID TTSL RESET AC?
1276  5313    JMP ERACH                 /NO
1277  6414  HNEXT1,     TTRL                        /READ LSR TO AC
1300  3140    DCA I STORAC          /STORE READ RESULTS
1301  4042    JMS I SR1                           /SCOPE REPEAT? (SR1 SET)
1302  5304    JMP .+2                   /NO
1303  5271    JMP LSRH                  /YES
1304  1140    TAD I STORAC
1305  1326    TAD M125                  /DOES AC EQUAL 0125?
1306  7440    SZA                       /SKIP IF EQUAL
1307  5317    JMP ERLSRH                /NO
1310  4051  HNEXT2,     JMS I SR2                           /VERIFY REPEAT? (SR2 SET)
1311  5327    JMP LSRI                  /NO
1312  5271    JMP LSRH                  /YES

                /AC NOT RESET BY TTSL
1313  4020  ERACH,      JMS I SR0                           /HALT ON ERROR? (SR0 SET)
1314  5277    JMP HNEXT1                /NO
1315  7402  ERAC5,      HLT                         /YES
1316  5766    JMP I ALSRA           /REPEAT TEST LSRA

                /TEST LSRH FAILED
1317  4020  ERLSRH,     JMS I SR0                           /HALT ON ERROR? (SR0 SET)
1320  5310    JMP HNEXT2                /NO
1321  7100    CLL
1322  1140    TAD I STORAC
1323  7402  ERLSR8,     HLT                         /AC AND LSR SHOULD EQUAL 125
1324  5271    JMP LSRH                  /REPEAT TEST LSRH

1325  0125  C125,       0125
1326  7653  M125,       -0125
```

```
                /TEST LSRI - SET LSR1, 3 AND 5 TO ONE

1327  6411  LSRI,       TTCL                        /RESET LSR
1330  7300    CLA CLL
1331  1363    TAD C052
1332  6412    TTSL                      /AC5-11 TO LSR
1333  7440    SZA                       /DID TTSL RESET AC?
1334  5351    JMP ERACI                           /NO
1335  6414  INEXT1,     TTRL                        /READ LSR TO AC
1336  3140    DCA Z STORAC          /STORE TEST RESULT
1337  4042    JMS Z SR1                           /SCOPE REPEAT? (SR1 SET)
1340  5342    JMP .+2                   /NO
1341  5327    JMP LSRI                  /YES
1342  1140    TAD Z STORAC
1343  1364    TAD M052                  /DOES AC EQUAL 052?
1344  7440    SZA
1345  5355    JMP ERLSRI                /NO
1346  4051  INEXT2,     JMS Z SR2                               /VERIFY REPEAT? (SR2 SET)
1347  5765    JMP I ALSRJ           /NO, ENTER NEXT TEST
1350  5327    JMP LSRI                  /YES, REPEAT TEST LSRI


                /AC NOT RESET BY TTSL
1351  4020  ERACI,      JMS Z SR0                               /HALT ON ERROR? (SR0 SET)
1352  5335    JMP INEXT1                /NO
1353  7402  ERAC6,      HLT
1354  5766    JMP I ALSRA           /REPEAT TEST LSRA

                /TEST LSRI FAILED
1355  4020  ERLSRI,     JMS Z SR0                               /HALT ON ERROR? (SR0 SET)
1356  5346    JMP INEXT2                /NO
1357  7100    CLL
1360  1140    TAD Z STORAC
1361  7402  ERLSR9,     HLT                                 /AC AND LSR SHOULD EQUAL 052
1362  5327    JMP LSRI                  /REPEAT TEST LSRI

1363  0052  C052,       0052
1364  7726  M052,       -0052
1365  1400  ALSRJ,      LSRJ

1366  1000  ALSRA,      LSRTST
```

```
                *1400

                /TEST LSRJ - CLEAR, LOAD AND READ LSR (IOT 6417)

1400  7300  LSRJ,       CLL CLA
1401  3237    DCA LINCNT              /RESET LINE COUNT
1402  1237    TAD LINCNT
1403  6417    6417                    /CLEAR, LOAD AND READ LSR
1404  3140    DCA I STORAC          /STORE READ RESULT
1405  4042    JMS I SR1                       /SCOPE REPEAT? (SR1 SET)
1406  5210    JMP .+2                 /NO
1407  5202    JMP LSRJ+2              /REPEAT WITH SAME LINE NUMBER
1410  1237    TAD LINCNT
1411  7041    CIA                     /AC EQUALS MINUS LINCNT
1412  1140    TAD I STORAC          /WAS CORRECT LINE COUNT READ?
1413  7440    SZA
1414  5225    JMP FRLSRJ              /NO
1415  2237  JNEXT1,     ISZ LINCNT              /YES, INCREMENT LINE COUNT
1416  1237    TAD LINCNT
1417  1240    TAD M200                /HAS LINE COUNT OF 177 BEEN TESTED?
1420  7640    SZA CLA
1421  5202    JMP LSRJ+2              /NO
1422  4051    JMS I SR2                       /YES; VERIFY REPEAT?
1423  5241    JMP LSRK                /NO, ENTER NEXT TEST
1424  5200    JMP LSRJ

                /TEST LSRJ FAILED
1425  4020  FRLSRJ,     JMS I SR0                       /HALT ON ERROR? (SR0 SET)
1426  5215    JMP JNEXT1              /NO
1427  7100    CLL
1430  1237    TAD LINCNT
1431  7402  FLSR10,     HLT                     /HALT WITH CORRECT LINE COUNT IN AC
1432  7200    CLA
1433  1140    TAD I STORAC
1434  7402    HLT                     /HALT WITH INCORRECT TEST RESULT IN AC
1435  7200    CLA
1436  5202    JMP LSRJ+2

1437  0000  LINCNT,     0
1440  7600  M200,       -0200
```

```
                /TEST LSRK - INCREMENT LSR FROM 000 TO 177

1441  7300  LSRK,       CLL CLA
1442  3237    DCA LINCNT              /CLEAR LINE COUNT
1443  6411    TTCL                    /CLEAR LSR TO ZERO
1444  6401  ADD1,       TTINCR                  /INCREMENT LSR BY ONE
1445  4042    JMS I SR1                       /SCOPE REPEAT? (SR1 SET)
1446  5250    JMP .+2                 /NO
1447  5271    JMP AGAIN                       /YES
1450  2237    ISZ LINCNT
1451  1237    TAD LINCNT
1452  0313    AND C177K
1453  3237    DCA LINCNT
1454  6414    TTRL                    /READ LSR TO AC
1455  3140    DCA I STORAC          /STORE AC
1456  1237    TAD LINCNT
1457  7041    CIA                     /AC CONTAINS - LINE COUNT
1460  1140    TAD I STORAC
1461  7440    SZA                     /DID LSR INCREMENT CORRECTLY?
1462  5274    JMP ERLSRK              /NO
```

```
1463  1237  KNEXT,     TAD LINCNT                  /YES
1464  7440    SZA                          /DOES LINE COUNT EQUAL 000
1465  5244    JMP ADD1                     /NO
1466  4051    JMS # SR2                             /YES; VERIFY REPEAT? (SR2 SET)
1467  5312    JMP EXLSR                             /NO
1470  5241    JMP LSRK                     /YES, REPEAT LSRK

              /SET UP SCOPE REPEAT
1471  1237  AGAIN,    TAD LINCNT
1472  6413    6413                         /CLEAR LSR AND LOAD WITH CURRENT
1473  5244    JMP ADD1                     /LINE COUNT

              /LSR DID NOT INCREMENT CORRECTLY
1474  4020  ERLSRK,    JMS # SR0                                   /HALT ON ERROR? (SR0 SET)
1475  5263    JMP KNEXT                             /NO
1476  7100    CLL
1477  1237    TAD LINCNT
1500  7402  ELSR11,    HLT                         /HALT WITH CORRECT LINE COUNT IN AC

1501  7200    CLA
1502  1140    TAD # STORAC
1503  7402    HLT                          /HALT WITH INCORRECT LINE COUNT
1504  7200    CLA                          /IN AC
1505  1237    TAD LINCNT
1506  1314    TAD M1                       /SUBTRACT 1 FROM LINE COUNT
1507  0313    AND C177K
1510  3237    DCA LINCNT                   /RETEST SAME LINE COUNT
1511  5271    JMP AGAIN

1512  5715  EXLSR,     JMP I ATS681          /ENTER 681 INSTRUCTION TESTS

1513  0177  C177K,     0177
1514  7777  M1,        -0001
1515  1600  ATS681,    TS681A
```

```
1600            PAUSE

                /680 DCS EXPANDED STATIC TEST  -  TAPE 3
                /681 INSTRUCTION TEST

                *1600
                /TS681A - 681 NO ACTIVITY TEST (IOT 6400)
1600  7200      TS681A,     CLA
1601  1237        TAD OKJMP1
1602  3207        DCA NOAC+1
1603  1240        TAD ERJMP1
1604  3210        DCA NOAC+2              /PRESET JMP INSTRUCTIONS
1605  7120        CLL CML                 /1 TO LINK
1606  6400      NOAC,       6400                  /ADDRESS 681 BUT DEFINE NO ACTION
1607  5212        JMP NOSTAT              /THIS INSTRUCTION SHOULD BE EXECUTED
1610  5223        JMP SKIPER              /DON'T EXECUTE
1611  5227        JMP TTIER                       /DON'T EXECUTE

1612  4042      NOSTAT,     JMS Z SR1                       /SCOPE REPEAT? (SR1 SET)
1613  5215        JMP .+2                 /NO
1614  5200        JMP TS681A              /YES
1615  7430        SZL                     /WAS THE LINK RESET?
1616  5220        JMP .+2                 /NO
1617  5233        JMP TTOER                       /YES
1620  4051        JMS Z SR2                       /VERIFY REPEAT? (SR2 SET)
1621  5241        JMP TS681B              /NO, ENTER NEXT TEST
1622  5200        JMP TS681A                  /YES, REPEAT TS681A

                /INSTRUCTION FOLLOWING 6400 WAS NOT EXECUTED
1623  4020      SKIPER,     JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1624  5212        JMP NOSTAT              /NO
1625  7402      ERTT01,     HLT                     /HALT 1 - INCORRECT 681 SKIP ENABLE
1626  5200        JMP TS681A              /REPEAT TEST

                /TWO INSTRUCTIONS FOLLOWING 6400 WERE NOT EXECUTED
1627  4020      TTIER,      JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1630  5212        JMP NOSTAT              /NO
1631  7402      ERTT02,     HLT                     /HALT 2 - IOT 6400 INTERPRETED AS IOT 6402
1632  5200        JMP TS681A              /REPEAT TEST

                /LINK BIT WAS RESET
1633  4020      TTOER,      JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1634  5220        JMP SKIPER-3        /NO
1635  7402      ERTT03,     HLT                     /HALT 3 - IOT 6400 INTERPRETED AS IOT 6404
1636  5200        JMP TS681A              /REPEAT TEST

1637  5212    OKJMP1,     JMP NOSTAT
1640  5223    ERJMP1,     JMP SKIPER
```

```
                /TS681B - TTO TEST, (6404), PART 1 - CHECK ZERO THE LINC
1641  7320      TS681B,     CLA CLL CML          /0 TO AC, 1 TO LINK
1642  6404        TTO                          /CONTENTS OF LINE SELECTION REGISTER
                                               /SHOULD NOT AFFECT THIS TEST
1643  3140        DCA I STORAC                 /STORE AC
1644  4042        JMS I SR1                                /SCOPE REPEAT? (SR1 SET)
1645  5247        JMP .+2                      /NO
1646  5241        JMP TS681B                   /YES
1647  7430        SZL                          /WAS LINK RESET TO ZERO?
1650  5260        JMP LNOTZ                                /NO
1651  1140        TAD I STORAC                 /YES; NOW EXAMINE AC0
1652  7500        SMA                          /SKIP IF AC0 (1)
1653  5255        JMP .+2
1654  5265        JMP AC0SET                   /LINK BIT WAS SHIFTED

1655  4051  PT1NXT,      JMS I SR2                                /TEST OK; VERIFY REPEAT? (SR
1656  5272        JMP TS681C                   /NO, ENTER TEST PART 2
1657  5241        JMP TS681B                   /REPEAT PART 1

                /LINC BIT WAS NOT RESET.
1660  4020  LNOTZ,       JMS I SR0                                /HALT ON ERROR? (SR0 SET)
1661  5255        JMP PT1NXT                   /NO
1662  1140        TAD I STORAC                 /HALT AND DISPLAY CONTENTS OF
1663  7402  ERTT04,      HLT                                      /AC FOLLOWING TTO EXECUTION
1664  5241        JMP TS681B                   /REPEAT TTO TEST, PART 1

                /AC0 WAS SET TO ONE.
1665  4020  AC0SET,      JMS I SR0                                /HALT ON ERROR? (SR0 SET)
1666  5255        JMP PT1NXT                   /NO
1667  1140        TAD I STORAC                 /HALT AND DISPLAY CONTENTS OF AC
1670  7402  ERTT05,      HLT                                      /FOLLOWING TTO EXECUTION
1671  5241        JMP TS681B                   /REPEAT TTO TEST, PART 1

                /TS681C - TTO TEST, PART 2 - CHECK LINC ROT. DISABLE AND RAR
1672  7320  TS681C,      CLA CLL CML          /1 TO LINK
1673  1325        TAD C4041                                /1 TO AC0 AND AC11
1674  6404        TTO                          /0 TO LINK AND RAR
1675  3140        DCA I STORAC                 /STORE AC
1676  4042        JMS I SR1                                /SCOPE REPEAT? (SR1 SET)
1677  5301        JMP .+2                      /NO
1700  5272        JMP TS681C                   /YES
1701  7430        SZL                          /IS LINK RESET?
1702  5312        JMP LROTER                   /NO
1703  1140        TAD I STORAC                 /YES
1704  1326        TAD M2000                                /WAS AC EQUAL TO 2000 AFTER
1705  7440        SZA                          /EXECUTION OF TTO?
1706  5317        JMP SHFTER                   /NO
1707  4051  PT2NXT,      JMS I SR2                                /VERIFY REPEAT? (SR2 SET)
1710  5327        JMP TS681D                   /NO, ENTER TEST PART 3
1711  5272        JMP TS681C                   /YES, REPEAT PART 2
```

```
                /LINK ROTATE NOT DISABLED
1712  4020  LROTER,     JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1713  5307    JMP PT2NXT              /NO
1714  1140    TAD Z STORAC
1715  7402  ERTT06,     HLT                             /HALT AND DISPLAY AC TEST RESULTS
1716  5272    JMP TS681C              /REPEAT PART 2

                /RAR NOT EXECUTED CORRECTLY
1717  4020  SHFTER,     JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1720  5307    JMP PT2NXT              /NO
1721  7100    CLL
1722  1140    TAD Z STORAC
1723  7402  ERTT07,     HLT                             /HALT AND DISPLAY AC TEST RESULTS
1724  5272    JMP TS681C              /REPEAT PART 2

1725  4001  C4001,      4001
1726  6000  M2000,      -2000

                /TS681 - TTO TEST, PART 3
1727  7300  TS681D,     CLA CLL
1730  1362    TAD C5252
1731  6404    TTO                     /TEST RAR EXECUTION
1732  3140    DCA Z STORAC        /STORE AC
1733  4042    JMS * SR1                               /SCOPE REPEAT? (SR1 SET)
1734  5336    JMP .+2                 /NO
1735  5327    JMP TS681D              /YES
1736  7430    SZL                     /IS LINK STILL RESET?
1737  5347    JMP ERCML                               /LINK WAS COMPLIMENTED
1740  1140    TAD Z STORAC        /LINK IS OK
1741  1363    TAD M2525                               /WAS AC SHIFTED CORRECTLY
1742  7440    SZA
1743  5354    JMP ERSHFT              /NO
1744  4051  PT3NXT,     JMS Z SR2                       /VERIFY REPEAT? (SR2 SET)
1745  5764    JMP I ATTITS        /NO, ENTER NEXT TEST
1746  5327    JMP TS681D              /YES, REPEAT PART 3

                /LINC BIT WAS SET TO ONE.
1747  4020  ERCML,      JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1750  5344    JMP PT3NXT              /NO
1751  1140  ERTT08,     TAD Z STORAC        /CHECK FOR INCORRECT CM
1752  7402    HLT
1753  5327    JMP TS681D

                /RAR WAS NOT EXECUTED CORRECTLY.
1754  4020  ERSHFT,     JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
1755  5344    JMP PT3NXT              /NO
1756  7100    CLL
1757  1140    TAD * STORAC
1760  7402  ERTT09,     HLT                             /AC SHOULD EQUAL 2525
1761  5327    JMP TS681D

1762  5252  C5252,      5252
1763  5253  M2525,      -2525
1764  2000  ATTITS,     TS681E
```

```
                /681 INSTRUCTION TEST, (CONTINUED)

                *2000

                /TS681F - TTI TEST, PART 1 - CHECK IOT 6402 EXECUTION FORMAT
2000  7340      TS681E,     CLL CLA CMA
2001  6412        TTSL                        /PRESET LINE SELECTION REG. TO 177
2002  1232        TAD SWJMP1                  /AND CLEAR AC
2003  3207        DCA TTYIN+1
2004  1233        TAD CWJMP1
2005  3210        DCA TTYIN+2           /PRESET ERROR JUMP INSTRUCTIONS
2006  6402      TTYIN,      TTI                         /DON'T EXECUTE NEXT TWO WORDS
2007  5216        JMP FRJMP2                  /LINE STATUS WORD (LSW)
2010  5222        JMP FRJMP3                  /CHARACTER ASSEMBLY WORD (CAW)

2011  5213        JMP OKJMP2

2012  5226        JMP FRJMP4

                /681 CORRECTLY SKIPPED LSW AND CAW
2013  4042      OKJMP2,     JMS Z SR1                               /SCOPE REPEAT? (SR1 SET)
2014  5234        JMP TS681F                  /NO, ENTER NEXT TEST
2015  5202        JMP TS681F+2          /YES

                /LSW WAS INTERPRETED AS AN INSTRUCTION
2016  4020      FRJMP2,     JMS Z SR0                               /HALT ON ERROR? (SR0 SET)
2017  5213        JMP OKJMP2                  /NO
2020  7402      ERTTI1,     HLT                         /HALT 1 - CHECK GENERATION OF S CYCLE
2021  5202        JMP TS681E+2

                /CAW WAS INTERPRETED AS AN INSTRUCTION
2022  4020      FRJMP3,     JMS Z SR0                               /HALT ON ERROR?
2023  5213        JMP OKJMP2                  /NO
2024  7402      ERTTI2,     HLT                         /HALT 2 - CHECK S CYCLE 'SKIP BUS IN' ENABLE
2025  5202        JMP TS681E+2

                /681 SKIPPED TWICE
2026  4020      FRJMP4,     JMS Z SR0                               /HALT ON ERROR?
2027  5213        JMP OKJMP2                  /NO
2030  7402      ERTTI3,     HLT                         /HALT 3 - DOUBLE SKIP OCCURRED
2031  5202        JMP TS681E+2

2032  5216    SWJMP1,     JMP FRJMP2
2033  5222    CWJMP1,     JMP FRJMP3
```

```
                /TS681F - TTI TEST, PART 2 - CHECK S CYCLE OPERATIONS
2034  7300  TS681F,     CLL CLA
2035  1331    TAD SW2000
2036  3242    DCA TTYIN2+1
2037  1331    TAD SW2000
2040  3243    DCA TTYIN2+2          /PRESET LSW AND CAW

2041  6402  TTYIN2,     TTI
2042  2000    2000                  /LSW
2043  2000    2000                  /CAW

2044  4042    JMS Z SR1             /SCOPE REPEAT? (SR1 SET)
2045  5247    JMP .+2               /NO
2046  5234    JMP TS681F            /YES
2047  1242    TAD TTYIN2+1
2050  1337    TAD M1000                        /LSW SHOULD CONTAIN 1000
2051  7440    SZA
2052  5262    JMP LSWERR
2053  1243    TAD TTYIN2+2
2054  1336    TAD MN2000                 /CAW SHOULD CONTAIN 2000
2055  7440    SZA
2056  5323    JMP CAWERR
2057  4051  NXTTY,      JMS Z SR2                        /VERIFY REPEAT? (SR2 SET)
2060  5735    JMP I AT681G          /NO, ENTER NEXT TEST
2061  5234    JMP TS681F            /YES

                /DETERMINE LSW ERROR TYPE
2062  4020  LSWERR,     JMS Z SR0                        /HALT ON ERROR? (SR0 SET)
2063  5257    JMP NXTTY                        /NO
2064  1242    TAD TTYIN2+1          /WAS MB SHIFTED?
2065  0331    AND SW2000
2066  7640    SZA CLA               /SKIP IF MB WAS SHIFTED
2067  5271    JMP .+2
2070  5275    JMP .+5

                /ERROR HALT 1 - MB WAS NOT SHIFTED CORRECTLY
2071  1242    TAD TTYIN2+1          /DISPLAY LSW IN AC
2072  7100    CLL
2073  7402  ERTTI4,     HLT                      /HALT 1- CHECK 'SHIFT MB'
2074  5234    JMP TS681F

                /VERIFY CORRECT MB0 (0) SHIFT ENABLED
2075  1242    TAD TTYIN2+1          /WAS MB0 INCORRECTLY SET TO 1?
2076  0332    AND SW5000
2077  1333    TAD M5000
2100  7640    SZA CLA               /SKIP IF MB0 (1) AND THE MB REG.
2101  5306    JMP .+5               /SHIFT WAS EXECUTED
```

```
                    /ERROR HALT 2
2112  1242            TAD TTYIN2+1        /DISPLAY LSW IN AC
2113  7100            CLL
2114  7402  ERTTI5,    HLT                         /HALT 2 - MBØ INCORRECTLY SET TO 1
2115  5234            JMP TS681F

                    /VERIFY THAT COUNT MB WAS NOT ENABLED
2116  1242            TAD TTYIN2+1        /WAS COUNT MB INCORRECTLY ENABLED?
2117  0334            AND SW0007
2120  7640            SZA CLA                 /DON'T SKIP IF COUNT WAS ENABLED
2121  5313            JMP .+2
2122  5317            JMP .+5                 /LSW ERROR UNIDENTIFIED

                    /ERROR HALT 3
2123  1242            TAD TTYIN2+1        /DISPLAY LSW IN AC
2124  7100            CLL
2125  7402  ERTTI6,    HLT                         /HALT 3 - 'COUNT MB' INCORRECTLY ENABLE
2126  5234            JMP TS681F

                    /ERROR HALT 4
2127  1242            TAD TTYIN2+1        /DISPLAY LSW IN AC
2130  7100            CLL
2131  7402  ERTTI7,    HLT                         /HALT 4 - COMBINATION OF ERRORS 4,5 & 6
2132  5234            JMP TS681F

                    /ERROR HALT 5 - CAW WAS MODIFIED
2133  4020  CAWERR,   JMS Z SRØ                           /HALT ON ERROR? (SRØ SET)
2134  5257            JMP NXTTY                   /NO
2135  1243            TAD TTYIN2+2        /DISPLAY CAW IN AC
2136  7100            CLL
2137  7402  ERTTI8,    HLT                         /HALT 5 - CHECK FOR INCORRECT C CY(
2140  5234            JMP TS681F

2141  2000  SW2000,    2000
2142  5000  SW5000,    5000
2143  3000  M5000,     -5000
2144  0007  SW0007,    0007
2145  2200  AT681G,    TS681G
2146  6000  MN2000,    -2000
2147  7000  M1000,     -1000
```

```
                *2200
                /TS681G - TTI TEST, PART 3 - CHECK IOT 6402 WITH LSW = 4003

2200  7300  TS681G,     CLL CLA
2201  1254    TAD LS4003                /PRESET LINE STATUS WORD
2202  3210    DCA TTYIN3+1
2203  1256    TAD CW4000                /PRESET CHARACTER ASSEMBLY WORD
2204  3211    DCA TTYIN3+2
2205  1260    TAD ANOP
2206  3212    DCA TTYIN3+3          /PRESET NOP INSTRUCTION

2207  6402  TTYIN3,     TTI
2210  4003    4003                      /LSW
2211  4000    4000                      /CAW
2212  7000    NOP
2213  4042    JMS Z SR1                           /SCOPE REPEAT? (SR 1 SET)
2214  5216    JMP .+2                   /NO
2215  5200    JMP TS681G                /YES
2216  1210    TAD TTYIN3+1
2217  1255    TAD M4004                           /WAS LSW UPDATED CORRECTLY?
2220  7440    SZA
2221  5231    JMP ERRLSW                /LSW IS INCORRECT
2222  1211    TAD TTYIN3+2
2223  1257    TAD M6000                           /WAS CAW UPDATED CORRECTLY?
2224  7440    SZA
2225  5236    JMP ERRCAW                /CAW IS INCORRECT

2226  4051  TTYNXT,     JMS Z SR2                                 /VERIFY REPEAT? (SR2 SET)
2227  5262    JMP TS681H                /NO
2230  5200    JMP TS681G                /YES

                /ERROR HALT 1 - LSW WAS NOT UPDATED CORRECTLY
2231  4020  ERRLSW,     JMS Z SR0                                 /HALT ON ERROR? (SR0 SET)
2232  5226    JMP TTYNXT                /NO
2233  1210    TAD TTYIN3+1          /DISPLAY LSW IN AC
2234  7402  ERTTI9,     HLT                       /HALT 1 - AC SHOULD EQUAL 4004
2235  5200    JMP TS681G
```

```
                /ERROR HALT 2 - CAW WAS NOT UPDATED CORRECTLY
2236  4020  FRRCAW,     JMS Z SR0                          /HALT ON FRROR? (SR0 SET)
2237  5226    JMP TTYNXT                 /NO
2240  1212    TAD TTYIN3+3          /WAS NOP MODIFIED?
2241  1261    TAD MNOP
2242  7640    SZA CLA
2243  5250    JMP .+5                    /NOP WAS MODIFIED
2244  7100    CLL
2245  1211    TAD TTYIN3+2
2246  7402  ETTI10,     HLT                          /HALT 2A - CAW & AC SHOULD = 6000
2247  5200    JMP TS681G
2250  7100    CLL
2251  1211    TAD TTYIN3+2
2252  7402  ETTI11,     HLT                          /HALT 2B - CHECK FOR INCORRECT S CYCLE
                                  /  SKIP ENABLE
2253  5200    JMP TS681G

2254  4003  LS4003,     4003
2255  3774  M4004,      -4004
2256  4000  CW4000,     4000
2257  2000  M6000,      -6000
2260  7000  ANOP,       NOP
2261  1000  MNOP,       -7000
```

```
                /TS681H - TTI TEST, PART 4 - CHECK 'COUNT MB' EXECUTION

02262  7300  TS681H,     CLL CLA
02263  1366    TAD MSEVEN                  /PRESET TTICNT TO -7
02264  3365    DCA TTICNT
02265  1131    TAD # FOUR                  /PRESET LSWCNT TO 4
02266  3364    DCA LSWCNT
02267  1256  PASTRT,     TAD CW4000
02270  1364    TAD LSWCNT
02271  3301    DCA TTYIN4+1          /PRESET LSW
02272  2364    ISZ LSWCNT                    /ADD ONE TO LSWCNT
02273  1364    TAD LSWCNT
02274  0367    AND MSKCNT                  /MSKCNT EQUALS 0007
02275  3364    DCA LSWCNT
02276  1256    TAD CW4000                  /PRESET CAW
02277  3302    DCA TTYIN4+2

02300  6402  TTYIN4,     TTI
02301  4004    4004                        /LSW - COUNT IS INCREMENTED ON EACH PASS
02302  4000    4000                        /CAW - SHOULD NEVER BE MODIFIED

02303  4042    JMS # SR1                             /SCOPE REPEAT? (SR1 SET)
02304  5312    JMP .+6                     /NO
02305  1364  RETEST,     TAD LSWCNT                  /YES
02306  1371    TAD CNTM1                             /SUBTRACT 1 FROM LSWCNT
02307  0367    AND MSKCNT
02310  3364    DCA LSWCNT
02311  5267    JMP PASTRT                  /EXECUTE REPEAT
                /WAS LSW UPDATED CORRECTLY?
02312  1301    TAD TTYIN4+1
02313  7500    SMA                         /DOES LSW0 CONTAIN 1?
02314  5334    JMP FRLSW0                  /NO; ERROR 1
02315  0367    AND MSKCNT                  /YES; CONTINUE TEST
02316  7041    CIA
02317  1364    TAD LSWCNT                  /WAS LSW COUNT INCREMENTED CORRECTLY?
02320  7440    SZA
02321  5343    JMP ERRCNT                  /NO; ERROR 2
02322  1302    TAD TTYIN4+2          /YES; TEST CAW
02323  7041    CIA
02324  1256    TAD CW4000                  /DOES CAW EQUAL 4000?
02325  7440    SZA
02326  5355    JMP MODCAW                  /NO
                /TEST FOR SEVENTH PASS
02327  2365  CHKPAS,     ISZ TTICNT
02330  5267    JMP PASTRT                  /NOT SEVENTH PASS

02331  4051    JMS # SR2                             /VERIFY REPEAT? (SR2 SET)
02332  5770    JMP I AT681I
02333  5262    JMP TS681H                  /YES, REPEAT TEST
```

```
                /ERROR 1 - LSWM WAS CLEARED TO ZERO
2334  4020  ERLSW0,    JMS Z SR0                       /HALT ON ERROR? (SR0 SET)
2335  5327    JMP CHKPAS              /NO
2336  7100    CLL
2337  1301    TAD TTYIN4+1        /DISPLAY LSW IN AC
2340  7402  ETTI12,    HLT                         /HALT 1 - CHECK FOR INCORRECT S CYCLE MB SHIFT
2341  7200    CLA
2342  5305    JMP RETEST

                /ERROR 2 - LSW COUNT IS INCORRECT
2343  4020  ERRCNT,    JMS Z SR0                       /HALT ON ERROR?
2344  5327    JMP CHKPAS              /NO
2345  7100    CLL
2346  1364    TAD LSWCNT              /DISPLAY EXPECTED LSW COUNT
2347  7402  ETTI13,    HLT                         /HALT 2A - CHECK S CYCLE 'COUNT MB ENABLE.'
2350  7200    CLA
2351  1301    TAD TTYIN4+1        /DISPLAY ACTUAL LSW COUNT
2352  7402    HLT                 /HALT 2B
2353  7200    CLA
2354  5305    JMP RETEST

                /ERROR 3 - CAW IS INCORRECT
2355  4020  MODCAW,    JMS Z SR0                       /HALT ON ERROR?
2356  5327    JMP CHKPAS              /NO
2357  7100    CLL
2360  1302    TAD TTYIN4+2        /DISPLAY CAW IN AC
2361  7402  ETTI14,    HLT                         /HALT 3 - CHECK FOR INCORRECT C CYCLE GENERATIO
2362  7200    CLA
2363  5305    JMP RETEST


2364  0000  LSWCNT,    0
2365  0000  TTICNT,    0
2366  7771  MSEVEN,    -0007
2367  0007  MSKCNT,    0007
2370  2400  AT681I,    TS681I
2371  7777  CNTM1,     -0001
```

```
                *2400

                /TS681I - MB REGISTER SHIFT TEST, PART 1

2400  7300  TS681I,     CLA CLL                    /FILL MB WITH ONES
2401  1255    TAD M14
2402  3252    DCA SHFCNT                      /PRESET SHIFT COUNTER
2403  3253    DCA CHKCAW                      /RESET TEST WORD
2404  3211  SHIFTI,     DCA TTYIN5+2          /PRESET CAW
2405  1254    TAD PRLSW1
2406  3210    DCA TTYIN5+1          /PRESET LINE STATUS WORD

2407  6402  TTYIN5,     TTI
2410  4003    4003                        /LSW
2411  0000    %                           /CAW

2412  4042    JMS # SR1                           /SCOPE REPEAT?
2413  5216    JMP .+3                     /NO
2414  1253    TAD CHKCAW                        /YES, RETAIN SAME CAW & REPEAT
2415  5204    JMP SHIFTI

                /CHECK RESULTS OF MB SHIFT
2416  7120    CLL CML                     /1 TO LINC
2417  1253    TAD CHKCAW
2420  7010    RAR                         /SIMULATE MB SHIFT
2421  3253    DCA CHKCAW                        /STORE SHIFT RESULTS

2422  1253    TAD CHKCAW
2423  7041    CIA
2424  1211    TAD TTYIN5+2          /COMPARE FOR CORRECT SHIFT RESULTS
2425  7640    SZA CLA                     /SKIP IF RESULTS ARE CORRECT
2426  5234    JMP ERMBSI

                /MB SHIFT CORRECT
2427  2252  SHFINI,     ISZ SHFCNT                        /SKIP IF MB IS FULLY, (ONES)
2430  5205    JMP SHIFTI+1

2431  4051    JMS # SR2                           /VERIFY REPEAT?
2432  5256    JMP TS681J                      /NO, ENTER PART 2
2433  5200    JMP TS681I                      /YES, REPEAT PART 1
```

```
                /MB SHIFT ERROR DETECTED, (PART 1)
2434  4020      ERMBSI,     JMS I SR0                       /HALT ON ERROR?
2435  5227        JMP SHFINI                      /NO
2436  7100        CLL
                /HALT 1 - MB SHIFT ERROR, PART 1
2437  1253        TAD CHKCAW
2440  7402      ERMBS1,     HLT                         /HALT & DISPLAY CORRECT SHIFT RESULTS
2441  7200        CLA
2442  1211        TAD TTYIN5+2
2443  7402        HLT                         /HALT & DISPLAY ACTUAL SHIFT RESULTS

                /RETEST FAILING SHIFT
2444  7300        CLA CLL
2445  1253        TAD CHKCAW
2446  7004        RAL                         /RESTORE PREVIOUS CAW CONTENTS
2447  3253        DCA CHKCAW                      /AND RETEST
2450  1253        TAD CHKCAW
2451  5204        JMP SHIFTI

2452  0000      SHFCNT,     0
2453  0000      CHKCAW,     0
2454  4003      PRLSW1,     4003
2455  7764      M14,        -0014
```

```
                /TS681J - MB REGISTER SHIFT TEST, PART 2

2456  7201  TS681J,     CLA IAC                    /FILL MB WITH ZEROS
2457  1255    TAD M14
2460  3252    DCA SHFCNT                      /PRESET SHIFT COUNTER
2461  1331    TAD MS3777
2462  3253    DCA CHKCAW                      /PRESET TEST WORD
2463  1254  SHIFTJ,     TAD PRLSW1
2464  3270    DCA TTYIN6+1          /PRESET LINE STATUS WORD
2465  1253    TAD CHKCAW
2466  3271    DCA TTYIN6+2          /PRESET CAW

2467  6402  TTYIN6,     TTI
2470  4003    4003                        /LSW
2471  3777    3777                        /CAW

2472  4042    JMS Z SR1                             /SCOPE REPEAT?
2473  5275    JMP .+2                     /NO
2474  5263    JMP SHIFTJ                        /YES, RETAIN SAME CAW & REPEAT

                /CHECK RESULTS OF MB SHIFT
2475  1253    TAD CHKCAW
2476  7110    CLL RAR                     /SIMULATE MB SHIFT
2477  3253    DCA CHKCAW
2500  1271    TAD TTYIN6+2          /GET ACTUAL MB SHIFT RESULT
2501  0331    AND MS3777
2502  7041    CIA
2503  1253    TAD CHKCAW                        /COMPARE WITH CORRECT MB SHIFT RESULT
2504  7640    SZA CLA                     /SKIP IF RESULTS ARE CORRECT
2505  5313    JMP ERMBSJ

                /MB SHIFT CORRECT
2506  2252  SHFINJ,     ISZ SHFCNT                    /SKIP IF MB IS FULL, (ZEROS)
2507  5263    JMP SHIFTJ

2510  4051    JMS Z SR2                             /VERIFY REPEAT?
2511  5732    JMP I AT681K          /NO, ENTER PART 3
2512  5256    JMP TS681J                        /YES, REPEAT PART 2
```

```
                /MB SHIFT ERROR DETECTED, (PART 2)
2513  4020  ERMBSJ,     JMS Z SR0                       /HALT ON ERROR?
2514  5306    JMP SHFINJ
                /HALT 2 - MB SHIFT ERROR, PART 2
2515  7100    CLL
2516  1253    TAD CHKCAW
2517  7402  ERMBS2,     HLT                         /HALT & DISPLAY CORRECT SHIFT RESULTS
2520  7200    CLA
2521  1271    TAD TTYIN6+2
2522  0331    AND MS3777
2523  7402    HLT                           /HALT & DISPLAY ACTUAL SHIFT RESULTS
2524  7200    CLA
2525  1253    TAD CHKCAW
2526  7124    CLL CML RAL           /RESTORE PREVIOUS CAW CONTENTS
2527  3253    DCA CHKCAW                      /AND RETET
2530  5263    JMP SHIFTJ

2531  3777  MS3777,     3777
2532  2600  AT681K,     TS681K
```

```
                *2600

                /TS681K - MB REGISTER SHIFT TEST, PART 3

2610  7300  TS681K,     CLA CLL                    /FILL MB WITH ALTERNATE ONES & ZEROS
2611  3302    DCA PSELEC                      /RESET PASS SELECTOR
2612  1301    TAD MIN14
2613  3277    DCA CNTSHF                      /PRESET SHIFT COUNTER
2614  1303    TAD PRCAW
2615  3276    DCA CAWCHK                      /PRESET TEST WORD
2616  1300  SHIFTK,     TAD PRLSW3
2617  3213    DCA TTYIN7+1          /PRESET LSW
2610  1276    TAD CAWCHK
2611  3214    DCA TTYIN7+2          /PRESET CAW TO 4000

2612  6402  TTYIN7,     TTI
2613  4003    4003                  /LSW
2614  4000    4000                  /CAW

2615  4042    JMS # SR1                       /SCOPE REPEAT?
2616  5220    JMP .+2               /NO
2617  5206    JMP SHIFTK                      /YES, RETAIN SAME CAW & RETEST

                /CHECK RESULTS OF MB SHIFT
2620  1276    TAD CAWCHK
2621  7130    CLL CML RAR           /SIMULATE MB SHIFT
2622  3276    DCA CAWCHK
2623  7010    RAR
2624  3304    DCA BITBUK                      /SAVE PREVIOUS CONTENTS OF MB11
2625  1214    TAD TTYIN7+2
2626  7041    CIA
2627  1276    TAD CAWCHK                      /COMPARE MB SHIFT RESULTS
2630  7640    SZA CLA               /SKIP IF RESULTS ARE CORRECT
2631  5250    JMP ERMBSK

                /MB SHIFT CORRECT
2632  2277  SHFINK,     ISZ CNTSHF                    /SKIP IF MB FULL, (ONES & ZEROS)
2633  5235    JMP .+2
2634  5267    JMP EX681T

2635  1302    TAD PSELEC                      /EXAMINE PASS SELECTOR
2636  7640    SZA CLA
2637  5246    JMP .+7
2640  1276    TAD CAWCHK                      /PASS SELECTOR = 0
2641  1305    AND RSTMB0                      /NOW SHIFT MB0 (0) TO MB1
2642  3276    DCA CAWCHK
2643  7001    IAC
2644  3302    DCA PSELEC                      /1 TO PASS SELECTOR
2645  5206    JMP SHIFTK
```

```
                /PASS SELECTOR = 1
2646  3302        DCA PSELEC                  /Ø TO PASS SELECTOR
2647  5206        JMP SHIFTK                  /NOW SHIFT MBØ (1) TO MB1

                /MB SHIFT ERROR DETECTED, (PART 3)
2650  4020  ERMBSK,     JMS Z SRØ                          /HALT ON ERROR?
2651  5232        JMP SHFINK                  /NO

                /HALT 3 - MB SHIFT ERROR, PART 3
2652  7100        CLL
2653  1276        TAD CAWCHK
2654  7402  ERMBS3,     HLT                          /HALT & DISPLAY CORRECT SHIFT RESULTS
2655  7200        CLA
2656  1214        TAD TTYIN7+2
2657  7402        HLT                       /HALT & DISPLAY ACTUAL SHIFT RESULTS
2660  7300        CLA CLL
2661  1304        TAD RITBUK                     /GET PREVIOUS CONTENTS OF MB11
2662  7004        RAL
2663  1276        TAD CAWCHK
2664  7004        RAL                       /RESTORE PREVIOUS CAW CONTENTS
2665  3276        DCA CAWCHK
2666  5206        JMP SHIFTK                     /RETEST FAILING MB SHIFT

2667  4051  EX681T,     JMS Z SR2                          /VERIFY REPEAT?
2670  5272        JMP .+2                   /NO
2671  5200        JMP TS681K

                /END OF STATIC TEST
2672  4060        JMS Z SR3                          /HALT AT COMPLETION OF STATIC TEST?
2673  5706        JMP I ARING          /NO, REPEAT STATIC TEST
2674  7402  ENDTST,     HLT                          /END OF STATIC TEST
2675  5706        JMP I ARING          /DEPRESS CONTINUE TO REPEAT STATIC TEST

2676  0000  CAWCHK,     Ø
2677  0000  CNTSHF,     Ø
2700  4003  PRLSW3,     4003
2701  7764  MIN14,      -ØØ14
2702  0000  PSELFC,     Ø
2703  4000  PRCAW,      4000
2704  0000  RITBUK,     Ø
2705  3777  RSTMBØ,     3777
2706  0756  ARING,      RING
```

```
HEADER  0532
HNEXT1  1277
HNEXT2  1310
INEXT1  1335
INEXT2  1346
INTCNT  0437
INTERR  0464
INTON   0234
INTRPT  0001
INTSTA  0012
JMPADD  0345
JMPCI1  0346
JNEXT1  1415
KEEPAC  0010
KNEXT   1463
LETTR   0554
LF      0523
LINCNT  1437
LNOTZ   1660
LROTFR  1712
LSKB    1023
LSKC    1046
LSKD    1071
LSKE    1125
LSKF    1200
LSKG    1240
LSKH    1271
LSKI    1327
LSKJ    1400
LSKK    1441
LSKTST  1000
LSTPAS  0452
LSXCNT  2364
LSXERR  2062
LS4003  2254
MASK1   0342
MIN14   2701
MNOP    2261

MNP000  2136
MOOCAW  2355
MSEVEN  2366
MSKCNT  2367
MSKSR0  0015
MSKSR1  0050
MSKSR2  0057
MSKSR3  0066
MSKSR4  0013
MSKSR5  0774
MS3777  2531
M052    1364
M1      1514
M14     0434
M1400   2137
M125    1326
M1253   0776
M14     2455
M177    1124
M177A   1237
M240    1440
M2000   1726
M2525   1763
M4000   0753
M4404   2255
M412    0354
M5      0343
M5400   2133
M6      0551
M6400   2257
M7777   1022
NOAC    1606
NOFLAG  0132
NORMAL  0417
NOSTAT  1612
NOTYPE  0510
NXTTY   2057
OKJMP1  1637
OKJMP2  2013
ONF     0126
PASS    0353
PASTRT  2267
PRCAW   2703
PRLSW1  2454
PRLSW3  2700
PSELEC  2702
PT1NXT  1655
PT2NXT  1707
PT3NXT  1744
PUTBAK  0625
P142    0435
P161    0436
RESTRT  0213
RETEST  2305
RING    0756
RNGCNT  0775
RNPS    0145
RSTMR0  2705
SELECT  0200
SHFCNT  2452
SHFINI  2427
SHFINJ  2506
SHFINK  2632
SHFTER  1717
SHIFTI  2404

SHIFTJ  2463
SHIFTK  2606
SKIPER  1623
SPACE   0631
SR0     0020
SR1     0042
SR2     0051
SR3     0060
STORAC  0140
STORE   0440
STORI   0011
ST685   0674
SUBTR   0636
SWJMP1  2032
SW0007  2134
SW2000  2131
SW3000  2132
THREE   0130
TIME    0355
TIMER   0240
TIMOUT  0136
TIMTRL  0442
TS581A  1600
TS681B  1641
TS681C  1672
TS681D  1727
TS681E  2000
TS681F  2034
TS681G  2200
TS681H  2262
TS681I  2400
TS681J  2456
TS681K  2600
TTCL    6411
TTI     6402
TTICNT  2365
TTIER   1627
TTINCR  6401
TTO     6404
TTOER   1633
TTRL    6414
TTSL    6412
TTXOFF  0463
TTYIN   2006
TTYIN2  2041
TTYIN3  2207
TTYIN4  2300
TTYIN5  2407
TTYIN6  2467
TTYIN7  2612
TTYNXT  2226
TT1OFF  6422
TT1ON   6424
TT1SKP  6421
TT2OFF  6432
TT2ON   6434
TT2SKP  6431
TT3OFF  6442
TT3ON   6444
TT3SKP  6441
TT4OFF  6452
TT4ON   6454
TT4SKP  6451
TWO     0127
TYPE    0524

WORK    0622
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