PDP-15 58

EAE

IDENTIFICATION

PRODUCT CODE:	MAINDEC-15-DØGB-D (D)
PRODUCT NAME:	PDP-15 [redacted]
DATE REVIEWED:	AUGUST 6, 1970
MAINTAINER:	DIAGNOSTIC GROUP
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2. ABSTRACT

Part 1 of the PDP-15 EAE Diagnostic verifies correct operation of all EAE operations, except multiplies and divides. Part 1 is written in three logical sections. Part 1 Section 1 is the EAE Set-Up Test and verifies that all set-up operations except LACS operate correctly. Part 1 Section 2 is the Shift Counter (LACS is verified) and Basic Shift Test and verification that the AC and MQ will each shift left1 and shift right 1 all combinations of 18 bits. Part 1 Section 3 is the Random Data, Normalize, and Interrupt Test verifying that random data will shift left and right 0 to 44_8 places, that normalize will " stop shift" on negative and positive data, and the teleprinter flag will cause a break after an EAE operation. Hardware malfunctions detected by the program result in an error on the teleprinter.

3. REQUIREMENTS

3.1 Storage

CAL subroutine	00020-00027
AC contents initial	00030
MQ contents initial	00031
Link initial	00032
SC of shift instructions	00033
AC contents as result	00034
MQ contents as result	00035
Link as result	00036
SC of LACS instruction	00037
Halt and/or Scope Loop subroutine	00040-00057
Halt and/or Repeat Sequence subroutine	00060-00077
Set-Up Test	00100-01000 (approx.)
Error Typeout subroutine	
Error texts and program constants	01035-02100 (approx.)
SC and Basic Shift Test	02200-04600 (approx.)
Random Data and Normalize	05000-06400 (approx.)

3.2 Subprograms and/or Subroutines

PDP-4/7/9 Teletype Output Package

(ASC11 tape 2A of this test)

3.3 Equipment

Minimum configuration PDP-15 with EAE option installed.

4. USAGE

4.1 Loading

a. Set Bank Mode SW on 1.
b. Set address SW to 17700.
c. Press reset, press READ IN.

4.2 Calling Sequence

Part 1 Section 1 must run in its entirety before running Part 1 Section 2.

Part 1 Section 2 must run in its entirety before running Part 1 Section 3.

4.3 Switch Settings

4.3.1 AC switches = 0 or down. With all AC Switches down the program results in the following:

(1) All hardware malfunctions detected by the program result in an error typeout on the teleprinter.

(2) At the completion of an error typeout the processor halts.

(3) The program repeats whichever section of the test it was started in and sequences from each sub-test of that section to the next without halting.

4.3.2 AC switches = 1 or up

SW#	Operation	Description
0	Delete error typeouts	The program will not type out error messages and will not error halt (see also SW0 and 7, Ring Bell on Error).
1	Halt after EAE operation Processor halts at address 0046 (AC)= S.A. to set up last operation	The processor halts after each EAE operation is initiated and its results are verified. (Note: Press CONTINUE to proceed.)
2	Repeat EAE operation (Scope Loop)	The program repeats the last EAE operation. If SW2 is set during an error typeout or halt, the program repeats the operation that caused the error (Note: SW1 is tested before SW2.)
3	Halt after EAE sequence	The processor halts after each sequence of

SW#	Operation	Description
	Processor halts at address 0066 (AC)=S.A. of last sequence	testing an EAE operation ; i.e., after testing that the MQ will complement all patterns, the processor halts.
4	Repeat EAE sequence	The program repeats the last sequence of testing an EAE operation; i.e., the program repeats the LEFT SHIFT ALL COMBINATIONS and does not proceed to RIGHT SHIFT ALL COMBINATIONS. (Note: The program tests SW3 before SW4.) In the Random Data Left and Random Data Right routines SW4 causes the program to repeatedly shift a single pair of random numbers 0 to 44_8 places.
5	Cycle all sections	At the completion of 1 pass through the Set-Up Test the program proceeds to the SC and Basic Shift Test. At the completion of 1 pass through the SC and Basic Shift Test the program proceeds to the Random Data and Normalize Test. At the completion of 1 pass through Random Data and Normalize Test the program repeats the Set-Up Test.
6	Type end of section	At completion of 1 pass through each of the sections a character is typed on the teleprinter as follows: Set-Up Test / SC and Basic Shift Test ' Random Data and Normalize *
7	Delete error halt	The processor will not halt after error typeouts.
0 & 7	Ring bell on error	SW0 and SW7 both up. Error typeouts and halts are deleted and the "bell" on the teleprinter is rung (to be used to determine marginal voltage limits, eliminates waiting for long typeouts).

4.4 Start Up and/or Entry

4.4.1 Start Up, Set-Up Test

Set AC switches = 000000

Set ADDRESS = 0200

Press I/O Reset

Press START

Processor halts at 0201 with MQ = 777777

Set ADDRESS = 0202

Press I/O Reset

Press START

Program reads C(MQ) into the AC and tests for 0, then proceeds to rest of test.

4.4.2 Start Up, SC and Basic Shift Test

Set AC switches = 000000

Set ADDRESS = 2200

Press I/O Reset

Press START

4.4.3 Start Up Random Data and Normalize Test

Set AC switches = 000000

Set ADDRESS = 5000

Press I/O Reset

Press START

4.5 Errors in Usage

Hardware malfunctions detected by the program will result in an error typeout on the teleprinter and a processor halt (see section 4.3.2, SW0 and SW7).

4.5.1 Error Typeout Format

All error typeouts are in standard formats and include the following information:

(1) An address that may be used to determine which test the program was in at the time the error was detected.

(2) A mnemonic describing the operation being tested

(3) The initial condition of registers pertinent to the failure

(4) The expected results of the operation being tested if they are not easily determined from the initial conditions and operation

(5) The resultant register contents that are pertinent to the failure

A common typeout routine called ERROR generates all error typeouts. The first line of every error typeout is the contents of memory register ERROR or the address + 1 of the JMS ERROR instruction.

The second line of every typeout is the mnemonic describing the operation being tested (see paragraph 4.5.2 for definitions of mnemonics used).

The third line of a typeout may be another address. In this case the second address typed should be used to determine which test failed. (Operations such as LRS or LLSS each have common error routines.)

The next information typed is a header to format the typeouts of the contents of pertinent registers. One of five headers may be used for any typeout.

The abbreviations used by the headers are as follows:

Abbr.	Meaning
L	The information under this column is the contents of the link.
C(AC)	The information under this column is the contents of the accumulator.
C(MQ)	The information under this column is the contents of the MQ register.
SC	The information under this column is the contents of the shift counter or the SC portion of shift instructions.
START	The information is this line is the initial condition of pertinent registers.

The five headers are as follows:

```
          C(AC)

START

          C(AC)       C(MQ)

START
          L           C(AC)          C(MQ)

START
```

4.5.1 (Continued)

```
                SC          C(AC)
START
L               C(AC)       C(MQ)
```

4.5.2 Error Typeout Mnemonics

Mnemonic	Description
EAENOP	EAE instruction with no other operation specified.
EAECLA	EAE. Clear the accumulator.
CLQ	Cl ear the MQ register.
CMQ	Complement the MQ register.
ORMQAC	Inclusive OR the MQ to the AC and place the results in the AC.
ACOTOL	Set AC bit 0 into the link.
ORACMQ	Inclusive OR the AC to the MQ and place the results in the MQ (and in test ACORMQ clear the AC).
LACQ	Clear the AC, then MQ 1's to the AC.
LLS	Long left shift
LLSS	Long left shift signed.
LRS	Long right shift.
LRSS	Long right shift signed.
LMQ	Clear the MQ, then AC 1's to the MQ.
ABS	Complement the AC if it is negative .
CLR SC	Clear the step counter (START).
LACS	Clear the AC and step counter; 1's to the AC.
NORM	Normalize the AC and MQ.
NORMS	Normalize signed.
ALS	Accumulator left shift.
PAT	Pattern being tested.
COR	Results expected from the operation being tested.
INCO	Erroneous results of the operation.

4.5.3 Error typeout Examples

The following are examples of error typeouts. The addresses indicated by these typeouts should not necessarily be taken as true representations:

Example 1: Complement the MQ Failure

Example			Explanation
000226			JMS ERROR is at 00225
CMQ			Operation is complement the MG
	C(AC	C(MQ	Header
START	000000	000000	Initial conditions
CMQ	000000	767777	Contents of the AC and MQ after CMQ was executed.

Note: Examine the MQ indicators to be sure they agree with the typeout. If the MQ as indicated does not agree with a typeout, an error was present in MQ 1's to the AC. This is true of all error typeouts that include the MQ as an end condition.

Example 2: EAE NOP AC Failure

Example		Explanation
000135		JMS ERROR is at 00134
EAENOP		Operation is NOP 640000
	C(AC)	Header
START	777777	Initial condition of the AC
EAENOP	000000	Contents of the AC after the NOP was executed

Example 3: AC Sign to Link Failure

Example				Explanation
000455				JMS ERROR is at 00454
ACOTOL				Operation is AC bit 0 to link
	L	C(AC)	C(MQ)	Header

4.5.3 (Continued)

Example				Explanation
START	1	400000		Initial conditions MQ not pertinent
ACOTOL	0	400000		State of the LINK and AC after the operation was executed

Example 4: AC to MQ to AC Failures

Example				Explanation
000526				JMS ERROR is at 00525
ORACMQ				Operation is AC 1's to MQ
	C(AC)	C(AC)		Header
START	000000	000000		Initial register states
ORACMQ	000000	000000	COR	Expected results
LACQ	000000	000000	INCO	The contents of the AC after ORACMQ and the contents of the MQ as indicated by a LACQ instruction.
000526				
ORACMQ				
	C(AC)	C(MQ)		
START	005000	000000		
ORACMQ	000000	005000	COR	
LACQ	000000	004000	INCO	

Note: Again, the contents of the MQ as indicated by the MQ indicators may not necessarily agree with the MQ contents as typed.

Example 5: Step Counter Error

Example	Explanation
002530	JMS ERROR is at 02527
SC ERROR	One of the SC tests failed

Example				Explanation
002262				JMS SCERR is at 02261
	SC	C(AC)		Header
START	00	200000		Initial register status
NORM	01			Instruction used to set the SC
SET SC	76			NORM 01 should set the SC to 76
SC +1	77	COR		SC should increment to 77
LACS	67	INCO	200000	Contents of the SC as read to the AC by a LACS instruction and the contents of the AC after the NORM instruction.

Example 6: ALS (Accumulator Left Shift) Failure

Example			Explanation
003123			JMS ERROR is at 03122
ALS	05		ALS instruction 5 places
003076			JMS ALSERR is at 03075
L	C(AC)	C(MQ)	Header
1	777776	PAT	Pattern being tested
1	777777	RESULT	Results in AC after the shift
LACS	00		Shift counter read back to the AC

Example 7: Long Left Shift

Example				Explanation
003673				JMS ERROR is at 03672
LLS	01			Long left shift 1 place
003507				JMS LLSERR is at 03506
L	C(AC)	C(MQ)		Header
1	777777	777737	PAT	Initial register states
1	777777	777377	RESULT	Registers at completion of shift

4.5.3 (Continued)

Example				Explanation
LACS	00			SC as read back to the AC

Example 8: Long Left Shift Signed

Example				Explanation
003716				JMS ERROR is at 03715
LLSS	03			Long left shift signed 3 places
005075				JMS LRSSER is at 05074
L	C(AC)	C(MQ)		Header
0	456701	234567	PAT	Pattern being tested.
	567012	345677	COR	Expected results
1	567012	347677	INCO	L, AC, and MQ after the shift
LACS	00			SC as read back to the AC

Example 9: Long Right Shift

Example				Explanation
004600				JMS ERROR is at 004577
LSR	01			Long Right shift 1 place
004537				JMS LRSER 1 is at 004536
L	C(AC)	C(MQ)		Header
1	402101	402101	PAT	Pattern being tested
	601200	601200	COR	Expected results
1	601200	601000	INCO	ACand MQ after completion of the shift
LACS	00			SC as read to the AC after completion of the shift

Example 10: Random Data Sequenced

Example	Explanation
005501	JMS ERROR is at 005500
RANDOM DATA SEQUENCED 02	Random Sequence 2
005301	JMS SEQCOM is at 005300

Example				Explanation
L	C(AC)	C(MQ)		Header
0	045670	123450	START	Pattern sequenced
0	045630	123450	RESULT	L, AC, and MQ after shift sequence
LACS	00			SC after shift sequence

```
Note:  Sequence 2 is LLSS 03
                     LRS  06
                     LLSS 06
                     LRS  03
```

The AC and MQ results should equal the AC and MQ at START. This is true of all of the Random Data Sequences.

Example 11: Normalize

Example				Explanation
006217				JMS ERROR
NORM	01			Normalize SC = 1
005766				JMS NORMER is at 05765
L	C(AC)	C(MQ)		Header
0	200000	000000	PAT	Pattern being tested
0	400000	000000	RESULT	L, AC, and MQ after NORM
LACS	77	COR		SC expected after the NORM
LACS	00	RESULT		SC read back to the AC

Example 12: Interrupt Failure

Example	Explanation
006310	JMS ERROR is at 06307
NO PROGRAM INTERRUPT	Error is no interrupt
EAE NOP	Instruction tested

Example	Explanation
006305	Address of NOP instruction

4.6 Recovery From Such Errors

4.6.1 General

At the completion of an error typeout the processor halts. One of the following operations may be necessary if more information about the failure is required to repair the malfunction:

1. Repeat the exact operation that detected the failure (possibly for a scope loop).

2. Continue normally in the test to generate more information about the failure.

3. Repeat the sequence of operations or data patterns that detected the error.

AC switch control is built into the program to allow for any of these operations. Assuming the processor has halted after an error typeout, the operations may be accomplished as follows:

1. Repeat same operation

Set AC switch 2 up or to a 1
Press CONTINUE

Note that AC SW0 allows deletion of error typeouts for a scope loop.

2. Continue normally

Press CONTINUE

3. Repeat Sequence

Set AC switch 4 up to a 1
Press CONTINUE

In the Random Data Tests, switch 4 a 1 causes the same pair of random numbers to be repeatedly shifted 0 to 44_8 places. This is useful in determining which shift the random data first fails.

4.6.2 To Determine Area in Program that Failed

4.6.2.1 From Error Typeouts

4.6.2.1 (Continued)

Each error typeout includes an address typeout that may be used to determine the exact test routine that detected the error. Some of the typeouts include an address that points at a common error routine for that type of error and a second address that points at the test routine. (Section 4.5.3, example 3 has only one octal typeout before the header and example 5 has two. The second octal typeout in example 5 (002262) determines which SC test failed.) Determine which address to use, go to the numerically sorted program labels (section 10.4.1) and find the program labels with addresses lower and higher than the one typed. The last program label with an address lower than the one typed is in the test routine that failed.

4.6.2.2 From CAL Routine

This test program includes a halt at address 00026 that indicates a CAL instruction was executed. Pressing CONTINUE at this point causes the processor to CAL at address 00027. At the time of the first HALT the contents of the AC indicate the contents of address 00020 after the CAL or the address + 1 of the CAL. The approximate area of the test program that was being executed may be determined by examining the following memory addresses.

Address	Contents Indicate
00040	Address + 1 or +2 of last JMS SWITCH
00057	Starting address of last SCOPE LOOP
00060	Address +1 or +2 of last JMS SWITCH
00077	Starting address of last TEST SEQUENCE

By comparing the contents of these memory locations with the numerically sorted symbol list, the test routine (at the time of a CAL, hang up, or program wipeout) that was being executed may be determined.

5. RESTRICTIONS (Not Applicable)

6. DESCRIPTION

6.1 Discussion

6.1.1 General

The PDP-15 EAE Diagnostic Part 1 verifies correct operation of all EAE operations except multiplies and divides. Part 1 itself is written in three logical sections as follows:

Section 1: Set-Up Test

Verifies correct operation of all EAE set-up operations except LACS.

6.1.1 (Continued)

Section 2: SC and Basic Shift Test

Verifies correct operation of the SC and LACS instruction and verifies that the AC and MQ will shift left and right 1 place all combinations of 18 bits.

Section 3: Random Data and Normalize Test

This section of Part 1 verifies that the AC and MQ will shift random data left and right 0 to 44_8 places, that the NORM and NORMS instructions operate correctly, and that the processor interrupts after an EAE operation.

The above sections are to be used incrementally. That is, Section 1 must operate at all margins before Section 2 is run. Section 2 must run at all margins before Section 3 is run.

6.1.2 Test Descriptions

6.1.2.1 Set-Up Test

The Set-Up Test incrementally verifies correct operation of all of the EAE set-up instructions except LACS.

The sequence of testing is as follows:

Test Mnemonic	Operation(s) Tested
SETUP	Does CMQ set MQ = 0's to 1's Do all MQ indicators light (visual)
EAERMQ	Does START clear the MQ Does MQ = 0's to AC = 0's
NOPAC	Does EAE NOP not clear the AC
EAECAC	Do EAE and bit 8 clear the AC
EAECLQ	Does bit 5 clear the MQ
MQITAC	Does bit 16 with MQ = 1's set AC to 1's
NOPACI	Does EAE NOP with MQ = 1's alter the AC
NOPMQ	Does EAE NOP with MQ = 1's alter the MQ
NOPMQI	Does EAE NOP with AC = 1's alter the MQ
NOPLNK	Does EAE NOP alter the link

6.1.2.1 (Continued)

Test Mnemonic	Operation(s) Tested
QONEAC	Does MQ =1's inclusive OR to AC = 1's
EAESLK	Do EAE and bit 4 get AC sign to link
NOPLKI	Does EAE NOP alter the MQ with link =1
ACORMQ	Does AC inclusive OR all patterns to MQ = 0's and MQ to AC all patterns
ACLMQ	Does the LMQ instruction operate as specified
COMPMQ	Will the MQ complement all patterns
ACONEQ	Will the AC=1's inclusive OR to MQ =1's
EAEABS	Does the ABS instruction operate as specified

6.1.2.2 SC and Basic Shift Test

The SC and Basic Shift Test incrementally verifies correct operation of the SC (including the LACS instruction) and the left and right shifts. The SC Test assumes that a NORM instruction with the AC= 200000 generates a stop shift.

The sequence of testing is as follows:

Test Mnemonic	Operation(s) Tested
SCTSTI	(1) Does NORM "stop shift" with AC= 200000 (visual) SC is set to 77
	(2) Does START clear the SC
	(3) Does LACS get SC = 0's to the AC
NOPSC	Does EAE NOP alter the SC = 0's
SCTO76	(1) Will the SC set to 76 and + 1 to 77
	(2) Will LACS read SC = 77 to the AC
SCTO74	Will the SC set to 74 and + 1 to 75
SCTO70	Will the SC set to 70 and + 1 to 71
SCTO60	Will the SC set to 60 and + 1 to 61

6.1.2.2 (Continued)

Test Mnemonic	Operation(s) Tested
SCTO40	Will the SC set to 40 and + 1 to 41
SCTO00	Will the SC set to 00 and + 1 to 01
SCTO01	Will the SC set to 01 and + 1 to 02
SCTO03	Will the SC set to 03 and + 1 to 04
SCTO07	Will the SC set to 07 and + 1 to 10 (Is "high count" generated?)
SCTO17	Will the SC set to 17 and + 1 to 20
SCTO37	Will the SC set to 37 and + 1 to 40
SCTO77	Will the SC set to 77 and + 1 to 00
NOPSC1	Does EAE NOP alter SC =77
ALSZER	Does ALS with SC = 00 "stop shift"
ALS01	Does ALS 1 place shift AC = 0's
ALSLNK	Does link get to AC17 on an ALS 1 place
LNKALS	Does bit 0 of the AC not go to the link on an ALS 1 place
ALSMQT	Does ALS alter the MQ Does MQ0 not go to AC17
HSALS	Will ALS shift the AC 1 to 18 places bit and no-bit
LLSTS1	Will the AC/MQ shift 0's place left
LLSTS2	Does link go to MQ17 on an LLS
LLSACT	(1) Does link not go to AC 17 on an LLS
	(2) Does MQ0 go to AC17 on an LLS
LLSTS3	Does each bit of the MQ = 1 shift left 1 place (1 bit at a time = 1)
LLSTS4	Does each bit of the MQ = 0 shift left 1 place (1 bit at a time = 0)

6.1.2.2 (Continued)

Test Mnemonic	Operation(s) Tested
LLSTS5	Will MQ/AC shift a 1 bit 1 to 44_8 places left
LLSTS6	Will MQ/AC shift a 0 bit 1 to 44_8places left
LRSTS1	Will AC/MQ shift right 1 all 0's
LRSTS2	Does link go to AC0 on an LRS
LRSTS3	Does AC17 go to MQ0 on an LRS
LRSTS4	Does AC17 not go to link on an LRS
LRSTS5	Will AC/MQ shift a 1 bit from each position right 1 place (1 bit at a time)
LRSTS6	Will AC/MQ shift a 0 bit right 1 place (1 bit at a time)
LRSTS7	Will AC/MQ shift 1 bit (ACO) right 1 to 44_8 places
LRSTS8	Will AC/MQ shift a 0 bit (ACO) right 1 to 44_8 places
LLSSEQ	Will the AC and MQ each shift left 1 place every combination of 18 bits
LRSSEQ	Will the AC and MQ each shift right 1 place every combination of 18 bits

6.1.2.3 Random Data and Normalize Test

The Random Data and Normalize Test verifies that the AC/MQ will shift left and right random data 0 to 44_8 places, that the NORM and NORMS instructions operate as specified, and that the processor interrupts after an EAE instruction.

The sequence of testing is as follows:

Test Mnemonic	Operation(s) Tested
RANSHF	Generates 4096 pairs of random numbers, 1 for the AC and 1 for the MQ. Each pair of random numbers is shifted left signed (LLSS) 0 to 44_8 places, and the results are tested against a table generated by 44 left shift 1 place.
RANRIT	Generates 4096 pairs of random numbers 1 for the AC and 1 for the MQ. Each pair of random

Test Mnemonic	Operation(s) Tested
	numbers is shifted right (LRS) 0 to 44_8 places, and the results are tested against a table generated by 44 shift right 1 place.
RANSEQ	Generates 4096 pairs of random numbers 1 for the AC and 1 for the MQ. Each pair of random numbers is used by RANSEQ0 to RANSEQ8. After each sequence the AC and MQ should equal their starting patterns.
RANSQ0	Bit 0 to AC = bit 17 of MQ. Random numbers are sequenced 1 left signed, 2 right, 2 left signed, 1 right.
RANSQ1	Bit 0 and 1 of AC = bit 16 and 17 of MQ. Sequence is: 2 right signed 4 left signed 4 right 2 left signed
RANSQ2	Bits 0 to 2 of AC = bits 15 to 17 of MQ. Sequence is: 3 left signed 6 right 6 left signed 3 right
RANSQ3	Bits 0 to 3 of AC = bits 14 to 17 of MQ. Sequence is: 4 right signed 8 left signed 8 right 4 left signed
RANSQ4	Bits 0 to 4 of AC = bits 13 to 17 or MQ. Sequence is: Left 5 signed Right 10 Left 10 signed Right 5
RANSQ5	Bits 0 to 5 of AC = bits 12 to 17 of MQ. Sequence is: Right 6 signed Left 12 signed Right 12 Left 6 signed

6.1.2.3 (Continued)

Test Mnemonic		Operation(s) Tested
RANSQ6		Bits 0 to 6 of AC = bits 11 to 17 of MQ. Sequence is: Left 7 signed; Right 14; Left 14 signed; Right 7
RANSQ7		Bits 0 to 7 of AC = bits 10 to 17 of MQ. Sequence is: Right 8 signed; Left 16 signed; Right 16; Left 8 signed
RANSQ8		Bits 0 to 8 of AC = bits 9 to 17 of MQ. Sequence is: Left 9 signed; Right 18; Left 18 signed; Right 9
NRMLZE		Does NORMS get AC sign = 0 to link
NRMLZ1		Does NORMS get AC sign = 1 to link
NRMLZ2		Will NORM "stop shift" with AC0 ≠ AC1, AC0 = 1, AC1 = 0, or AC0 = 0, AC1 = 0
NRMLZ3		Does NORM NOT "stop shift" with AC0 = AC1, AC1 = 0, or AC0 = 0, AC1 = 0 or until SC = 77
NRMLZ4		Will NORMS normalize the alternate pattern of 1 and 0 bits for each bit position of the AC and MQ.
NRMLZ5		Will complement bit patterns normalize
INTEST	(1)	Will the teleprinter flag cause an interrupt after an EAE NOP
	(2)	Will the teleprinter flag cause an interrupt after an LLS 43_8 places
	(3)	Does the interrupt not occur until the LLS is complete
	(4)	Does the interrupt not occur until 2 instructions after a normalize.

7. METHODS (Not Applicable)

8. FORMAT (Not Applicable)

9. EXECUTION TIME (Not Applicable)

10. PROGRAM

10.1 Core Map (None)

10.2 Dimension List (None)

10.3 Macro, Parameter, and Variable Lists (None)

```
                                  .TITLE EAE-P1
                                  .ABS
                          /EAE  SET UP DIAGNOSTIC
                          /
                          /START AT 200
                          /PROCESSOR HALTS AT 201 WITH MQ=1'S
                          /SET ADDRESS SWITCHES TO 202, THEN DO RESET AND START.
                          /
                          /SW0 - DELETE ERROR TYPEOUTS
                          /SW1 - HALT AFTER EACH EAE OPERATION
                          /SW2 - REPEAT LAST EAE OPERATION
                          /SW3 - HALT AFTER EACH EAE SEQUENCE
                          /SW4 - REPEAT EACH EAE SEQUENCE
                          /SW5 - 0-REPEAT SET UP TEST OR SCA AND SHIFT TESTS
                          /SW5 - 1-CYCLE SET UP AND SC AND SHIFT TEST
                          /
00020                             .LOC 20
                          /
                          /CAL SUBROUTINE
00020   000020                    20                    /20 IN CASE CAL*
00021   200020                    LAC 20                /GET ADDRESS
00022   040000                    DAC 0                 /SAVE
00023   200027                    LAC .+4               /RESTORE 20
00024   040020                    DAC 20
00025   200000                    LAC 0
00026   740040                    HLT                   /HLT DISPLAY
00027   000020                    20                    /WILL CAL IF CONTINUE
                          /
                          /
                          /AC,  MQ, LINK AND SC FOR TYPEOUTS
00030                             .LOC 30
00030   000000            ACSTRT  0
00031   000000            MQSTRT  0
00032   000000            LKSTRT  0
00033   000000            SCSTRT  0
00034   000000            ACEND   0
00035   000000            MQEND   0
00036   000000            LKEND   0
00037   000000            SCEND   0
                          /
                                  .EJECT
```

```
                             /ROUTINES THAT TEST REPEAT AND STOP
                             /STOP AFTER MINOR LOOP (SW1) AND REPEAT MINOR LOOP (SW2)
                             /
      00040   600040         SWITCH    JMP .
      00041   750004                   LAS
      00042   501322                   AND BIT1
      00043   741200                   SNA                   /MINOR LOOP HALT?
      00044   600047                   JMP .+3               /NO
      00045   220040                   LAC* SWITCH
      00046   740040                   HLT
      00047   220040                   LAC* SWITCH
      00050   040057                   DAC .+7
      00051   440040                   ISZ SWITCH
      00052   750004                   LAS
      00053   501323                   AND BIT2
      00054   740200                   SZA                   /REPEAT LOOP?
      00055   620057                   JMP* .+2  /YES
      00056   620040                   JMP* SWITCH           /CONTINUE IN SEQUENCE
      00057   000000                   0
                             /
                             /STOP AFTER MAJOR LOOP (SW3) AND REPEAT MAJOR LOOP (SW4)
      00060   600060         SWTCHS    JMP .
      00061   750004                   LAS
      00062   501324                   AND BIT3
      00063   741200                   SNA                   /MAJOR LOOP HALT?
      00064   600067                   JMP .+3               /NO
      00065   220060                   LAC* SWTCHS
      00066   740040                   HLT
      00067   220060                   LAC* SWTCHS
      00070   040057                   DAC SWTCHS-1
      00071   440060                   ISZ SWTCHS
      00072   750004                   LAS
      00073   501325                   AND BIT4
      00074   741200                   SNA                   /REPEAT MAJOR LOOP?
      00075   620060                   JMP* SWTCHS           /CONTINUE
      00076   620057                   JMP* SWTCHS-1         /REPEAT LOOP
                             /
                                       .EJECT
```

```
                                 /DOES EAE - OR THE MQ TO AC READ 0'S
                                 /MQ SHOULD BE ZERO FROM RESET KEY
                                 /
        00200                              .LOC 200
        00200    640024          SETUP     CMQ
        00201    740040                    HLT
                                 /
        00202    754000          EAERMQ    CLA+4000  /CLEAR LINK
        00203    040031                    DAC MQSTRT
        00204    040030                    DAC ACSTRT
        00205    640002                    EAE+2                /OR MQ 1'S TO AC
        00206    040034                    DAC ACEND
        00207    741200                    SNA
        00210    600221                    JMP .+11
        00211    101134                    JMS ERROR
        00212    001533                        TYRMQ
        00213    001375                        HDR2
        00214    600030                    ACSTRT+600000
        00215    600031                    MQSTRT+600000
        00216    001533                        TYRMQ
        00217    600034                    ACEND+600000
        00220    000000                    0
        00221    100040                    JMS SWITCH
        00222    000202                        EAERMQ
        00223    201363                    LAC NBIT16
        00224    041261                    DAC CHARK            /SET END TEST K
                                 /
                                 /DOES EAE NOP CLEAR THE AC?
                                 /
        00225    754001          NOPAC     CLC+4000  /CLEAR LINK
        00226    040030                    DAC ACSTRT           /AC AT START
        00227    501365                    AND KALL7 /MAKE MB=1'S BEFORE
        00230    640000                    EAE
        00231    040034                    DAC ACEND /AC AT END
        00232    740001                    CMA
        00233    741200                    SNA                  /AC ALTERED
        00234    600244                    JMP .+10             /NO
        00235    101134                    JMS ERROR
        00236    001514                        TYNOP
        00237    001366                        HDR1
        00240    600030                    ACSTRT+600000        /TYPE CONTENTS OF
                                 /
        00241    001514                        TYNOP            /TYPE TEXT
        00242    600034                    ACEND+600000         /TYPE CONTENTS OF
        00243    000000                    0
        00244    100040                    JMS SWITCH           /REPEAT SET
        00245    000225                        NOPAC            /LOOP TO HERE
                                 /
                                           .EJECT
```

```
                                /DOES EAE AND CLR AC BIT CLR THE AC?
                                /
       00246   754001          EAECAC     CLC+4000            /CLEAR LINK
       00247   641000                     EAE+1000            /SHOULD CLEAR AC
       00250   040034                     DAC ACEND
       00251   741200                     SNA
       00252   600262                     JMP .+10
       00253   101134                     JMS ERROR
       00254   001517                         TYCLA
       00255   001366                         HDR1
       00256   600030                     ACSTRT+600000
       00257   001517                         TYCLA
       00260   600034                     ACEND+600000
       00261   000000                     0
       00262   100040                     JMS SWITCH
       00263   000246                     EAECAC
                                /
                                /
                                /
                                /DOES CLQ CLEAR THE MQ
                                /
       00264   754001          EAECLQ     CLC+4000
       00265   040031                     DAC MQSTRT
       00266   640004                     EAE+4               /SET MQ TO 1'S
       00267   750000                     CLA
       00270   040030                     DAC ACSTRT
       00271   650000                     CLQ                 /CLEAR THE MQ
       00272   040034                     DAC ACEND
       00273   750000                     CLA
       00274   640002                     EAE+2               /OR MQ 1'S TO AC
       00275   040035                     DAC MQEND
       00276   741200                     SNA                 /READ 0'S BACK?
       00277   600311                     JMP .+12
       00300   101134                     JMS ERROR
       00301   001523                         TYCLQ
       00302   001375                         HDR2
       00303   600030                     ACSTRT+600000
       00304   600031                     MQSTRT+600000
       00305   001523                         TYCLQ
       00306   600034                     ACEND+600000
       00307   600035                     MQEND+600000
       00310   000000                     0
       00311   100040                     JMS SWITCH          /REPEAT SET
       00312   000264                         EAECLQ                    /START OVER
                                /
                                          .EJECT
```

```
                                 /DOES MQ COMPLIMENT FROM 0'S TO 1'S
                                 /AND MQ 1'S TO AC
                                 /
        00313    754000          MQ1TAC      CLA+4000
        00314    040030                      DAC ACSTRT
        00315    040031                      DAC MQSTRT
        00316    650004                      CLQ+4                   /CLEAR THE MQ AND COMPLIMENT
        00317    040034                      DAC ACEND
        00320    750000                      CLA
        00321    640002                      EAE+2                   /OR THE MQ TO AC
        00322    040035                      DAC MQEND
        00323    740001                      CMA
        00324    741200                      SNA
        00325    600337                      JMP .+12
        00326    101134                      JMS ERROR
        00327    001527                          TYCMQ
        00330    001375                          HDR2
        00331    600030                      ACSTRT+600000
        00332    600031                      MQSTRT+600000
        00333    001527                          TYCMQ
        00334    600034                      ACEND+600000
        00335    600035                      MQEND+600000
        00336    000000                      0
        00337    100040                      JMS SWITCH
        00340    000313                          MQ1TAC
                                 /
                                 /
                                 /DOES EAE-NOP WITH MQ=1'S ALTER THE AC
                                 /
        00341    754000          NOPAC1      CLA+4000
        00342    040030                      DAC ACSTRT
        00343    750001                      CLC
        00344    040031                      DAC MQSTRT
        00345    650004                      CLQ+4                   /SET MQ TO ONES
        00346    501365                      AND KALL7               /MAKE MB TO 1#S
        00347    640000                      EAE                     /NOP
        00350    040034                      DAC ACEND
        00351    740001                      CMA
        00352    741200                      SNA                     /ONES FROM MQ TO AC?
        00353    600364                      JMP .+11
        00354    101134                      JMS ERROR
        00355    001514                          TYNOP
        00356    001375                          HDR2
        00357    600030                      ACSTRT+600000
        00360    600031                      MQSTRT+600000
        00361    001514                          TYNOP
        00362    600034                      ACEND+600000
        00363    000000                      0
        00364    100040                      JMS SWITCH
        00365    000341                          NOPAC1
                                 /
                                             .EJECT
```

```
                                /DOES EAE NOP WITH MQ=1'S ALTER THE MQ
                                /
        00366   754000          NOPMQ       CLA+4000
        00367   650004                      CLQ 4           /SET MQ TO 1'S
        00370   501365                      AND KALL7       /MAKE MB TO 1#S BEFORE
        00371   640000                      EAE             /NOP
        00372   040034                      DAC ACEND
        00373   750000                      CLA
        00374   640002                      EAE+2
        00375   040035                      DAC MQEND
        00376   740001                      CMA
        00377   741200                      SNA             /MQ STILL 1'S?
        00400   600412                      JMP .+12
        00401   101134                      JMS ERROR
        00402   001514                          TYNOP
        00403   001375                          HDR2
        00404   600030                      ACSTRT+600000
        00405   600031                      MQSTRT+600000
        00406   001514                          TYNOP
        00407   600034                      ACEND+600000
        00410   600035                      MQEND+600000
        00411   000000                      0
        00412   100040                      JMS SWITCH
        00413   000366                          NOPMQ
                                /
                                /
                                /DOES NOP WITH AC=1'S ALTER MQ
                                /
        00414   754000          NOPMQ1      CLA+4000
        00415   040031                      DAC MQSTRT
        00416   650000                      CLQ
        00417   750001                      CLC
        00420   040030                      DAC ACSTRT
                                /
        00421   501365                      AND KALL7       /MAKE MB TO 1S BEFORE
        00422   640000                      EAE             /NOP
        00423   040034                      DAC ACEND
        00424   641002                      LACQ            /GET MQ TO AC
        00425   040035                      DAC MQEND
        00426   741200                      SNA             /ANY 1'S IN MQ
        00427   600441                      JMP .+12
        00430   101134                      JMS ERROR
        00431   001514                          TYNOP
        00432   001375                          HDR2
        00433   600030                      ACSTRT+600000
        00434   600031                      MQSTRT+600000
        00435   001514                          TYNOP
        00436   600034                      ACEND+600000
        00437   600035                      MQEND+600000
        00440   000000                      0
        00441   100040                      JMS SWITCH
        00442   000414                          NOPMQ1
                                /
                                            .EJECT
                                /DOES NOP ALTER THE LINK
                                /AC 0'S MQ 0'S, AC 1'S MQ 1'S
                                /
        00443   650000          NOPLNK    CLQ
        00444   140030                    DZM ACSTRT
        00445   140031                    DZM MQSTRT
        00446   140032                    DZM LKSTRT
        00447   200032                    LAC LKSTRT
        00450   740020                    RAR
        00451   200030                    LAC ACSTRT          /SET LINK FOR TEST
        00452   501365                    AND KALL7           /MAKE MB TO ONES BEFORE
        00453   640000                    EAE                 /NOP
        00454   750010                    GLK
        00455   040036                    DAC LKEND
        00456   540032                    SAD LKSTRT          /LINK ALTERED?
        00457   600471                    JMP .+12
        00460   101134                    JMS ERROR
        00461   001514                        TYNOP
        00462   001411                        HDR3
        00463   700032                    LKSTRT+700000       /ZERO SUPPRESS CONTENTS
        00464   600030                    ACSTRT+600000
        00465   600031                    MQSTRT+600000
        00466   001514                        TYNOP
        00467   700036                    LKEND+700000
        00470   000000                    0
        00471   100040                    JMS SWITCH
        00472   000447                    NOPLNK+4
        00473   200032                    LAC LKSTRT
        00474   440032                    ISZ LKSTRT
        00475   741200                    SNA                 /CHECKED L=0 AND L=1?
        00476   600447                    JMP NOPLNK+4
        00477   200030                    LAC ACSTRT
        00500   740200                    SZA                 /CHECKED FOR AC=1'S
        00501   600533                    JMP EAESLK          /YES
        00502   650004                    CLQ+4               /SET MQ TO 1'S
        00503   750001                    CLC
        00504   040030                    DAC ACSTRT          /AC START =1'S
        00505   040031                    DAC MQSTRT
        00506   140032                    DZM LKSTRT          /LINK START=0
        00507   600447                    JMP NOPLNK+4
                                /
                                          .EJECT
```

```
                        /DOES MQ TO AC ALL 1'S WITH AC=1'S
        00510   750001  QONEAC    CLC
        00511   040030            DAC ACSTRT
        00512   040031            DAC MQSTRT                      /SET MQ TO 1'S
        00513   650004            CLQ+4               /MQ1'S TO AC1'A
        00514   640002            OMQ
        00515   040034            DAC ACEND
        00516   740001            CMA
        00517   741200            SNA                 /AC STAY 1'S
        00520   600531            JMP .+11
        00521   101134            JMS ERROR
        00522   001533                TYRMQ
        00523   001375                HDR2
        00524   600030                ACSTRT+600000
        00525   600031                MQSTRT+600000
        00526   001533                TYRMQ
        00527   600034                ACEND+600000
        00530   000000            0
        00531   100040            JMS SWITCH
        00532   000510                QONEAC
                        /
                                  .EJECT
```

```
                          /LINK SET TO 1 AND TO ZERO?
                          /
      00533   140032      EAESLK    DZM LKSTRT          /START LINK 0 TO 1
      00534   140031                DZM MQSTRT          /MQ 0'S
      00535   650000                CLQ
      00536   201321                LAC BIT0            /400000
      00537   040030                DAC ACSTRT
      00540   200032                LAC LKSTRT          /SET LINK INITIAL
      00541   740020                RAR
      00542   200030                LAC ACSTRT
      00543   660000                EAE+20000           /AC BIT 0 TO LINK
      00544   040034                DAC ACEND
      00545   750010                GLK
      00546   040036                DAC LKEND
      00547   742020                RTR
      00550   540030                SAD ACSTRT                  /LINK SAME AS START?
      00551   741000                SKP
      00552   600556                JMP .+4             /ERROR
      00553   200034                LAC ACEND
      00554   540030                SAD ACSTRT          /AC ALTERED?
      00555   600570                JMP .+13
      00556   101134                JMS ERROR
      00557   001537                    TYSLK
      00560   001411                    HDR3
      00561   700032                LKSTRT+700000
      00562   600030                ACSTRT+600000
      00563   000031                    MQSTRT
      00564   001537                    TYSLK
      00565   700036                LKEND+700000
      00566   600034                ACEND+600000
      00567   000000                0
      00570   100040                JMS SWITCH          /LOOP SET?
      00571   000540                EAESLK+5
      00572   440032                ISZ LKSTRT          /NEXT PASS LINK 1 TO ZERO
      00573   200030                LAC ACSTRT
      00574   140030                DZM ACSTRT
      00575   740200                SZA
      00576   600540                JMP EAESLK+5
                          /
                                    .EJECT
```

```
                                 /DOES NOP ALTER MQ=0'S WITH L=1
                                 /
        00577   140030           NOPLK1     DZM ACSTRT           /START AC 0'S
        00600   140031                      DZM MQSTRT           /MQ 0'S
        00601   650000                      CLQ
        00602   201342                      LAC BIT17            /1=LINK
        00603   040032                      DAC LKSTRT
        00604   744020                      RAR+4000             /CLR LINK, SET LINK
        00605   501365                      AND KALL7            /MAKE MB TO ONES BEFORE
        00606   640000                      EAE                  /NOP
        00607   240034                      DAC ACEND
        00610   750010                      GLK
        00611   040036                      DAC LKEND
        00612   641002                      LACQ
        00613   040035                      DAC MQEND
        00614   741200                      SNA                  /MQ STILL ZERO'S
        00615   200034                      LAC ACEND
        00616   751200                      SNA!CLA              /AC STILL ZERO'S
        00617   200036                      LAC LKEND
        00620   740200                      SZA                  /LINK STILL 1
        00621   600635                      JMP .+14
        00622   101134                      JMS ERROR
        00623   001514                          TYNOP
        00624   001411                          HDR3
        00625   700032                      LKSTRT+700000
        00626   600030                      ACSTRT+600000
        00627   600031                      MQSTRT+600000
        00630   001514                          TYNOP
        00631   700036                      LKEND+700000
        00632   600034                      ACEND+600000
        00633   600035                      MQEND+600000
        00634   000000                      0
        00635   100040                      JMS SWITCH           /CHECK MINOR LOOP SW
        00636   000577                          NOPLK1
        00637   100060                      JMS SWTCHS           /MAJOR LOOP SET?
        00640   000225                          NOPAC            /START NOP THE AC
                                 /
                                            .EJECT
```

```
                                /WILL AC TO MQ TO AC ALL PATTERNS
                                /WITH MQ INITIALLY = 0  AND LINK = 0
                                /
        00641   140030          ACORMQ    DZM ACSTRT          /START AC = 0'S
        00642   140031                    DZM MQSTRT          /MQ ALWAYS 0'S
        00643   754000                    CLL!CLA
        00644   650000                    CLQ
        00645   200030                    LAC ACSTRT          /GET NEXT SET
        00646   643002                    EAE+3000            /AC TO MQ
        00647   040034                    DAC ACEND
        00650   641002                    LACQ                /MQ TO AC
        00651   040035                    DAC MQEND
        00652   540030                    SAD ACSTRT          /MQ TO AC SAME AS START?
        00653   741000                    SKP
        00654   600660                    JMP .+4
        00655   200034                    LAC ACEND           /YES, TRY AC
        00656   741200                    SNA                 /AC SHOULD BE 0
        00657   600676                    JMP .+17
        00660   101134                    JMS ERROR
        00661   001543                        TYSMQ
        00662   001375                        HDR2
        00663   600030                    ACSTRT+600000
        00664   600031                    MQSTRT+600000
        00665   001543                        TYSMQ
        00666   600031                    MQSTRT+600000
        00667   600030                    ACSTRT+600000
        00670   001461                        TYCOR
        00671   001547                        TYLACQ
        00672   600034                    ACEND+600000
        00673   600035                    MQEND+600000
        00674   001463                        TYINCO
        00675   000000                    0
        00676   100040                    JMS SWITCH          /CHECK FOR REPEAT LOOP
        00677   000643                    ACORMQ+2
        00700   440030                    ISZ ACSTRT          /TO 777777
        00701   600643                    JMP ACORMQ+2
        00702   100060                    JMS SWTCHS
        00703   000641                        ACORMQ
                                /
                                          .EJECT
```

```
                              /WILL AC TO MQ TO AC ALL PATTERNS
                              /WITH MQ = LAST PATTERN AND LINK = 1
                              /
      00704   140030          ACLMQ     DZM ACSTRT            /START AC 0'S
      00705   140031                    DZM MQSTRT            /MQ 0'S
      00706   650000                    CLQ
      00707   201342                    LAC BIT17             /LINK 1
      00710   040032                    DAC LKSTRT
      00711   744002                    STL                   /SET LINK
      00712   200030                    LAC ACSTRT            /GET NEXT CONSTANT
      00713   652000                    LMQ                   /MQ TO 0'S, AC 1'S TO MQ
      00714   040034                    DAC ACEND             /SAVE AC RESULT
      00715   750010                    GLK
      00716   040036                    DAC LKEND             /SAVE LINK RESULT
      00717   641002                    LACQ                  /GET MQ
      00720   040035                    DAC MQEND
      00721   540030                    SAD ACSTRT            /MQ = AC AT START?
      00722   741000                    SKP
      00723   600732                    JMP ACLMQE            /MQ ERROR
      00724   200036                    LAC LKEND
      00725   741200                    SNA                   /LINK=1 AT END?
      00726   600732                    JMP ACLMQE            /LINK ERROR
      00727   200034                    LAC ACEND
      00730   540030                    SAD ACSTRT            /AC END = AC START?
      00731   600753                    JMP .+22
      00732   101134          ACLMQE    JMS ERROR
      00733   001622                        TYLMQ
      00734   001411                        HDR3
      00735   700032                    LKSTRT+700000
      00736   600030                    ACSTRT+600000
      00737   600031                    MQSTRT+600000
      00740   001622                        TYLMQ
      00741   700032                    LKSTRT+700000
      00742   600030                    ACSTRT+600000
      00743   600030                    ACSTRT+600000
      00744   001461                        TYCOR
      00745   001547                        TYLACQ
      00746   700036                    LKEND+700000
      00747   600034                    ACEND+600000
      00750   600035                    MQEND+600000
      00751   001463                        TYINCO
      00752   000000                    0
      00753   200035                    LAC MQEND
      00754   040031                    DAC MQSTRT            /NEW MQ START
      00755   100040                    JMS SWITCH            /REPEAT SET?
                              /
      00756   000711                    ACLMQ+5
                              /
      00757   440030                    ISZ ACSTRT            /TO 777777?
      00760   600711                    JMP ACLMQ+5
      00761   100060                    JMS SWTCHS
      00762   000704                        ACLMQ
                              /
                                        .EJECT
```

```
                           /DOES THE MQ COMPLIMENT ALL PATTERNS
                           /
00763    140030            COMPMQ    DZM ACSTRT
00764    200030                      LAC ACSTRT             /GET NEXT PATTERN
00765    040031                      DAC MQSTRT
00766    672000                      LMQ+20000              /AC TO MQ, AC0 TO L
00767    640004                      CMQ                    /-MQ
00770    040034                      DAC ACEND              /SAVE AC RESULT
00771    641002                      LACQ                   /GET MQ
00772    040035                      DAC MQEND
00773    740001                      CMA                    //MQ
00774    540030                      SAD ACSTRT             /-MQ = AC START?
00775    200034                      LAC ACEND
00776    540030                      SAD ACSTRT             /ACEND = AC START?
00777    601011                      JMP .+12
01000    101134                      JMS ERROR
01001    001527                          TYCMQ
01002    001375                          HDR2
01003    600030                      ACSTRT+600000
01004    600031                      MQSTRT+600000
01005    001527                          TYCMQ
01006    600034                      ACEND+600000
01007    600035                      MQEND+600000
01010    000000                      0
01011    100040                      JMS SWITCH
01012    000764                      COMPMQ+1
01013    440030                      ISZ ACSTRT
01014    600764                      JMP COMPMQ+1
01015    100060                      JMS SWTCHS
01016    000763                          COMPMQ
                           /
                                     .EJECT
                           /DOES AC TO MQ ALL 1'S WITH MQ=1'S
01017   750001             ACONEQ    CLC
01020   040031                       DAC MQSTRT
01021   040030                       DAC ACSTRT
01022   650004                       CLQ+4                  /SET MQ=1'S
01023   642000                       EAE+2000  /AC 1'S TO MQ1'S
01024   040034                       DAC ACEND
01025   641002                       LACQ
01026   040035                       DAC MQEND
01027   740001                       CMA
01030   741200                       SNA         /MQ STAY 1'S
01031   601047                       JMP .+16
01032   101134                       JMS ERROR
01033   001543                           TYSMQ
01034   001375                           HDR2
01035   600030                           ACSTRT+600000
01036   600031                           MQSTRT+600000
01037   001543                           TYSMQ
01040   600034                           ACEND+600000
01041   600035                           MQEND+600000
01042   000000                       0
01043   100040                       JMS SWITCH
01044   001017                           ACONEQ
                           /
                                     .EJECT
```

```
                                 /DOES ABS GET ABSOLUTE AC
                                 /AND NOT DISTURB LINK=1 OR 0
        01045   140030           EAEABS     DZM ACSTRT           /START AC 0'S
        01046   201342                      LAC BIT17            /LINK 1
        01047   040032                      DAC LKSTRT
        01050   200032                      LAC LKSTRT
        01051   740020                      RAR                  /SET LINK
        01052   200030                      LAC ACSTRT           /GET AC START
        01053   644000                      ABS                  /ABSOLUTE AC
        01054   040034                      DAC ACEND            /SAVE RESULT
        01055   750010                      GLK
        01056   040036                      DAC LKEND
        01057   540032                      SAD LKSTRT           /LINK SAME?
        01060   741000                      SKP                  /YES
        01061   601067                      JMP .+6              /ERROR, LINK CHANGED
        01062   200030                      LAC ACSTRT
        01063   741100                      SPA                  /AC POSITIVE AT START?
        01064   740001                      CMA                  /NO, SHOULD BE POS. ABS
        01065   540034                      SAD ACEND            /RESULT AC OK?
        01066   601100                      JMP .+12             /YES
        01067   101134                      JMS ERROR            /ABS ERROR LINK OR AC
        01070   001626                          TYABS
        01071   001411                          HDR3
        01072   700032                      LKSTRT+700000
        01073   600030                      ACSTRT+600000
        01074   001626                          TYABS
        01075   700036                      LKEND+700000
        01076   600034                      ACEND+600000
        01077   000000                      0
        01100   100040                      JMS SWITCH
        01101   001050                      EAEABS+3
        01102   440030                      ISZ ACSTRT
        01103   741000                      SKP
        01104   601112                      JMP NOSETU
        01105   200032                      LAC LKSTRT
        01106   740001                      CMA
        01107   501342                      AND BIT17
        01110   040032                      DAC LKSTRT
        01111   601050                      JMP EAEABS+3
                                 /
                                            .EJECT
```

```
01112   100060       NDSETU   JMS SWTCHS          /TEST REPEAT MAJOR
01113   201045                EAEABS
01114   750004                LAS
01115   501327                AND BIT6
01116   741200                SNA
01117   601125                JMP .+6
01120   760057                LAW 57
01121   101716                TY1
01122   441261                ISZ CHARK
01123   601127                JMP .+4
01124   101240                JMS CRLF
01125   201363                LAC NBIT16
01126   041261                DAC CHARK
01127   750004                LAS
01130   501326                AND BIT5
01131   741200                SNA                 /REPEAT ALL SET?
01132   600225                JMP NOPAC           /CYCLE SET UP TEST
01133   602246                JMP SCT076                   /CYCLE SET UP AND SHIFT
                     /
                     /EAE ERROR TYPEOUT ROUTINE
                     /GENERAL PURPOSE
                     /LINKS TYPTEX AND ALL TYPE CONTENTS
                     /
                     /AC=0      IS END OF TYPEOUT
                     /AC NOT = 0 AND POSITIVE IS TYPETEXT
                     /AC - AND BIT 1=0 IS CR, LF TYPE CONTENTS
                     /AC - AND BIT 1=1 IS TYPE CONTENTS
                     /AC - AND BIT 2=0 IS NO ZERO UPPRESS
                     /AC - AND BIT 2=1 IS ZERO SUPPRESS
                     /AC - AND BIT 3=0 IS ZERO SUPPRESS5
                     /AC - AND BIT 3=1 IS ZERO SUPPRESS4
                     /
                     /
01134   601134       ERROR    JMP .
01135   750004                LAS
01136   741100                SPA
01137   601244                JMP TYDELE
01140   101240                JMS CRLF
01141   201144                LAC .+3
01142   041276                DAC SAVERR
01143   601167                JMP TYPECN                   /CR LF TYPE CONTENTS ERROR
01144   001134                          ERROR
01145   221134       ERLOOP   LAC* ERROR          /GET NEXT TYPE CONSTANT
01146   041276                DAC SAVERR          /FOR INDIRECTS
01147   506471                AND (7777
01150   041277                DAC SVER
01151   441134                ISZ ERROR
01152   740200                SZA                 /END OF MESSAGE?
01153   601163                JMP ERCONT          /NO
01154   750004                LAS                 /GET SWITCHES
01155   501330                AND BIT7
01156   741200                SNA                 /DELETE HALT?
01157   740040                HLT                 /ERROR HALT
01160   700401                TSF
01161   601160                JMP .-1             /WAIT FLAG
```

```
        01162   621134                  JMP* ERROR              /EXIT ERROR ROUT.
        01163   741100         ERCONT   SPA                     /TYPE TEXT INDICATED?
        01164   601167                  JMP TYPECN              /NO, TYE CONTENTS
        01165   101673                  TSR
        01166   601145                  JMP ERLOOP
                               /
                                        .EJECT
```

```
                             /TYPE CONTENTS ROUTINES
                             /
01167   501322      TYPECN   AND BIT1
01170   741200               SNA                  /CARRIAGE RETURN INDICATED
01171   101240               JMS CRLF             /YES
01172   201276               LAC SAVERR
01173   501323               AND BIT2
01174   741200               SNA                  /SUPPRESS ZERO SET?
01175   601215               JMP TCALL            /NO, TYPE ALL
01176   201276               LAC SAVERR
01177   501324               AND BIT3
01200   740200               SZA                  /SUPPRESS 4 0'S SET?
01201   601224               JMP TCTWO            /YES
01202   221277               LAC* SVER
01203   501214               AND .+11
01204   740200               SZA                  /UPPER 5 CHAR = 0
01205   601215               JMP TCALL            /NO, TYPE ALL
01206   221277               LAC* SVER
01207   746020               CLL!RTR
01210   742020               RTR
01211   102026                   TWORD
01212   000001               1
01213   601220               JMP TCALL+3                    /SPACE 3
01214   777770               777770
                             /
                                     .EJECT
```

```
        01215   221277          TCALL     LAC* SVER
        01216   102026                  TWORD                   /TYPE 6 OCTAL
        01217   000006                    6
        01220   761442                    LAW SPACE3
        01221   101673                    TSR                   /OUTPUT 3 SPACES
        01222   601145                    JMP ERLOOP
        01223   777700                    777700
        01224   221277          TCTWO     LAC* SVER
        01225   501223                    AND .-2
        01226   740200                    SZA                   /FIRST 4 CHARACTERS 0
        01227   601215                    JMP TCALL             /NO, TYPE WHOLE WORD
        01230   221277                    LAC* SVER
        01231   746020                    CLL!RTR               /POSITION LS 2
        01232   742020                    RTR                   /TO UPPER 2
        01233   742020                    RTR                   /FOR TYPEOUT ROUT
        01234   740020                    RAR
        01235   102026                        TWORD             /TYPE UPPER 2 CHAR
        01236   000002                    2
        01237   601220                    JMP TCALL+3                     /SPACE 3
        01240   601240          CRLF      JMP .
        01241   761465                    LAW CRCODE
        01242   101673                    TSR
        01243   621240                    JMP* CRLF
                                /
                                          .EJECT
```

```
01244   221134        TYDELE    LAC* ERROR
01245   441134                  ISZ ERROR
01246   740200                  SZA                     /REACHED END OF MESS.
                      /
01247   601244                  JMP TYDELE                      /NO
01250   750004                  LAS
01251   501330                  AND BIT7
01252   741200                  SNA                     /RING BELL SET?
01253   621134                  JMP* ERROR              /NO. EXIT
01254   206472                  LAC (207207
01255   102107                  JMS OTY
01256   621134                  JMP* ERROR
                      /
01257   777773        MIN5      777773
01260   777772        MIN6      777772
01261   000000        CHARK     0
01262   000000                  0
01263   000000        SVCHAR    0
01264   000000                  0
01265   000000                  0
01266   000000                  0
01267   000000                  0
01270   000000                  0
01271   000007        SEVEN     7
01272   000240        TWO40     240
01273   000260        TWO60     260
01274   000077        SEVSEV    77
01275   000076        SEVSIX    76
01276   000000        SAVERR    0
01277   000000        SVER      0
01300   777756        K18       777756
01301   000060        SIXTY     60
01302   000070        SEVNTY    70
01303   000074        SEVN4     74
01304   000041        FOUR1     41
01305   000037        THREE7    37
01306   000061        SIXONE    61
01307   000017        ONESEV    17
01310   000071        SEVONE    71
01311   000075        SEVFIV    75
01312   000003        THREE     3
01313   000045        FOUR5     45
01314   000044        FOUR4     44
01315   000043        FOUR3     43
01316   000034        THREE4    34
01317   000056        FIVE6     56
01320   252525        COMBIT    252525
                      /
                                .EJECT
```

```
                                     /BIT AND NO BIT CONSTANTS
                                     /
         01321    400000             BIT0       400000
         01322    200000             BIT1       200000
         01323    100000             BIT2       100000
         01324    040000             BIT3       40000
         01325    020000             BIT4       20000
         01326    010000             BIT5       10000
         01327    004000             BIT6       4000
         01330    002000             BIT7       2000
         01331    001000             BIT8       1000
         01332    000400             BIT9       400
         01333    000200             BIT10      200
         01334    000100             BIT11      100
         01335    000040             BIT12      40
         01336    000020             BIT13      20
                                     /
         01337    000010             BIT14      10
                                     /
         01340    000004             BIT15      4
         01341    000002             BIT16      2
         01342    000001             BIT17      1
         01343    377777             NBIT0      377777
         01344    577777             NBIT1      577777
         01345    677777             NBIT2      677777
         01346    737777             NBIT3      737777
         01347    757777             NBIT4      757777
         01350    767777             NBIT5      767777
         01351    773777             NBIT6      773777
         01352    775777             NBIT7      775777
         01353    776777             NBIT8      776777
         01354    777377             NBIT9      777377
         01355    777577             NBIT10     777577
         01356    777677             NBIT11     777677
         01357    777737             NBIT12     777737
         01360    777757             NBIT13     777757
         01361    777767             NBIT14     777767
         01362    777773             NBIT15     777773
         01363    777775             NBIT16     777775
         01364    777776             NBIT17     777776
         01365    777777             KALL7      777777
                                     /
                                                .EJECT
```

```
                           /MESSAGE CONSTANTS
                           /ERROR TYPEOUT HEADERS
                           /AC CONTENTS
                           /
      01366   151203       HDR1      .SIXBT <15><12>'C(AC)'
      01367   500103
      01370   510000
      01371   151223                 .SIXBT <15><12>'START  '<77>
      01372   240122
      01373   244040
      01374   770000
                           /AC AND MQ
                           /
      01375   151240       HDR2      .SIXBT <15><12>'        C(AC)    C(MQ)'
      01376   404040
      01377   404040
      01400   400350
      01401   010351
      01402   404040
      01403   400350
      01404   152151
      01405   151223                 .SIXBT <15><12>'START  '<77>
      01406   240122
      01407   244040
      01410   770000
                           /LINK AC AND MQ
                           /
      01411   151240       HDR3      .SIXBT <15><12>'       L    C(AC)    C(MQ)'
      01412   404040
      01413   404040
      01414   144040
      01415   404003
      01416   500103
      01417   514040
      01420   404003
      01421   501521
      01422   510000
      01423   151223                 .SIXBT <15><12>'START  '<77>
      01424   240122
      01425   244040
      01426   770000
                           /SC AC
                           /
      01427   151240       HDR4      .SIXBT <15><12>'       SC    C(AC)'
      01430   404040
      01431   404040
      01432   230340
      01433   404040
      01434   035001
      01435   035100
      01436   151223                 .SIXBT <15><12>'START  '<77>
      01437   240122
      01440   244040
      01441   770000
                           /3 SPACES
                           /
        01442   404040     SPACE3     .SIXBT '    '<77>
        01443   770000
                           /4 SPACES
                           /
        01444   151240     SPACE4     .SIXBT <15><12>'     '<77>
        01445   404040
        01446   770000
                           /
                                      .EJECT
        01447   151214     HDR5      .SIXBT <15><12>'L    C(AC)    C(MQ)'<77>
        01450   404040
        01451   400350
        01452   010351
        01453   404040
        01454   400350
        01455   152151
        01456   770000
                           /
        01457   200124     TYPATR    .SIXBT 'PAT'<77>
        01460   770000
                           /
        01461   031722     TYCOR     .SIXBT 'COR'<77>
        01462   770000
                           /
        01463   111603     TYINCO    .SIXBT 'INCO'<77>
        01464   177700
                           /
        01465   151277     CRCODE    .SIXBT <15><12><77>
                           /
        01466   151216     TYNRMS    .SIXBT <15><12>'NORMS  '<77>
        01467   172215
        01470   234040
        01471   770000
                           /
        01472   151216     TYINTE    .SIXBT <15><12>'NO PROGRAM INTERRUPT'<77>
        01473   174020
        01474   221707
        01475   220115
        01476   401116
        01477   240522
        01500   222520
        01501   247700
                           /
        01502   151211     INDAT     .SIXBT <15><12>'INTERRUPT DATA ERROR'<77>
        01503   162405
        01504   222225
        01505   202440
        01506   040124
        01507   014005
        01510   222217
        01511   227700
                           /
        01512   232401     TYSTRT    .SIXBT 'START'<77>
        01513   222477
                           /
                                     .EJECT
```

```
                        /OPERATION TYPEOUTS
                        /EAE NO OPERATION
                        /
01514   151205          TYNOP     .SIXBT <15><12>'EANOP '<77>
01515   211617
01516   204077
                        /
                        /
                        /EAE CLA
01517   151205          TYCLA     .SIXBT <15><12>'EAECLA '<77>
01520   010503
01521   140140
01522   770000
                        /
                        /
                        /CLEAR MQ
01523   151203          TYCLQ     .SIXBT <15><12>'CLQ    '<77>
01524   142140
01525   404040
01526   770000
                        /
                        /
                        /COMPLIMENT Q
01527   151203          TYCMQ     .SIXBT <15><12>'CMQ    '<77>
01530   152140
01531   404040
01532   770000
                        /
                        /
                        /OR MQ TO AC
01533   151217          TYRMQ     .SIXBT <15><12>'ORMQAC '<77>
01534   221521
01535   010340
01536   770000
                        /
                        /
                        /AC0 TO LINK
01537   151201          TYSLK     .SIXBT <15><12>'AC0TOL '<77>
01540   036024
01541   171440
01542   770000
                        /
                        /
                        /OR AC TO MQ
01543   151217          TYSMQ     .SIXBT <15><12>'ORACMQ '<77>
01544   220103
01545   152140
01546   770000
                        /
                        /
                        /LOAD AC WITH MQ
01547   151214          TYLACQ    .SIXBT <15><12>'LACQ   '<77>
01550   010321
01551   404040
01552   770000
```

```
                                /
                                /
                                /LLS
        01553   151214          TYLLS       .SIXBT <15><12>'LLS     '<77>
        01554   142340
        01555   404040
        01556   770000
                                /
                                /
                                /LLSS
        01557   151214          TYLLSS      .SIXBT <15><12>'LLSS    '<77>
        01560   142323
        01561   404040
        01562   770000
                                /
                                            .EJECT
                                /LRS
        01563   151214          TYLRS       .SIXBT <15><12>'LRS     '<77>
        01564   222340
        01565   404042
        01566   770000
                                /
                                /
                                /RESULT
        01567   151222          TYSIMR      .SIXBT <15><12>'RESULT '<77>
        01570   052325
        01571   142440
        01572   770000
                                /
                                /
                                /TYLRSS
        01573   151214          TYLRSS      .SIXBT <15><12>'LRSS    '<77>
        01574   222323
        01575   404040
        01576   770000
                                /
                                /
                                /TYRDSQ
        01577   151222          TYRDSQ      .SIXBT <15><12>'RANDOM DATA SEQUENCED'<77>
        01600   011604
        01601   171540
        01602   040124
        01603   014023
        01604   052125
        01605   051603
        01606   050477
        01607   220523          TYRES       .SIXBT 'RESULT'<77>
        01610   251424
        01611   770000
        01612   151211          TYQINT      .SIXBT <15><12>'INTERUPT NOT DELAYED'<77>
        01613   162405
        01614   222520
        01615   244016
        01616   172440
        01617   040514
        01620   013105
        01621   047700
                                /
                                            .EJECT
```

```
                        /LOAD MQ WITH AC
        01622   151214  TYLMQ      .SIXBT <15><12>'LMQ     '<77>
        01623   152140
        01624   404040
        01625   770000
                        /
                        /
                        /
        01626   151201  TYABS      .SIXBT <15><12>'ABS     '<77>
        01627   022340
        01630   404040
        01631   770000
                        /
                        /
                        /CLR SC
        01632   151203  TYCSC      .SIXBT <15><12>'CLR SC '<77>
        01633   142240
        01634   230340
        01635   770000
                        /
                        /
                        /LACS
        01636   151214  TYLACS     .SIXBT <15><12>'LACS    '<77>
        01637   010323
        01640   404040
        01641   770000
                        /
                        /
                        /SC ERROR
        01642   151223  TYSCER     .SIXBT <15><12>'SC ERROR '<77>
        01643   034005
        01644   222217
        01645   224077
                        /
                        /
                        /NORM
        01646   151216  TYNORM     .SIXBT <15><12>'NORM    '<77>
        01647   172215
        01650   404040
        01651   770000
                        /
                        /
                        /SET SC
        01652   151223  TYSSC      .SIXBT <15><12>'SET SC '<77>
        01653   052440
        01654   230340
        01655   770000
                        /
                        /
                        /SC+1
        01656   151223  TYPLS1     .SIXBT <15><12>'SC+1    '<77>
        01657   235361
        01660   404040
        01661   770000
                        /
```

```
                                /
                                /ALS MQ TEST
        01662   151201          TYALSQ    .SIXBT <15><12>'ALS MQ TEST'<77>
        01663   142340
        01664   152140
        01665   240523
        01666   247700
                                /
                                /
                                /ALS
        01667   151201          TYALS     .SIXBT <15><12>'ALS    '<77>
        01670   142340
        01671   404040
        01672   770000
                                /TAPE 3A
                                /TYPE STRING OF CHARACTERS
                                /EOM=77=?
        01673   601673          TYPTSR    JMP .
        01674   506471                    AND (7777
        01675   046470                    DAC TEMY1#
        01676   226470                    LAC* TEMY1
        01677   446470                    ISZ TEMY1
        01700   041755                    DAC TYPSAV
        01701   742020                    RTR
        01702   742020                    RTR
        01703   742020                    RTR
        01704   041756                    DAC TYPSAV+1
        01705   742020                    RTR
        01706   742020                    RTR
        01707   742020                    RTR
        01710   101716                    JMS TYPCHR
        01711   201756                    LAC TYPSAV+1
        01712   101716                    JMS TYPCHR
        01713   201755                    LAC TYPSAV
        01714   101716                    JMS TYPCHR
        01715   601676                    JMP TYPTSR+3
        01716   740040          TYPCHR    HLT
        01717   041757                    DAC TYPSAV+2        /ACTIVE
        01720   201755                    LAC TYPSAV                    /TEST FOR CRLF
        01721   506473                    AND (777700
        01722   546474                    SAD (151200         /CRLF?
        01723   741000                    SKP                 /YES
        01724   601732                    JMP .+6             /NO
        01725   201755                    LAC TYPSAV                    /CORRECT IT FOR NEXT TIME
        01726   506475                    AND (000077
        01727   741755                    DAC TYPSAV
        01730   102101                    JMS TYCRLF                    /DO CRLF
        01731   601713                    JMP TYPCHR-3        /TYPE LAST CHARACTER
        01732   201757                    LAC TYPSAV+2
        01733   506475                    AND (77
        01734   546475                    SAD (77             /END OF MESSAGE?
        01735   621673                    JMP* TYPTSR         /YES
        01736   741200                    SNA                 /IF ZERO IGNOR
        01737   621716                    JMP* TYPCHR         /IGNOR
        01740   744001                    CMA!CLL
        01741   346476                TAD (40
        01742   741400                SZL
        01743   601750                JMP .+5
        01744   201757                LAC TYPSAV+2
        01745   506475                AND (77
        01746   346477                TAD (200
        01747   601753                JMP TYPSAV-2
        01750   201757                LAC TYPSAV+2
        01751   506475                AND (77
        01752   346500                TAD (300
        01753   102107                JMS OTY
        01754   621716                JMP* TYPCHR
        01755   000000       TYPSAV   0                     /3RD
        01756   000000                0                     /2ND
        01757   000000                0                     /ACTIVE CHAR
        01760   000000                0
        01761   000000                0
                                      .EJECT
```

```
                                /TYPE CONTENTS OF THE AC IN OCTAL
        01762   601762          TYPCON     JMP .
        01763   102047                     JMS DECONT
        01764   102070                     JMS TYPOCT
        01765   201761                     LAC TYPSAV+4
        01766   102070                     JMS TYPOCT
        01767   201760                     LAC  TYPSAV+3
        01770   102070                     JMS TYPOCT
        01771   201757                     LAC TYPSAV+2
        01772   102070                     JMS TYPOCT
        01773   201756                     LAC TYPSAV+1
        01774   102070                     JMS TYPOCT
        01775   201755                     LAC TYPSAV
        01776   102070                     JMS TYPOCT
        01777   102075                     JMS SPACE2
        02000   621762                     JMP* TYPCON
                                /TYPE OUT LOWEST 3 CHAR IN OCTAL
        02001   602001          TYPC03     JMP .
        02002   102047                     JMS DECONT
        02003   201757                     LAC TYPSAV+2
        02004   102070                     JMS TYPOCT
        02005   201756                     LAC TYPSAV+1
        02006   102070                     JMS TYPOCT
        02007   201755                     LAC TYPSAV
        02010   102070                     JMS TYPOCT
        02011   102075                     JMS SPACE2
        02012   622001                     JMP* TYPC03
        02013   602013          TYPTYT     JMP .
        02014   102022                     TSP
        02015   102022                     TSP
        02016   102022                     TSP
        02017   102022                     TSP
        02020   102022                     TSP
        02021   622013                     JMP* TYPTYT
        02022   602022          SPAC       JMP .
        02023   206501                     LAC (240
        02024   102107                     JMS OTY
        02025   622022                     JMP* SPAC
                                /FORMAT FOR TWORD
                                /LAC WORD
                                /TWORD     /VALUE
                                /N         /NUMBER OF DIGITS TO PRINT FROM LEFT OF WORD
        02026   740040          TOCTAL     HLT
        02027   046467                     DAC NUVAL#                    /VALUE OF WORD
        02030   222026                     LAC* TOCTAL                   /NUMBER OF WORD
        02031   740001                     CMA
        02032   046466                     DAC NUCT#           /SAVE COUNT
        02033   446466                     ISZ NUCT            /INC COUNT
        02034   442026                     ISZ TOCTAL                    /PUSH RETURN POINTER
        02035   206467          TOCT1      LAC NUVAL           /LOAD VALUE
        02036   742010                     RTL
        02037   740010                     RAL                           /SHIFT INTO POSITION
        02040   046467                     DAC NUVAL           /SAVE SHIFTED VALUE
        02041   740010                     RAL                           /PASS THE LINK
        02042   506502                     AND (7)                       /MASK DIGIT
        02043   102070               TDIGIT                                     /TYPE DIGIT
        02044   446466               ISZ NUCT                 /MORE DIGITS
        02045   602035               JMP TOCT1                /YES.
        02046   622026               JMP* TOCTAL                                /NO - EXIT
                                     .EJECT
        02047   602047          DECONT     JMP .
        02050   041755                     DAC TYPSAV
        02051   742020                     RTR
        02052   740020                     RAR
        02053   041756                     DAC TYPSAV+1
        02054   742020                     RTR
        02055   740020                     RAR
        02056   041757                     DAC TYPSAV+2
        02057   742020                     RTR
        02060   740020                     RAR
        02061   041760                     DAC TYPSAV+3
        02062   742020                     RTR
        02063   740020                     RAR
        02064   041761                     DAC TYPSAV+4
        02065   742020                     RTR
        02066   740020                     RAR
        02067   622047                     JMP* DECONT
        02070   602070          TYPOCT     JMP .
        02071   506502                     AND (7
        02072   346503                     TAD (260
        02073   102107                     JMS OTY
        02074   622070                     JMP* TYPOCT
        02075   602075          SPACE2     JMP .
        02076   766475                     LAW (77
        02077   101673                     TSR
        02100   622075                     JMP* SPACE2
        02101   602101          TYCRLF     JMP .
        02102   206504                     LAC (215
        02103   102107                     JMS OTY
        02104   206505                     LAC (212
        02105   102107                     JMS OTY
        02106   622101                     JMP* TYCRLF
                102070          TDIGIT=JMS TYPOCT
                102026          TWORD=JMS TOCTAL
                101716          TY1=JMS TYPCHR
                102022          TSP=JMS SPAC
                101673          TSR=JMS TYPTSR                          /STRING
                102101          TCR=JMS TYCRLF                          /CR,LF
                102101          TIN=TCR
                101762          OPS=JMS TYPCON                /CONTENTS OF AC IN OCTAL
                102013          TYT=JMS TYPTYT                          /TAB
                101762          OPT=OPS
                                /
        02107   000000          OTY        0
        02110   707704                     LEM
        02111   700406                     TLS
        02112   700401                     TSF
        02113   602112                     JMP .-1
        02114   622107                     JMP* OTY
                                           .EJECT
```

```
                          /
                          /ROTATE LEFT 6
                          /
02115   000000            RL6       0
02116   742010                      RTL
02117   742010                      RTL
02120   742010                      RTL
02121   622115                      JMP* RL6
                          /SHIFT COUNTER AND
                          /AC MQ SHIFT TEST
                          /TAPE 3  OF PDP7 EAE TEST
                          /
                          /SHIFT COUNTER TEST
                          /UTILIZES NORMALIZE INSTRUCTION
                          /WITH NO SHIFT TO DATA TEST S.C
02200                               .LOC 2200
02200   201274            SCTST1    LAC SEVSEV
02201   040033                      DAC SCSTRT
02202   201322                      LAC BIT1            /200000 ALREADY NORMALIZED
02203   640400                      NORM-44                     /SET SC TO 00
02204   740000                      NOP
02205   641001                      LACS                /SC TO AC
02206   040037                      DAC SCEND
02207   741200                      SNA                 /READ SC=0'S TO AC?
02210   602221                      JMP .+11            /YES, CONTINUE
02211   101134                      JMS ERROR
02212   201632                          TYCSC
02213   201427                          HDR4
02214   740033                      SCSTRT+740000
02215   201632                          TYCSC
02216   201636                          TYLACS
02217   740037                      SCEND+740000
02220   000000                      0
02221   100040                      JMS SWITCH
02222   202206                      SCTST1+6
02223   201363                      LAC NBIT16
02224   041261                      DAC CHARK
                          /
                                    .EJECT
```

```
                              /DOES EAE NOP ALTER THE SC
                              /
02225    140033               NOPSC     DZM SCSTRT
02226    501365                         AND KALL7          /MAKE MB ONES BEFORE
02227    640000                         EAE                /NOP.
02230    641001                         LACS               /GET SC TO AC
02231    040037                         DAC SCEND
02232    741200                         SNA                /SC STILL ZERO'S
02233    602244                         JMP .+11
02234    101134                         JMS ERROR
02235    001514                             TYNOP
02236    001427                             HDR4
02237    740033                         SCSTRT+740000
02240    001514                             TYNOP
02241    001636                             TYLACS
02242    740037                         SCEND+740000
02243    000000                         0
02244    100040                         JMS SWITCH
02245    002225                             NOPSC
                              /
                              /DOES SC SET TO 76 AND +1 TO 77
02246    200037               SCT076    LAC SCEND
02247    040033                         DAC SCSTRT
02250    201342                         LAC BIT17
02251    040031                         DAC MQSTRT                   /NORM 01
02252    201322                         LAC BIT1
02253    040030                         DAC ACSTRT
02254    640401                         NORM-43                      /SET SC TO 76+1 TO 77
02255    040034                         DAC ACEND
02256    641001                         LACS
02257    040037                         DAC SCEND
02260    541274                         SAD SEVSEV
02261    602263                         JMP .+2
02262    102520                         JMS SCERR
02263    100040                         JMS SWITCH
02264    002246                             SCT076
                              /
                              /DOES SC SET TO 74 AND +1 TO 75
02265    200037               SCT074    LAC SCEND
02266    040033                         DAC SCSTRT
02267    201312                         LAC THREE
02270    040031                         DAC MQSTRT
02271    201322                         LAC BIT1
02272    640403                         NORM-41                      /SC TO 74+1 TO 75
02273    040034                         DAC ACEND          /SAVE FOR ERROR TYPE
02274    641001                         LACS
02275    040037                         DAC SCEND
02276    541311                         SAD SEVFIV
02277    602301                         JMP .+2
02300    102520                         JMS SCERR
02301    100040                         JMS SWITCH
02302    002265                             SCT074
                              /
                                        .EJECT
```

```
                                /DOES SC SET TO 70 AND +1 TO 71
                                /
      02303   200037            SCTO70    LAC SCEND
      02304   040033                      DAC SCSTRT
      02305   201271                      LAC SEVEN
      02306   040031                      DAC MQSTRT
      02307   201322                      LAC BIT1
      02310   640407                      NORM-35                         /7, SC TO 70 AND +1 TO 71
      02311   040034                      DAC ACEND           /SAVE FOR ERROR TYPE
      02312   641001                      LACS
      02313   040037                      DAC SCEND
      02314   541310                      SAD SEVONE
      02315   602317                      JMP .+2
      02316   102520                      JMS SCERR
      02317   100040                      JMS SWITCH
      02320   002303                          SCTO70
                                /
                                /WILL SC SET TO 60 AND +1 TO 61
                                /
      02321   200037            SCTO60    LAC SCEND
      02322   040033                      DAC SCSTRT
      02323   201307                      LAC ONESEV          /NORM 17
      02324   040031                      DAC MQSTRT
      02325   201322                      LAC BIT1
      02326   640417                      NORM-25                         /SET SC TO 60 AND +1 TO 61
      02327   040034                      DAC ACEND           /SAVE FOR ERROR TYPE
      02330   641001                      LACS
      02331   040037                      DAC SCEND
      02332   541306                      SAD SIXONE          /REA
      02333   602335                      JMP .+2
      02334   102520                      JMS SCERR
      02335   100040                      JMS SWITCH
      02336   002321                          SCTO60
                                /
                                /WILL SC SET TO 40 AND +1 TO 41
                                /
      02337   200037            SCTO40    LAC SCEND
      02340   040033                      DAC SCSTRT
      02341   201305                      LAC THREE7          /NORM 37
      02342   040031                      DAC MQSTRT
      02343   201322                      LAC BIT1            /200000 ALREADY NORMALIZED
      02344   640437                      NORM-5                          /SET SC TO 40 AND +1 TO 41
      02345   040034                      DAC ACEND
      02346   641001                      LACS                /GET SC TO AC
      02347   040037                      DAC SCEND           /SAVE FOR ERROR TYPE
      02350   541304                      SAD FOUR1           /READ 41 FROM SC TO AC
      02351   602353                      JMP .+2             /YES
      02352   102520                      JMS SCERR
      02353   100040                      JMS SWITCH
      02354   002337                          SCTO40
                                /
                                          .EJECT
```

```
                              /WILL SC SET TO 0 AND +1 TO 1
                              /
     02355    200037          SCT000     LAC SCEND
     02356    040033                     DAC SCSTRT
     02357    201274                     LAC SEVSEV          /NORM 77
     02360    040031                     DAC MQSTRT
     02361    201322                     LAC BIT1
     02362    640477                     NORM +33            /SC TO 00 +1 TO 01
     02363    040034                     DAC ACEND
     02364    641001                     LACS
     02365    040037                     DAC SCEND
     02366    541342                     SAD BIT17           /SC READ 01?
     02367    602371                     JMP .+2             /YES
     02370    102520                     JMS SCERR
     02371    100040                     JMS SWITCH
     02372    002355                         SCT000
                              /
                              /WILL SC SET TO 01 AND +1 TO 02
                              /
     02373    200037          SCT001     LAC SCEND
     02374    040033                     DAC SCSTRT
     02375    201275                     LAC SEVSIX          /NORM 76
     02376    040031                     DAC MQSTRT
     02377    201322                     LAC BIT1
     02400    640476                     NORM 32             /SET SC TO 1 +1 TO 2
     02401    040034                     DAC ACEND
     02402    641001                     LACS
     02403    040037                     DAC SCEND
     02404    541341                     SAD BIT16
     02405    602407                     JMP .+2
     02406    102520                     JMS SCERR
     02407    100040                     JMS SWITCH
     02410    002373                         SCT001
                              /
                              /WILL SC SET TO 03 AND +1 TO 04
                              /
     02411    200037          SCT003     LAC SCEND
     02412    040033                     DAC SCSTRT
     02413    201303                     LAC SEVN4           /NORM 74
     02414    040031                     DAC MQSTRT
     02415    201322                     LAC BIT1
     02416    640474                     NORM +30            /SET SC TO 3 +1 TO 4
     02417    040034                     DAC ACEND
     02420    641001                     LACS
     02421    040037                     DAC SCEND
     02422    541340                     SAD BIT15 /SC TO AC =4?
     02423    602425                     JMP .+2             /YES
     02424    102520                     JMS SCERR
     02425    100040                     JMS SWITCH
     02426    002411                         SCT003
                              /
                                         .EJECT
```

```
                                /WILL SC SET TO 07 AND +1 TO 10
        02427   200037          SCT007    LAC SCEND
        02430   040033                    DAC SCSTRT
        02431   201302                    LAC SEVNTY        /NORM 70
        02432   040031                    DAC MQSTRT
        02433   201322                    LAC BIT1
        02434   640470                    NORM +24          /SET SC TO 7 +1 TO 10
        02435   040034                    DAC ACEND
        02436   641001                    LACS
        02437   040037                    DAC SCEND
        02440   541337                    SAD BIT14         /SC TO AC = 10?
        02441   602443                    JMP .+2           /YES
        02442   102520                    JMS SCERR
        02443   100040                    JMS SWITCH
        02444   002427                        SCT007
                                /
                                /WILL SC SET TO 17 AND +1 TO 20
        02445   200037          SCT017    LAC SCEND
        02446   040033                    DAC SCSTRT
        02447   201301                    LAC SIXTY         /NORM 60
        02450   040031                    DAC MQSTRT
        02451   201322                    LAC BIT1
        02452   640460                    NORM +14          /SC TO 17+1 TO 20
        02453   040037                    DAC SCEND
        02454   641001                    LACS
        02455   040037                    DAC SCEND
        02456   541336                    SAD BIT13         /SC TO AC = 20?
        02457   602461                    JMP .+2           /YES
        02460   102520                    JMS SCERR
        02461   100040                    JMS SWITCH
        02462   002445                        SCT017
                                /
                                /WILL SC SET TO 37 AND +1 TO 40
                                /
        02463   200037          SCT037    LAC SCEND
        02464   200033                    LAC SCSTRT
        02465   201335                    LAC BIT12         /NORM 40
        02466   040031                    DAC MQSTRT
        02467   201322                    LAC BIT1
        02470   640440                    NORM+4                      /SET SC TO 37 +1 TO 40
        02471   040034                    DAC ACEND
        02472   641001                    LACS
        02473   040037                    DAC SCEND
        02474   541335                    SAD BIT12         /SC TO AC = 40?
        02475   602477                    JMP .+2           /YES
        02476   102520                    JMS SCERR
        02477   100040                    JMS SWITCH
        02500   002463                        SCT037
                                /
                                          .EJECT
```

```
                                   /WILL SC SET TO 77 AND +1 TO 00
                                   /
        02501   200037             SCT077    LAC SCEND
        02502   042033                       DAC SCSTRT
        02503   201274                       LAC SEVSEV          /NORM 0
        02504   042031                       DAC MQSTRT
        02505   201322                       LAC BIT1
        02506   642400                       NORM+44                       /SET SC TO 77 AND +1 TO 0
        02507   040034                       DAC ACEND
        02510   641001                       LACS                /GET SC TO AC
        02511   042037                       DAC SCEND
        02512   741200                       SNA                 /SC TO AC = 00?
        02513   602515                       JMP .+2             /YES
        02514   102520                       JMS SCERR
        02515   100040                       JMS SWITCH
        02516   302501                       SCT077
        02517   602555                           JMP NOPSC1
                                   /
                                             .EJECT
        02520   602520          SCERR       JMP .
        02521   200031                      LAC MQSTRT              /GET SC OF NORM
        02522   740001                      CMA
        02523   501274                      AND SEVSEV              /SHOULD SET SC TO
        02524   040035                      DAC MQEND
        02525   341342                      TAD BIT17
        02526   501274                      AND SEVSEV              /SC SHOULD +1 TO
        02527   040036                      DAC LKEND
        02530   101134                      JMS ERROR               /TYPE OUT
        02531   001642                          TYSCER                      /SC ERROR
        02532   602520                      SCERR+600000            /ERROR ADDRESS
        02533   001427                          HDR4
        02534   740033                      SCSTRT+740000           /SC AT START
        02535   001442                          SPACE3
        02536   600030                      ACSTRT+600000           /AC AT START
        02537   001646                          TYNORM
        02540   740031                      MQSTRT+740000           /SC PORTION OF NORM
        02541   001652                          TYSSC
        02542   740035                      MQEND+740000            /SHOULD SET SC TO
        02543   001656                          TYPLS1
        02544   740036                      LKEND+740000            /SC SHOULD +1 TO
        02545   001461                          TYCOR
        02546   001636                          TYLACS
        02547   740037                      SCEND+740000            /SC TO AC EQUALED
        02550   001463                          TYINCO
        02551   001442                          SPACE3
        02552   600034                      ACEND+600000            /AC AFTER NORM
        02553   000000                      0
        02554   622520                      JMP* SCERR
                                /
                                /
                                /DOES EAE NOP ALTER SC = 77
                                /
        02555   201274          NOPSC1      LAC SEVSEV
        02556   040033                      DAC SCSTRT
        02557   201322                      LAC BIT1
        02560   640401                      NORM-43                         /SET SC TO 77
        02561   501365                      AND KALL7               /MAKE MB TO ONES BEFORE
        02562   640077                      EAE+77                  /NOP SHOULD NOT ALTER SC
        02563   641001                      LACS                    /GET SC TO AC
        02564   040037                      DAC SCEND
        02565   540033                      SAD SCSTRT              /SC TO AC = 77?
        02566   602600                      JMP .+12
        02567   101134                      JMS ERROR
        02570   001514                          TYNOP
        02571   001427                          HDR4
        02572   740033                      SCSTRT+740000
        02573   001514                          TYNOP
        02574   740033                      SCSTRT+740000
        02575   001636                          TYLACS
        02576   740037                      SCEND+740000
        02577   000000                      0
        02600   100040                      JMS SWITCH
        02601   002555                          NOPSC1
        02602   100060                      JMS SWTCHS
        02603   202246                        SCT076
                               /
                                        .EJECT
```

```
                        /SHIFT TESTS
                        /ALS - ACCUMULATOR LEFT SHIFT
                        /DOES ALS AC = Ø'S ALTER THE AC?
                        /
02604   140030          ALSZER     DZM ACSTRT
02605   140031                     DZM MQSTRT
02606   140032                     DZM LKSTRT
02607   140033                     DZM SCSTRT
02610   651000                     CLQ+1000              /CLEAR AC - MQ AND LINK
02611   744000                     CLL
02612   640700                     ALS
02613   040034                     DAC ACEND
02614   750010                     GLK
02615   040036                     DAC LKEND
02616   641001                     LACS
02617   040037                     DAC SCEND
02620   200034                     LAC ACEND
02621   741200                     SNA
02622   741000                     SKP
02623   103175                     JMS ALSERR
02624   100040                     JMS SWITCH
02625   202610                         ALSZER+4
                        /
                        /
                        /DOES ALS 01 AC = Ø'S OK
                        /
02626   201342          ALSØ1      LAC BIT17             /ALS 01
02627   040033                     DAC SCSTRT
02630   140030                     DZM ACSTRT            /AC Ø'S TO START
02631   140031                     DZM MQSTRT            /MQ Ø'S
02632   140032                     DZM LKSTRT            /LINK IS ZERO
02633   650000                     CLQ
02634   641000                     EAE+1000
02635   744000                     CLL
02636   640701                     ALS Ø1                /SHIFT AC LEFT 1
02637   040034                     DAC ACEND
02640   750010                     GLK
02641   040036                     DAC LKEND             /LINK FOR TYPEOUTS
02642   641001                     LACS
02643   040037                     DAC SCEND             /SC FOR TYPEOUTS
02644   200034                     LAC ACEND
02645   741200                     SNA
02646   741000                     SKP
02647   103175                     JMS ALSERR
02650   200031                     LAC MQSTRT
02651   652000                     LMQ
02652   100040                     JMS SWITCH
02653   002634                         ALSØ1+6
02654   200031                     LAC MQSTRT
02655   740200                     SZA
02656   602663                     JMP .+5
02657   750001                     CLC
02660   040031                     DAC MQSTRT            /2ND PASS MQ = 1'S
02661   640004                     EAE+4
02662   602634                     JMP ALSØ1+6
```

```
                    /                 .EJECT
```

```
                                /LINK TO AC 17
                                /BIT = 0 L=0, BIT =0 L=1, BIT = 1 L = 0, BIT = 1 L = 1
                                /
        02663   140030          ALSLNK     DZM ACSTRT           /START AC 0'S
        02664   140031                     DZM MQSTRT
        02665   140032                     DZM LKSTRT           /LINK START 0
        02666   650000                     CLQ
        02667   200032                     LAC LKSTRT
        02670   740020                     RAR                  /LINK = 0 OR 1
        02671   200030                     LAC ACSTRT
        02672   640701                     ALS 01
        02673   040034                     DAC ACEND
        02674   750010                     GLK
        02675   040036                     DAC LKEND
        02676   641001                     LACS
        02677   040037                     DAC SCEND
        02700   200030                     LAC ACSTRT
        02701   740010                     RAL
        02702   340032                     TAD LKSTRT
        02703   540034                     SAD ACEND
        02704   741000                     SKP
        02705   103175                     JMS ALSERR
        02706   100040                     JMS SWITCH
        02707   002666                     ALSLNK+3
        02710   200032                     LAC LKSTRT
        02711   440032                     ISZ LKSTRT
        02712   741200                     SNA                  /2ND PASS L=1
        02713   602666                     JMP ALSLNK+3
        02714   140032                     DZM LKSTRT
        02715   200030                     LAC ACSTRT
        02716   440030                     ISZ ACSTRT
        02717   741200                     SNA                  /3RD AND 4TH PASS AC=1
        02720   602666                     JMP ALSLNK+3
                                /
                                           .EJECT
```

```
                                 /DOES ALS ALTER THP LINK = 1 OR 0
                                 /
        02721   140031           LNKALS      DZM MQSTRT          /MQ ALWAYS = 0
        02722   140030                       DZM ACSTRT          /START AC=0
        02723   140032                       DZM LKSTRT          /LINK START 0
        02724   201342                       LAC BIT17
        02725   040033                       DAC SCSTRT          /SC = 01
        02726   650000                       CLQ
        02727   200032                       LAC LKSTRT
        02730   740020                       RAR                 /LINK = 1 O R 0
        02731   200030                       LAC ACSTRT          /AC = 0 OR 400000
        02732   640701           KALS01      ALS 01
        02733   040034                       DAC ACEND           /SAVE AC RESULT
        02734   641001                       LACS
        02735   040037                       DAC SCEND           /SAVE SC RESULT
        02736   750010                       GLK
        02737   040036                       DAC LKEND
        02740   540032                       SAD LKSTRT          /LINK SAME AS STRT?
        02741   741000                       SKP                 /YES
        02742   103175                       JMS ALSERR
        02743   100040                       JMS SWITCH
        02744   002726                       LNKALS+5
        02745   200032                       LAC LKSTRT
        02746   440032                       ISZ LKSTRT
        02747   741200                       SNA
        02750   602726                       JMP LNKALS+5        /2ND AND 4TH PAS L = 1
        02751   200030                       LAC ACSTRT
        02752   201321                       LAC BIT0
        02753   540030                       SAD ACSTRT                    /AC 0 ALREADY = 1
        02754   602760                       JMP .+4
        02755   140032                       DZM LKSTRT                    /3RD AND 4TH PASS
        02756   040030                       DAC ACSTRT          /AC=400000
        02757   602726                       JMP LNKALS+5
                                 /
                                             .EJECT
```

```
                                /DOES ALS ALTER THE MQ
                                /
        02760   140031          ALSMQT     DZM MQSTRT           /1ST PASSES MQ = 0'S
        02761   140030                     DZM ACSTRT
        02762   140032                     DZM LKSTRT
        02763   201342                     LAC BIT17
        02764   040033                     DAC SCSTRT           /ALS 01 PLACE
        02765   200032                     LAC LKSTRT
        02766   740020                     RAR                  /L=1 OR 0
        02767   200031                     LAC MQSTRT
        02770   652000                     LMQ                  /MQ = 0'S OR 1'S
        02771   200030                     LAC ACSTRT           /AC = 0'S OR 1'S
        02772   640701                     ALS 01
        02773   040034                     DAC ACEND
        02774   750010                     GLK
        02775   040036                     DAC LKEND
        02776   641001                     LACS
        02777   040037                     DAC SCEND
        03000   641002                     LACQ
        03001   040035                     DAC MQEND
        03002   540031                     SAD MQSTRT           /MQ SAME AS START?
        03003   603017                     JMP .+14  /YES
        03004   101134                     JMS ERROR
        03005   001662                         TYALSQ
        03006   001411                         HDR3
        03007   700032                     LKSTRT+700000
        03010   600030                     ACSTRT+600000
        03011   000031                         MQSTRT
        03012   001667                         TYALR
        03013   700036                     LKEND+700000
        03014   600034                     ACEND+600000
        03015   600035                     MQEND+600000
        03016   000000                     0
        03017   100040                     JMS SWITCH
        03020   002765                     ALSMQT+5
        03021   200032                     LAC LKSTRT
        03022   440032                     ISZ LKSTRT           /EVERY OTHER PASS L = 1
        03023   741200                     SNA
        03024   602765                     JMP ALSMQT+5
        03025   140032                     DZM LKSTRT           /NEXT PASS L = 0
        03026   200030                     LAC ACSTRT
        03027   740001                     CMA                  /AC=0'S, 1'S, 0'S, 1'S
        03030   040030                     DAC ACSTRT
        03031   740200                     SZA
        03032   602765                     JMP ALSMQT+5
        03033   200031                     LAC MQSTRT           /MQ = 0'S 4 PASSES 1'S 4 PASSES
        03034   740001                     CMA
        03035   040031                     DAC MQSTRT
        03036   740200                     SZA                  /MQSTRT BACK TO 0'S?
        03037   602765                     JMP ALSMQT+5         /NO, TEST M1 = 1'S
        03040   100060                     JMS SWTCHS
        03041   002604                         ALSZER
                                /
                                           .EJECT
```

```
                        /WILL ACØ GO TO LINK PROPERLY
                        /IMMEDIATELY FOLLOWING AN ALS LEFT SHIFT
                        /Ø-Ø,Ø-1,1-Ø,1-1
Ø3Ø42   14ØØ32          SGNSHF  DZM LKSTRT                      /LK TO Ø FIRST
Ø3Ø43   14ØØ31                  DZM MQSTRT                      /TO COMPARE LINK ONLY
Ø3Ø44   2Ø1321                  LAC BITØ
Ø3Ø45   Ø4ØØ3Ø                  DAC ACSTRT                      /FIRST ACØ=1 GOES TO Ø
Ø3Ø46   2Ø1342                  LAC BIT17
Ø3Ø47   Ø4ØØ33                  DAC SCSTRT                      /SHIFT=1 ØPLACE
Ø3Ø5Ø   2ØØØ32                  LAC LKSTRT
Ø3Ø51   74ØØ2Ø                  RAR             /MAKE L=START
Ø3Ø52   2ØØØ3Ø                  LAC ACSTRT
Ø3Ø53   64Ø7Ø1                  ALS Ø1          /ACØ=1 GOES TO Ø OR = Ø GOES TO 1
Ø3Ø54   66ØØØØ                  EAE+2ØØØØ       /GET SIGN OF AC
Ø3Ø55   Ø4ØØ34                  DAC ACEND       /SAVE FOR TYPEOUTS
Ø3Ø56   75ØØ1Ø                  GLK
Ø3Ø57   Ø4ØØ36                  DAC LKEND       /SAVE FOR TYPEOUTS
Ø3Ø6Ø   54ØØ31                  SAD MQSTRT                      /L=CORRECT RESULT
Ø3Ø61   6Ø3Ø77                  JMP NSNERR                      /YES
Ø3Ø62   1Ø1134                  JMS ERROR
Ø3Ø63   ØØ1667                      TYALS
Ø3Ø64   74ØØ33                  SCSTRT+74ØØØØ
Ø3Ø65   ØØ1537                      TYSLK
Ø3Ø66   ØØ1411                      HDR3
Ø3Ø67   7ØØØ32                  LKSTRT+7ØØØØØ
Ø3Ø7Ø   6ØØØ3Ø                  ACSTRT+6ØØØØØ
Ø3Ø71   ØØ1667                  TYALS
Ø3Ø72   ØØ1537                  TYSLK
Ø3Ø73   7ØØØ36                  LKEND+7ØØØØØ
Ø3Ø74   6ØØØ34                  ACEND+6ØØØØØ
Ø3Ø75   ØØ16Ø7                  TYRES
Ø3Ø76   ØØØØØØ                  Ø
Ø3Ø77   1ØØØ4Ø          NSNERR  JMS SWITCH                      /END SCOPE LOOP
Ø31ØØ   ØØ3Ø5Ø                  SGNSHF+6
Ø31Ø1   2ØØØ32                  LAC LKSTRT
Ø31Ø2   44ØØ32                  ISZ LKSTRT
Ø31Ø3   7412ØØ                  SNA
Ø31Ø4   6Ø3Ø5Ø                  JMP SGNSHF+6    /THIS PASS L=1
Ø31Ø5   14ØØ32                  DZM LKSTRT
Ø31Ø6   2Ø1322                  LAC BIT1
Ø31Ø7   54ØØ3Ø                  SAD ACSTRT                      /TESTED SIGN=1
Ø311Ø   6Ø3114                  JMP HSALS       /YES
Ø3111   Ø4ØØ3Ø                  DAC ACSTRT
Ø3112   44ØØ31                  ISZ MQSTRT
Ø3113   6Ø3Ø5Ø                  JMP SGNSHF+6
                        /
                                .EJECT
```

```
                              /WILL ALS SHIFT 1 TO 18 PLACES?
                              /1ST PASS BIT 2ND PASS NO BIT
                              /
        03114   140031        HSALS     DZM MQSTRT
        03115   201342                  LAC BIT17
        03116   040030                  DAC ACSTRT
        03117   140032                  DZM LKSTRT
        03120   103216                  JMS SIMALS
        03121   201300                  LAC K18
        03122   040010                  DAC 10
        03123   202732                  LAC KALS01
        03124   043134                  DAC HSALSE
        03125   201342                  LAC BIT17
        03126   040033                  DAC SCSTRT
        03127   200032        HSALSL    LAC LKSTRT
        03130   740020                  RAR
        03131   200031                  LAC MQSTRT          /MQ ALTERNATES
        03132   652000                  LMQ                 /FROM 1'S TO 0'S
        03133   200030                  LAC ACSTRT
        03134   640701        HSALSE    ALS 01              /1 TO 18 PLACES
        03135   040034                  DAC ACEND
        03136   750010                  GLK
        03137   040036                  DAC LKEND
        03140   641001                  LACS
        03141   040037                  DAC SCEND
        03142   740200                  SZA                 /SC GO TO ZERO?
        03143   603151                  JMP .+6
        03144   200036                  LAC LKEND
        03145   540032                  SAD LKSTRT          /WAS LINK ALTERED
        03146   200034                  LAC ACEND
        03147   563244                  SAD* SALSRP         /RESULT OF SHIFT OK?
        03150   603152                  JMP .+2
        03151   103175                  JMS ALSERR
        03152   100040                  JMS SWITCH
        03153   003127                      HSALSL
        03154   200031                  LAC MQSTRT
        03155   740001                  CMA                 /EVEN PASSES MQ = 777777
        03156   040031                  DAC MQSTRT
        03157   443134                  ISZ HSALSE                    /INCREMENT COUNT
        03160   443244                  ISZ SALSRP          /ADVANCE RESULT POINTER
        03161   440033                  ISZ SCSTRT          /FOR TYPEOUTS SC+1
        03162   440010                  ISZ 10              /SHIFT 18 TIMES?
        03163   603127                  JMP HSALSL
        03164   440032                  ISZ LKSTRT          /NO BIT PASS L = 1
        03165   200030                  LAC ACSTRT
        03166   740001                  CMA                 /2ND PASS AC STRT=777776
        03167   040030                  DAC ACSTRT
        03170   741100                  SPA                 /MADE 2 PASSES?
        03171   603120                  JMP HSALS+4         /NO, SHIFT NO BIT
        03172   100060                  JMS SWTCHS
        03173   003114                      HSALS
        03174   603310                  JMP LLSTS1
                              /
                                        .EJECT
```

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```
                                /ALS INSTRUCTION
                                /COMMON ERROR TYPEOUT
                                /
        03175   603175          ALSERR    JMP .
        03176   101134                    JMS ERROR
        03177   001667                        TYALS
        03200   740033                    SCSTRT+740000
        03201   403175                    ALSERR+400000
        03202   001447                        HDR5
        03203   500032                    LKSTRT+500000
        03204   600030                    ACSTRT+600000
        03205   600031                    MQSTRT+600000
        03206   001457                        TYPATR
        03207   500036                    LKEND+500000
        03210   600034                    ACEND+600000
        03211   001607                        TYRES
        03212   001636                        TYLACS
        03213   740037                    SCEND+740000
        03214   000000                    0
        03215   623175                    JMP* ALSERR
                                /
                                /
                                /SIMULATE ALS OPERATION
                                /STORES SHIFTS 1 TO 18 PLACES
                                /
        03216   603216          SIMALS    JMP .
        03217   206506                    LAC (RESULT-1
        03220   040017                    DAC 17
        03221   040015                    DAC 15
        03222   341342                    TAD BIT17
        03223   043244                    DAC SALSRP           /SET RESULT POINTER TO START
        03224   201300                    LAC K18
        03225   040016                    DAC 16
        03226   200032                    LAC LKSTRT
        03227   740020                    RAR
        03230   200030                    LAC ACSTRT
        03231   740010                    RAL
        03232   060017                    DAC* 17
        03233   440016                    ISZ 16
        03234   200032                    LAC LKSTRT
        03235   740020                    RAR
        03236   220015                    LAC* 15
        03237   740010                    RAL
        03240   060017                    DAC* 17
        03241   440016                    ISZ 16
        03242   603234                    JMP .-6
        03243   623216                    JMP* SIMALS
        03244   000000          SALSRP    0
        03245   000000          RESULT    0
                                /
        03267                             .LOC RESULT+22                 /RESERVE 17 SHIFT LOCATIONS
                                /
                                          .EJECT
        03267   750004          ENDSHF    LAS
        03270   501327                    AND BIT6
        03271   741200                    SNA                     /COMMA AT END?
        03272   603300                    JMP .+6                 /NO
        03273   760054                    LAW 54
        03274   101716                    TY1
        03275   441261                    ISZ CHARK
        03276   603302                    JMP .+4
        03277   101240                    JMS CRLF
        03300   201363                    LAC NBIT16
        03301   041261                    DAC CHARK
        03302   750004                    LAS
        03303   501326                    AND BIT5
        03304   741200                    SNA                     /CYCLE BOTH TESTS
        03305   602246                    JMP SCT076              /NO, STAY IN SHIFT TEST
        03306   605002                    JMP RANSHF              /REPEAT FROM SETUP TEST
        03307   000254          COMMA     254
                                /
                                /LLS  AND LRS BASIC TESTS
                                /TAPE 4   OF EAE PDP7 TEST
                                /
                                /
                                /LONG LEFT SHIFT
                                /
                                /
                                /LLS 01  ALL ZERO'S
                                /
        03310   140030          LLSTS1    DZM ACSTRT
        03311   140031                    DZM MQSTRT
        03312   140032                    DZM LKSTRT
        03313   201342                    LAC BIT17
        03314   040033                    DAC SCSTRT
        03315   650000                    CLQ                     /START SCOPE LOOP
        03316   754000                    CLA!CLL                 /CLR AC AND LINK
        03317   640601                    LLS 01
        03320   040034                    DAC ACEND
        03321   750010                    GLK
        03322   040036                    DAC LKEND
        03323   641001                    LACS
        03324   040037                    DAC SCEND
        03325   641002                    LACQ
        03326   040035                    DAC MQEND
        03327   741200                    SNA                     /MQ STILL 0'S?
        03330   200034                    LAC ACEND
        03331   741200                    SNA                     /AC STILL 0'S?
        03332   200036                    LAC LKEND
        03333   741200                    SNA                     /LINK STILL 0'S?
        03334   200037                    LAC SCEND
        03335   741200                    SNA                     /SC GO TO ZERO?
        03336   603340                    JMP .+2
        03337   103745                    JMS LLSERR
        03340   100040                    JMS SWITCH
        03341   003315                        LLSTS1+5
                                /
                                          .EJECT
```

)|

```
                                  /DOES LINK GO TO MQ17 ON AN LLS
                                  /0=0, 1-0, 0-1, 1-1
                                  /
         03342   140031           LLSTS2    DZM MQSTRT
         03343   140030                     DZM ACSTRT
         03344   140032                     DZM LKSTRT
         03345   201342                     LAC BIT17             /LLS  01
         03346   040033                     DAC SCSTRT
         03347   200031                     LAC MQSTRT            /2 PASSES = 0  START SCOPE LOOP
         03350   652000                     LMQ                   /2 PASSES = 1 (MQ17)
         03351   200032                     LAC LKSTRT
         03352   740020                     RAR                   /L=1 EVERY 2ND PASS
         03353   200030                     LAC ACSTRT            /AC ALWAYS = 0
         03354   640601                     LLS 01
         03355   040034                     DAC ACEND             /SAVE RESULTS
         03356   750010                     GLK
         03357   040036                     DAC LKEND
         03360   641001                     LACS
         03361   040037                     DAC SCEND
         03362   641002                     LACQ
         03363   040035                     DAC MQEND
         03364   200032                     LAC LKSTRT
         03365   740020                     RAR
         03366   200031                     LAC MQSTRT
         03367   740010                     RAL
         03370   540035                     SAD MQEND
         03371   741000                     SKP
         03372   103745                     JMS LLSERR
         03373   100040                     JMS SWITCH                      /END SCOPE LOOP
         03374   003347                         LLSTS2+5
         03375   200032                     LAC LKSTRT
         03376   440032                     ISZ LKSTRT
         03377   741200                     SNA                   /2ND OR 4TH PASS?
         03400   603347                     JMP LLSTS2+5
         03401   140032                     DZM LKSTRT            /NEXT PASS L = 0
         03402   200031                     LAC MQSTRT
         03403   440031                     ISZ MQSTRT
         03404   741200                     SNA                   /MADE WITH MQ17=1?
         03405   603347                     JMP LLSTS2+5
                                  /
                                            .EJECT
```

```
                                /DOES LINK NOT GO TO AC17 ON AN LLS
                                /DOES MQ0 GO TO AC17 ON AN LLS
                                /
        03406   140030          LLSACT     DZM ACSTRT
        03407   140031                     DZM MQSTRT
        03410   140032                     DZM LKSTRT
        03411   201342                     LAC BIT17
        03412   040033                     DAC SCSTRT
        03413   200031                     LAC MQSTRT                  /START SCOPE LOOP
        03414   652000                     LMQ
        03415   200032                     LAC LKSTRT
        03416   740020                     RAR              /L=0, 1, 0, 1
        03417   200030                     LAC ACSTRT       /AC=0, 0, 1, 1
        03420   640601                     LLS 01
        03421   040034                     DAC ACEND
        03422   750010                     GLK
        03423   040036                     DAC LKEND
        03424   641001                     LACS
        03425   040037                     DAC SCEND        /SAVE SC FOR TYPEOUT
        03426   641002                     LACQ
        03427   040035                     DAC MQEND        /MQ FOR TYPEOUT
        03430   540032                     SAD LKSTRT       /LINK TO MQ17?
        03431   741000                     SKP              /YES, OK
        03432   603441                     JMP .+7          /MQ ERROR
        03433   200031                     LAC MQSTRT
        03434   740010                     RAL
        03435   200030                     LAC ACSTRT
        03436   740010                     RAL
        03437   540034                     SAD ACEND        /AC0 SHOULD BE = MQ0
        03440   741000                     SKP
        03441   103745                     JMS LLSERR
        03442   100040                     JMS SWITCH
        03443   003413                     LLSACT+5
        03444   200032                     LAC LKSTRT
        03445   440032                     ISZ LKSTRT       /L=0,1,0, 1,0, 1, 0, 1
        03446   741200                     SNA
        03447   603413                     JMP LLSACT+5
        03450   140032                     DZM LKSTRT
        03451   200030                     LAC ACSTRT
        03452   440030                     ISZ ACSTRT       /AC0 = 0, 0, 1, 1, 0, 0, 1, 1
        03453   741200                     SNA
        03454   603413                     JMP LLSACT+5
        03455   140030                     DZM ACSTRT
        03456   201321                     LAC BIT0
        03457   540031                     SAD MQSTRT       /TESTED MQ0 = 1?
        03460   603463                     JMP .+3          /YES
        03461   040031                     DAC MQSTRT       /MQ0 = 0, 4 PASSES
        03462   603413                     JMP LLSACT+5     /=1,  4 PASSES
        03463   100060                     JMS SWTCHS
        03464   003310                         LLST81
                                /
                                           .EJECT
```

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```
                              /WILL EACH BIT OF THE MQ SHIFT TO THE NEXT
                              /1→0, AND 0→1 LEFT
                              /
        03465   201342        LLSTS3     LAC BIT17            /START MQ 17 TO MQ 16
        03466   040031                   DAC MQSTRT
        03467   040033                   DAC SCSTRT
        03470   140032                   DZM LKSTRT
        03471   140030                   DZM ACSTRT
        03472   200031                   LAC MQSTRT                     /START SCOPE LOOP
        03473   652000                   LMQ
        03474   754000                   CLA!CLL              /AC AND L ALWAYS 0'S
        03475   640601                   LLS 01
        03476   040034                   DAC ACEND
        03477   750010                   GLK
        03500   040036                   DAC LKEND            /FOR TYPEOUTS
        03501   641001                   LACS
        03502   040037                   DAC SCEND            /FOR TYPEOUTS
        03503   641002                   LACQ
        03504   040035                   DAC MQEND
        03505   200031                   LAC MQSTRT
        03506   740010                   RAL
        03507   540035                   SAD MQEND
        03510   741000                   SKP
        03511   603516                   JMP .+5
        03512   200030                   LAC ACSTRT
        03513   740010                   RAL
        03514   540034                   SAD ACEND
        03515   603517                   JMP .+2
        03516   103745                   JMS LLSERR
        03517   100040                   JMS SWITCH                     /END SCOPE
        03520   003472                   LLSTS3+5
        03521   200031                   LAC MQSTRT           /SET UP NEXT MQ BIT
        03522   744010                   CLL!RAL
        03523   040031                   DAC MQSTRT
        03524   740400                   SNL                  /TESTED MQ0 = 1
        03525   603472                   JMP LLSTS3+5
                              /
                                         .EJECT
```

```
                          /WILL EACH BIT OF THE MQ SHIFT TO THE NEXT
                          /1=1, 0-1, 1-0 LEFT
                          /
03526   201364            LLSTS4    LAC NBIT17          /START 777776
03527   040031                      DAC MQSTRT
03530   740001                      CMA
03531   040033                      DAC SCSTRT          /LLS 01
03532   040032                      DAC LKSTRT          /LINK ALWAYS = 1
03533   750001                      CLC
03534   040030                      DAC ACSTRT          /AC = 1'S ALL
03535   200031                      LAC MQSTRT                    /START SCOPE LOOP
03536   652000                      LMQ
03537   754003                      STL!CLC
03540   640601                      LLS 01
03541   040034                      DAC ACEND
03542   750010                      GLK
03543   040036                      DAC LKEND           /L, FOR TYPEOUT
03544   641001                      LACS
03545   040037                      DAC SCEND           /SC FOR TYPEOUT
03546   641002                      LACQ
03547   040035                      DAC MQEND
03550   200031                      LAC MQSTRT                    /SIMULATE LLS
03551   744002                      STL                 /TO GET
03552   740010                      RAL                 /COMPARE CONSTANT
03553   540035                      SAD MQEND           /MQ SHIFT OK?
03554   741000                      SKP                 /YES
03555   603562                      JMP .+5
03556   200030                      LAC ACSTRT
03557   740010                      RAL
03560   540034                      SAD ACEND           /AC SHIFT OK?
03561   603563                      JMP .+2
03562   103745                      JMS LLSERR
03563   100040                      JMS SWITCH                    /END SCOPE
03564   003535                      LLSTS4+7
03565   744002                      STL
03566   200031                      LAC MQSTRT
03567   740010                      RAL
03570   040031                      DAC MQSTRT
03571   741400                      SZL                 /TESTED MQ0 = 0
03572   603535                      JMP LLSTS4+7
03573   100060                      JMS SWTCHS
03574   003465                          LLSTS3
                          /
                                    .EJECT
```

```
                                /WILL MQ AC SHIFT A 1 BIT 1 TO 44 PLACES
                                /USES LLS SIGNED
                                /
        03575   140030          LLSTS5    DZM ACSTRT                   /AC START ZEROS
        03576   201342                    LAC BIT17
        03577   040033                    DAC SCSTRT          /SC INCREMENTED TO 44
        03600   040031                    DAC MQSTRT          /MQ START BIT 17 = 1
        03601   040032                    DAC LKSTRT
        03602   044701                    DAC MQCOMK
        03603   144700                    DZM ACCOMK
        03604   203767                    LAC KLLSS1
        03605   043617                    DAC LLSSFX          /RESET SHIFT TO 1
        03606   204701          LLSSL1    LAC MQCOMK
        03607   744010                    CLL!RAL
        03610   044701                    DAC MQCOMK
        03611   204700                    LAC ACCOMK
        03612   740010                    RAL
        03613   044700                    DAC ACCOMK
        03614   200031                    LAC MQSTRT                   /START SCOPE LOOP
        03615   652000                    LMQ
        03616   754002                    STL!CLA
        03617   660601          LLSSEX    LLSS 01             /SC = 1 TO 44
        03620   040034                    DAC ACEND
        03621   641001                    LACS
        03622   040037                    DAC SCEND
        03623   750010                    GLK
        03624   040036                    DAC LKEND
        03625   641002                    LACQ
        03626   040035                    DAC MQEND
        03627   544701                    SAD MQCOMK
        03630   741000                    SKP
        03631   603635                    JMP .+4
        03632   204700                    LAC ACCOMK
        03633   540034                    SAD ACEND
        03634   741000                    SKP
        03635   603643                    JMP .+6
        03636   200036                    LAC LKEND
        03637   741200                    SNA                 /LINK GO TO  0
        03640   200037                    LAC SCEND
        03641   741200                    SNA                 /SC END = 0
        03642   603644                    JMP .+2
        03643   103770                    JMS LLSSER                   /END SCOPE LOOP
        03644   100040                    JMS SWITCH
        03645   003614                    LLSSEX-3
        03646   443617                    ISZ LLSSFX
        03647   440033                    ISZ SCSTRT
        03650   200033                    LAC SCSTRT
        03651   241313                    XOR FOURS
        03652   740200                    SZA
        03653   603606                    JMP LLSSL1
        03654   100060                    JMS SWTCHS
        03655   003575                        LLSTS5
                                /
                                          .EJECT
```

```
                                  /WILL MQ AC SHIFT A NO BIT 1 TO 44 PLACES
                                  /
        03656   140032            LLSTS6    DZM LKSTRT
        03657   201342                      LAC BIT17
        03660   040033                      DAC SCSTRT
        03661   740001                      CMA
        03662   040031                      DAC MQSTRT
        03663   044701                      DAC MQCOMK
        03664   750001                      CLC
        03665   040030                      DAC ACSTRT
        03666   044700                      DAC ACCOMK
        03667   203767                      LAC KLLSS1
        03670   043703                      DAC LLSSX2
        03671   204701            LLSSL2    LAC MQCOMK          /FORM AC
        03672   744002                      STL
        03673   740010                      RAL                 /AND MQ
        03674   044701                      DAC MQCOMK          /COMPARE CONSTANTS
        03675   204700                      LAC ACCOMK
        03676   740010                      RAL
        03677   044700                      DAC ACCOMK
        03700   200031                      LAC MQSTRT                    /SET UP SHIFT  START SCOPE LOOP
        03701   652000                      LMQ
        03702   754001                      CLL!CLC
        03703   660601            LLSSX2    LLSS 01             /SC=1 TO 44 PLACES
        03704   040034                      DAC ACEND
        03705   641001                      LACS
        03706   040037                      DAC SCEND           /GET SC FOR TEST 4
        03707   750010                      GLK
        03710   040036                      DAC LKEND           /LINK SHOULD BE 1
        03711   641002                      LACQ
        03712   040035                      DAC MQEND
        03713   544701                      SAD MQCOMK          /MQ SHIFT OK?
        03714   741000                      SKP
        03715   603721                      JMP .+4
        03716   204700                      LAC ACCOMK
        03717   540034                      SAD ACEND           /AC SHIFT OK?
        03720   741000                      SKP
        03721   603725                      JMP .+4
        03722   200036                      LAC LKEND
        03723   541342                      SAD BIT17           /LINK SET TO 1?
        03724   741000                      SKP
        03725   603731                      JMP .+4
        03726   200037                      LAC SCEND
        03727   741200                      SNA                 /SC GO TO 0?
        03730   741000                      SKP
        03731   103770                      JMS LLSSER
        03732   100040                      JMS SWITCH
        03733   003700                      LLSSX2-3
        03734   443703                      ISZ LLSSX2          /ADVANCE TO NEXT SHIFT
        03735   440033                      ISZ SCSTRT
        03736   200033                      LAC SCSTRT
        03737   241313                      XOR FOURS           /SHIFTED 44 PLACES?
        03740   740200                      SZA
        03741   603671                      JMP LLSSL2
        03742   100060                      JMS SWTCHS          /REPEAT SEQUENCE SET?
```

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        03743   003656                   LLSTS6
        03744   604016                JMP LRSTS1
                        /
                                      .EJECT
```

```
                                /COMMON ERROR TYPEOUT LLS
                                /
        03745   603745          LLSERR    JMP .
        03746   101134                    JMS ERROR
        03747   001553                        TYLLS
        03750   740033                    SCSTRT+740000
        03751   403745                    LLSERR+400000
        03752   001447                        HDR5
        03753   500032                    LKSTRT+500000
        03754   600030                    ACSTRT+600000
        03755   600031                    MQSTRT+600000
        03756   001457                        TYPATR
        03757   500036                    LKEND+500000
        03760   600034                    ACEND+600000
        03761   600035                    MQEND+600000
        03762   001607                        TYRES
        03763   001636                        TYLACS
        03764   740037                    SCEND+740000
        03765   000000                    0
        03766   623745                    JMP* LLSERR
        03767   660601          KLLSS1    LLSS 01              /TO SET UP LONG LEFT SHIFTS
                                /
                                /
                                /COMMON ERROR TYPEOUT
                                /LLS SIGNED
                                /
        03770   603770          LLSSER    JMP .
        03771   101134                    JMS ERROR
        03772   001557                        TYLLSS
        03773   740033                    SCSTRT+740000
        03774   403770                    LLSSER+400000
        03775   001447                        HDR5
        03776   500032                    LKSTRT+500000
        03777   600030                    ACSTRT+600000
        04000   600031                    MQSTRT+600000
        04001   001457                        TYPATR
        04002   001444                        SPACE4
        04003   604700                    ACCOMK+600000
        04004   604701                    MQCOMK+600000
        04005   001461                        TYCOR
        04006   500036                    LKEND+500000
        04007   600034                    ACEND+600000
        04010   600035                    MQEND+600000
        04011   001463                        TYINCO
        04012   001636                        TYLACS
        04013   740037                    SCEND+740000
        04014   000000                    0
        04015   623770                    JMP* LLSSER
                                /
                                          .EJECT
```

```
                        /LONG RIGHT SHIFT
                        /LRS 01 AC, MQ AND L = 0'S
                        /
      04016   140030    LRSTS1     DZM ACSTRT           /SET INITIAL CONDITIONS
      04017   140031               DZM MQSTRT
      04020   140032               DZM LKSTRT
      04021   201342               LAC BIT17
      04022   040033               DAC SCSTRT
      04023   650000               CLQ                  /START SCOPE LOOP
      04024   754000               CLA!CLL
      04025   640501               LRS 01
      04026   040034               DAC ACEND
      04027   750010               GLK
      04030   040036               DAC LKEND
      04031   641001               LACS
      04032   040037               DAC SCEND
      04033   641002               LACQ
      04034   040035               DAC MQEND
      04035   741200               SNA                  /MQ SHOULD BE 0
      04036   200034               LAC ACEND
      04037   741200               SNA                  /AC=0?
      04040   200037               LAC SCEND
      04041   741200               SNA                  /SC GO TO 0?
      04042   200036               LAC LKEND
      04043   741200               SNA                  /LINK STILL 0?
      04044   741000               SKP
      04045   104630               JMS LRSERR
      04046   100040               JMS SWITCH                     /END SCOPE
      04047   004023               LRSTS1+5
                        /
                                   .EJECT
```

```
                                 /DOES LINK GO TO AC 0 ON AN LRS
                                 /0=0, 1-0, 0-1, 1-1
        04050    140031          LRSTS2    DZM MQSTRT
        04051    140030                    DZM ACSTRT
        04052    140032                    DZM LKSTRT
        04053    201342                    LAC BIT17
        04054    040033                    DAC SCSTRT
        04055    200032                    LAC LKSTRT                      /START SCOPE LOOP
        04056    740020                    RAR
        04057    650000                    CLQ
        04060    200030                    LAC ACSTRT                      /SET UP COMPLETE
        04061    640501                    LRS 01
        04062    040034                    DAC ACEND            /SAVE RESULTS
        04063    641002                    LACQ
        04064    040035                    DAC MQEND
        04065    641001                    LACS
        04066    040037                    DAC SCEND
        04067    750010                    GLK
        04070    040036                    DAC LKEND            /LINK SHOULD NOT CHANGE
        04071    540032                    SAD LKSTRT
        04072    741000                    SKP
        04073    604105                    JMP .+12
        04074    200035                    LAC MQEND
        04075    740200                    SZA
        04076    604105                    JMP .+7
        04077    200032                    LAC LKSTRT
        04100    740020                    RAR
        04101    200030                    LAC ACSTRT
        04102    740020                    RAR
        04103    540034                    SAD ACEND
        04104    741000                    SKP
        04105    104630                    JMS LRSERR
        04106    100040                    JMS SWITCH                      /END SCOPE
        04107    004055                    LRSTS2+5
        04110    200032                    LAC LKSTRT
        04111    440032                    ISZ LKSTRT
        04112    741200                    SNA
        04113    604055                    JMP LRSTS2+5
        04114    140032                    DZM LKSTRT
        04115    201321                    LAC BIT0
        04116    540030                    SAD ACSTRT
        04117    604122                    JMP .+3
        04120    040030                    DAC ACSTRT
        04121    604055                    JMP LRSTS2+5
                                 /
                                           .EJECT
```

```
                                        /DOES AC17 GO TO MQ0 ON AN LRS
                                        /0-0, 1-0, 0-1, AND 1-1
        04122   140032                  LRSTS3    DZM LKSTRT          /LINK ALWAYS 0
        04123   140031                            DZM MQSTRT
        04124   140030                            DZM ACSTRT
        04125   201342                            LAC BIT17           /SHIFT OF 1
        04126   040033                            DAC SCSTRT
        04127   744000                            CLL
        04130   200031                            LAC MQSTRT          /SET MQ
        04131   652000                            LMQ
        04132   200030                            LAC ACSTRT
        04133   640501                            LRS 01
        04134   040034                            DAC ACEND
        04135   750010                            GLK
        04136   040036                            DAC LKEND
        04137   641001                            LACS
        04140   040037                            DAC SCEND
        04141   641002                            LACQ
        04142   040035                            DAC MQEND
        04143   200030                            LAC ACSTRT          /GENERATE MQ
        04144   740020                            RAR                 /COMPARE
        04145   200031                            LAC MQSTRT          /CONSTANT
        04146   740020                            RAR
        04147   540035                            SAD MQEND           /AC17 TO MQ0 OK?
        04150   741000                            SKP
        04151   604154                            JMP .+3
        04152   200034                            LAC ACEND
        04153   740200                            SZA                 /AC GO TO 0?
        04154   604160                            JMP .+4
        04155   200036                            LAC LKEND
        04156   741200                            SNA
        04157   741000                            SKP
        04160   104630                            JMS LRSERR
        04161   100040                            JMS SWITCH
        04162   004127                            LRSTS3+5
        04163   200030                            LAC ACSTRT
        04164   440030                            ISZ ACSTRT
        04165   741200                            SNA
        04166   604127                            JMP LRSTS3+5
        04167   201321                            LAC BIT0
        04170   140030                            DZM ACSTRT
        04171   540031                            SAD MQSTRT
        04172   604175                            JMP .+3
        04173   040031                            DAC MQSTRT
        04174   604127                            JMP LRSTS3+5
                                        /
                                                  .EJECT
```

```
                                /DOES AC17 NOT GO TO LINK ON AN LRS
        04175   140032          LRSTS4      DZM LKSTRT
        04176   140030                      DZM ACSTRT
        04177   140031                      DZM MQSTRT          /MQ ALWAYS ZERO
        04200   201342                      LAC BIT17
        04201   040033                      DAC SCSTRT          /SHIFT OF 1
        04202   650000                      CLQ
        04203   200032                      LAC LKSTRT
        04204   740020                      RAR                 /SET LINK INITIAL Ø OR 1
        04205   200030                      LAC ACSTRT          /AC=1 OR Ø
        04206   640501                      LRS Ø1
        04207   040034                      DAC ACEND
        04210   641001                      LACS
        04211   040037                      DAC SCEND
        04212   641002                      LACQ
        04213   040035                      DAC MQEND
        04214   750010                      GLK
        04215   040036                      DAC LKEND
        04216   540032                      SAD LKSTRT                    /WAS LINK ALTERED
        04217   741000                      SKP
        04220   104630                      JMS LRSERR
        04221   100040                      JMS SWITCH
        04222   004202                      LRSTS4+5
        04223   200032                      LAC LKSTRT
        04224   440032                      ISZ LKSTRT
        04225   741200                      SNA                 /TESTED L=1?
        04226   604202                      JMP LRSTS4+5        /NO
        04227   140032                      DZM LKSTRT
        04230   200030                      LAC ACSTRT
        04231   440030                      ISZ ACSTRT
        04232   741200                      SNA                 /TESTED AC 17=1
        04233   604202                      JMP LRSTS4+5
        04234   100060                      JMS SWTCHS
        04235   004016                      LRSTS1
                                /
                                            .EJECT
```

```
                          /WILL AC MQ SHIFT A 1 BIT EACH POSITION RIGHT
                          /
04236   140032            LRSTS5      DZM LKSTRT
04237   140031                        DZM MQSTRT
04240   144701                        DZM MQCOMK
04241   201342                        LAC BIT17
04242   040033                        DAC SCSTRT
04243   201321                        LAC BIT0
04244   040030                        DAC ACSTRT
04245   044700                        DAC ACCOMK
04246   204700                        LAC ACCOMK            /GENERATE COMPARE
04247   744020                        CLL!RAR               /CONSTANTS
04250   044700                        DAC ACCOMK
04251   204701                        LAC MQCOMK
04252   740020                        RAR
04253   044701                        DAC MQCOMK
04254   200031            LRST5L      LAC MQSTRT
04255   652000                        LMQ
04256   744000                        CLL
04257   200030                        LAC ACSTRT
04260   640501                        LRS 01
04261   040034                        DAC ACEND
04262   750010                        GLK
04263   040036                        DAC LKEND
04264   641001                        LACS
04265   040037                        DAC SCEND
04266   641002                        LACQ
04267   040035                        DAC MQEND
04270   544701                        SAD MQCOMK            /MQ SHIFT OK?
04271   741000                        SKP
04272   604276                        JMP .+4
04273   204700                        LAC ACCOMK
04274   540034                        SAD ACEND             /AC SHIFT OK?
04275   741000                        SKP
04276   104630                        JMS LRSERR
04277   100040                        JMS SWITCH
04300   004254                        LRST5L
04301   200030                        LAC ACSTRT
04302   744020                        CLL!RAR
04303   040030                        DAC ACSTRT
04304   200031                        LAC MQSTRT
04305   740020                        RAR
04306   040031                        DAC MQSTRT
04307   740400                        SNL
04310   604246                        JMP LRST5L-6
04311   100060                        JMS SWTCHS
04312   004236                        LRSTS5
                          /
                                      .EJECT
```

```
                           /WILL AC-MQ SHIFT A NO BIT 1 POSITION
                           /RIGHT FROM EACH BIT
     04313    201342       LRSTS6      LAC BIT17
     04314    040033                   DAC SCSTRT
     04315    040032                   DAC LKSTRT
     04316    201343                   LAC NBIT0          /377777
     04317    040030                   DAC ACSTRT
     04320    044700                   DAC ACCOMK
     04321    750001                   CLC
     04322    040031                   DAC MQSTRT
     04323    044701                   DAC MQCOMK
     04324    204700                   LAC ACCOMK         /GENERATE NEXT
     04325    744002                   STL
     04326    740020                   RAR                /SET OF
     04327    044700                   DAC ACCOMK         /AC MQ COMPARE
     04330    204701                   LAC MQCOMK         /CONSTANTS
     04331    740020                   RAR
     04332    044701                   DAC MQCOMK
     04333    200031       LRST6L      LAC MQSTRT         /SET UP LRS
     04334    652000                   LMQ
     04335    744002                   STL
     04336    200030                   LAC ACSTRT
     04337    640501                   LRS 01
     04340    040034                   DAC ACEND
     04341    641001                   LACS
     04342    040037                   DAC SCEND          /FOR TYPEOUTS
     04343    750010                   GLK
     04344    040036                   DAC LKEND          /FOR TYPEOUTS
     04345    641002                   LACQ
     04346    040035                   DAC MQEND
     04347    544701                   SAD MQCOMK         /MQ SHIFT OK?
     04350    741000                   SKP
     04351    604355                   JMP .+4
     04352    204700                   LAC ACCOMK
     04353    540034                   SAD ACEND          /AC SHIFT OK?
     04354    741000                   SKP
     04355    104630                   JMS LRSERR
     04356    100040                   JMS SWITCH
     04357    004333                   LRST6L
     04360    200030                   LAC ACSTRT
     04361    744002                   STL
     04362    740020                   RAR
     04363    040030                   DAC ACSTRT
     04364    200031                   LAC MQSTRT
     04365    740020                   RAR
     04366    040031                   DAC MQSTRT
     04367    741400                   SZL                /SHIFTED TILL MQ17=0
     04370    604324                   JMP LRST6L-7
     04371    100060                   JMS SWTCHS
     04372    004313                   LRSTS6
                           /
                                       .EJECT
```

```
                                /WILL AC MQ SHIFT A 1 BIT
                                /RIGHT TO 44 PLACES
                                /
        04373   140031          LRSTS7      DZM MQSTRT
        04374   140032                      DZM LKSTRT
        04375   201342                      LAC BIT17
        04376   040033                      DAC SCSTRT
        04377   201321                      LAC BIT0
        04400   040030                      DAC ACSTRT
        04401   044700                      DAC ACCOMK
        04402   144701                      DZM MQCOMK
        04403   204337                      LAC LRST6L+4        /LRS 01
        04404   044417                      DAC LRST7E          /FOR EXECUTE
        04405   204700          LRST7L      LAC ACCOMK
        04406   744020                      CLL!RAR             /GENERATE AC/MQ
        04407   044700                      DAC ACCOMK                    /COMPARE CONSTANTS
        04410   204701                      LAC MQCOMK
        04411   740020                      RAR
        04412   044701                      DAC MQCOMK
        04413   200031                      LAC MQSTRT          /SET UP LRS
        04414   652000                      LMQ
        04415   744000                      CLL
        04416   200030                      LAC ACSTRT
        04417   640501          LRST7E      LRS 01              /1 TO 44 PLACES
        04420   040034                      DAC ACEND
        04421   750010                      GLK
        04422   040036                      DAC LKEND
        04423   641001                      LACS
        04424   040037                      DAC SCEND
        04425   641002                      LACQ
        04426   040035                      DAC MQEND
        04427   544701                      SAD MQCOMK          /MQ SHIFT OK?
        04430   741000                      SKP
        04431   604435                      JMP .+4
        04432   204700                      LAC ACCOMK
        04433   540034                      SAD ACEND           /AC END OK?
        04434   741000                      SKP
        04435   104602                      JMS LRSER1
        04436   100040                      JMS SWITCH
        04437   004413                      LRST7E-4
        04440   444417                      ISZ LRST7E          /INCREMENT SHIFT COUNT
        04441   440033                      ISZ SCSTRT          /FOR TYPEOUTS
        04442   201313                      LAC FOUR5
        04443   540033                      SAD SCSTRT          /SHIFTED 44 PLACES?
        04444   741000                      SKP                 /YES
        04445   604405                      JMP LRST7L
        04446   100060                      JMS SWTCHS
        04447   004373                      LRSTS7
                                /
                                            .EJECT
```

```
                               /WILL AC MQ SHIFT A NO BIT RIGHT
                               /1 TO 44 PLACES
                               /
         04450   750001        LRSTS8    CLC
         04451   040031                  DAC MQSTRT                   /MQ START = 1'S
         04452   044701                  DAC MQCOMK
         04453   201343                  LAC NBIT0          /AC START BIT 0=0
         04454   040030                  DAC ACSTRT
         04455   044700                  DAC ACCOMK
         04456   201342                  LAC BIT17
         04457   040033                  DAC SCSTRT
         04460   040032                  DAC LKSTRT
         04461   204337                  LAC LRST6L+4                 /LRS 01
         04462   044476                  DAC LRST8E         /FOR EXECUTE
         04463   204700        LRST8L    LAC ACCOMK                   /GENERATE
         04464   744002                  STL
         04465   740020                  RAR                /NEXT
         04466   044700                  DAC ACCOMK         /COMPARE CONSTANTS
         04467   204701                  LAC MQCOMK
         04470   740020                  RAR
         04471   044701                  DAC MQCOMK
         04472   200031                  LAC MQSTRT         /SET UP LRS
         04473   652000                  LMQ
         04474   200030                  LAC ACSTRT
         04475   744002                  STL
         04476   640501        LRST8E    LRS 01             /1 TO 44 PLACES
         04477   040034                  DAC ACEND
         04500   750010                  GLK
         04501   040036                  DAC LKEND
         04502   641001                  LACS
         04503   040037                  DAC SCEND
         04504   641002                  LACQ
         04505   040035                  DAC MQEND
         04506   544701                  SAD MQCOMK         /MQ SHIFT OK?
         04507   741000                  SKP
         04510   604514                  JMP .+4
         04511   204700                  LAC ACCOMK
         04512   540034                  SAD ACEND          /AC SHIFT OK?
         04513   741000                  SKP
         04514   104652                  JMS LRSER1
         04515   100040                  JMS SWITCH
         04516   004472                  LRST8E-4
         04517   444476                  ISZ LRST8E         /ADVANCE SHIFT
         04520   440033                  ISZ SCSTRT         /COUNT
         04521   201313                  LAC FOURS
         04522   540033                  SAD SCSTRT         /SHIFTED 44 PLACES
         04523   741000                  SKP
         04524   604463                  JMP LRST8L
         04525   100060                  JMS SWTCHS
         04526   004450                  LRSTS8
                               /
                                         .EJECT
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                                /WILL MQ SHIFT LEFT 1
                                /EVERY COMBINATION OF BITS
        04527   140031          LLSSEQ    DZM MQSTRT          /AC AND MQ WILL
        04530   140030                    DZM ACSTRT          /ALWAYS BE =
        04531   201342                    LAC BIT17
        04532   040033                    DAC SCSTRT          /SHIFT IS ALWAYS 1
        04533   140032                    DZM LKSTRT
        04534   200031                    LAC MQSTRT
        04535   660000                    EAE+20000
        04536   740010                    RAL
        04537   044700                    DAC ACCOMK                    /AC SHOULD
        04540   044701                    DAC MQCOMK                    /=MQ
        04541   200031                    LAC MQSTRT
        04542   652000                    LMQ
        04543   660601                    LLSS 01
        04544   040034                    DAC ACEND
        04545   641001                    LACS
        04546   040037                    DAC SCEND
        04547   750010                    GLK
        04550   040036                    DAC LKEND
        04551   641002                    LACQ
        04552   040035                    DAC MQEND /MQ AND
        04553   540034                    SAD ACEND /AC SHIFT OK
        04554   741000                    SKP
        04555   103770                    JMS LLSSER
        04556   100040                    JMS SWITCH
        04557   004534                    LLSSEQ+5
        04560   440030                    ISZ ACSTRT
        04561   740000                    NOP
        04562   440031                    ISZ MQSTRT
        04563   604534                    JMP LLSSEQ+5
        04564   100060                    JMS SWTCHS
        04565   004527                    LLSSEQ
                                /
                                          .EJECT
                                /WILL MQ SHIFT RIGHT 1 EVERY
                                /COMBINATION OF BITS
        04566   140030          LRSSEQ   DZM ACSTRT          /AC AND MQ
        04567   140031                   DZM MQSTRT          /ALWAYS =
        04570   201342                   LAC BIT17
        04571   040033                   DAC SCSTRT          /ALWAYS SHIFT OF 1
        04572   200030                   LAC ACSTRT
        04573   501342                   AND BIT17
        04574   040032                   DAC LKSTRT          /LINK = AC 17
        04575   740020                   RAR       /SO THAT AC WILL = MQ
        04576   200031                   LAC MQSTRT
        04577   740020                   RAR
        04600   044701                   DAC MQCOMK          /AC AND MQ
        04601   044700                   DAC ACCOMK          /SHOULD BE =
        04602   740010                   RAL
        04603   652000                   LMQ
        04604   640501                   LRS 01
        04605   040034                   DAC ACEND
        04606   641001                   LACS
        04607   040037                   DAC SCEND
        04610   750010                   GLK
        04611   040036                   DAC LKEND
        04612   641002                   LACQ
        04613   040035                   DAC MQEND
        04614   540034                   SAD ACEND /AC AND MQ R 1 OK
        04615   741000                   SKP
        04616   104652                   JMS LRSER1
        04617   100040                   JMS SWITCH
        04620   004572                   LRSSEQ+4
        04621   440030                   ISZ ACSTRT
        04622   740000                   NOP
        04623   440031                   ISZ MQSTRT          /ALL COMBINATIONS
        04624   604572                   JMP LRSSEQ+4
        04625   100060                   JMS SWTCHS
        04626   004566                   LRSSEQ
        04627   603267                   JMP ENDSHF
                                /
                                         .EJECT
                                /LRS COMMON ERROR TYPEOUT
                                /SHIFT OF 1
        04630   624630          LRSERR      JMP .
        04631   101134                      JMS ERROR
        04632   001563                          TYLRS
        04633   740033                      SCSTRT+740000
        04634   404630                      LRSERR+400000
        04635   001447                          HDR5
        04636   500032                      LKSTRT+500000
        04637   600030                      ACSTRT+600000
        04640   600031                      MQSTRT+600000
        04641   001457                          TYPATR
        04642   500036                      LKEND+500000
        04643   600034                      ACEND+600000
        04644   600035                      MQEND+600000
        04645   001607                          TYRES
        04646   001636                          TYLACS
        04647   740037                      SCEND+740000
        04650   000000                      0
        04651   624630                      JMP* LRSERR
                                /
                                            .EJECT
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                                /LRS COMMON ERROR TYPEOUT
                                /SHIFTS OF MORE THAN 1
        04652   604652          LRSER1  JMP .
        04653   101134                  JMS ERROR
        04654   001563                      TYLRS
        04655   740033                  SCSTRT+740000
        04656   404652                  LRSER1+400000
        04657   001447                      HDR5
        04660   500032                  LKSTRT+500000
        04661   600030                  ACSTRT+600000
        04662   600031                  MQSTRT+600000
        04663   001457                      TYPATR
        04664   001444                      SPACF4
        04665   604700                  ACCOMK+600000
        04666   604701                  MQCOMK+600000
        04667   001461                      TYCOR
        04670   500036                  LKEND+500000
        04671   600034                  ACEND+600000
        04672   600035                  MQEND+600000
        04673   001463                      TYINCO
        04674   001636                      TYLACS
        04675   740037                  SCEND+740000
        04676   000000                  0
        04677   624652                  JMP* LRSER1
        04700   000000          ACCOMK  0
        04701   000000          MQCOMK  0
        04702   000000          SCCOMK  0
                                /TAPE 5
                                /RANDOM DATA SHIFTS
                                /NORMALIZE TEST
                                /INTERRUPT TEST
                                /
        05000                           .LOC 5000
        05000   201363                  LAC NBIT16
        05001   041261                  DAC CHARK               /SET PASS K TO -3
                                /
                                /
                                /START RANDOM DATA SHIFTS
                                /LEFT 0 TO 44 PLACES
        05002   201350          RANSHF  LAC NBIT5
        05003   045535                  DAC PASSK
        05004   105522                  JMS RANGEN
        05005   040031                  DAC MQSTRT
        05006   105522                  JMS RANGEN              /GENERATE AC START
        05007   045540                  DAC SHFBUF
        05010   206507                  LAC (SHFBUF
        05011   040010                  DAC 10
        05012   341342                  TAD BIT17
        05013   040011                  DAC 11
        05014   200031                  LAC MQSTRT
        05015   652000                  LMQ
        05016   060010                  DAC* 10
        05017   205540                  LAC SHFBUF
        05020   040030                  DAC ACSTRT
        05021   660601                  LLSS 01
        05022   760010                  DAC* 10
        05023   641002                  LACQ
        05024   060010                  DAC* 10
        05025   220011        SETLLS    LAC* 11
        05026   440011                  ISZ 11
        05027   640601                  LLS 01
        05030   060010                  DAC* 10
        05031   641002                  LACQ
        05032   060010                  DAC* 10
        05033   206510                  LAC (SHFBUF+111
        05034   540010                  SAD 10            /SHIFTED 44 PLACES?
        05035   741000                  SKP
        05036   605025                  JMP SETLLS
        05037   750010                  GLK
        05040   040032                  DAC LKSTRT
        05041   140033                  DZM SCSTRT
        05042   205537                  LAC KLLSS
        05043   045057                  DAC LRANEX
        05044   206511                  LAC (SHFBUF-1
        05045   040010                  DAC 10
                              /
                                        .EJECT
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        05046   220010      LRANLP      LAC* 10
        05047   044700                  DAC ACCOMK
        05050   220010                  LAC* 10
        05051   044701                  DAC MQCOMK
        05052   200031                  LAC MQSTRT
        05053   652000                  LMQ
        05054   200032                  LAC LKSTRT
        05055   740020                  RAR
        05056   200030                  LAC ACSTRT
        05057   660600      LRANEX      LLSS                /0 TO 44 PLACES
        05060   040034                  DAC ACEND
        05061   750010                  GLK
        05062   040036                  DAC LKEND
        05063   641001                  LACS
        05064   040037                  DAC SCEND
        05065   641002                  LACQ
        05066   040035                  DAC MQEND
        05067   544701                  SAD MQCOMK          /MQ = PREDICTED?
        05070   741000                  SKP
        05071   605075                  JMP .+4
        05072   204700                  LAC ACCOMK
        05073   540034                  SAD ACEND           /AC END = PREDICTED?
        05074   741000                  SKP
        05075   103770                  JMS LLSSER
        05076   100040                  JMS SWITCH
        05077   005052                  LRANLP+4
        05100   445057                  ISZ LRANEX
        05101   440033                  ISZ SCSTRT
        05102   201313                  LAC FOURS           /SHIFTED 44 PLACES?
        05103   540033                  SAD SCSTRT
        05104   741000                  SKP
        05105   605046                  JMP LRANLP
        05106   100060                  JMS SWTCHS
        05107   005010                  RANSHF+6
        05110   445535      RLSTAY      ISZ PASSK
        05111   605004                  JMP RANSHF+2
                            /
                                        .EJECT
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```
                                /RANDOM DATA RIGHT 0 TO 44 PLACES
        05112   201350          RANRIT    LAC NBITS
        05113   045535                    DAC PASSK
        05114   105522                    JMS RANGEN           /GENERATE MQ START
        05115   040031                    DAC MQSTRT
        05116   105522                    JMS RANGEN           /GENERATE ACSTRT
        05117   040030                    DAC ACSTRT
        05120   206512                    LAC (SHFBUF-1
        05121   040010                    DAC 10
        05122   040011                    DAC 11
        05123   200030                    LAC ACSTRT
        05124   060010                    DAC* 10
        05125   200031                    LAC MQSTRT
        05126   060010                    DAC* 10
        05127   652000                    LMQ
        05130   744000                    CLL
        05131   220011          SETLRS    LAC* 11
        05132   440011                    ISZ 11               /GENERATE AC MQ
        05133   640501                    LRS 01
        05134   060010                    DAC* 10              /COMPARE CONSTANTS
        05135   641002                    LACQ
        05136   060010                    DAC* 10
        05137   206513                    LAC (SHFBUF+111
        05140   540010                    SAD 10
        05141   741000                    SKP
        05142   605131                    JMP SETLRS
        05143   205536                    LAC KLRS
        05144   045161                    DAC RRANEX
        05145   140032                    DZM LKSTRT
        05146   140033                    DZM SCSTRT
        05147   206514                    LAC (SHFBUF-1
        05150   040010                    DAC 10
        05151   220010          RRANLP    LAC* 10
        05152   044700                    DAC ACCOMK
        05153   220010                    LAC* 10
        05154   044701                    DAC MQCOMK
        05155   200031                    LAC MQSTRT
        05156   652000                    LMQ
        05157   200030                    LAC ACSTRT
        05160   744000                    CLL
        05161   640500          RRANEX    LRS 0                /0 TO 44 PLACES
        05162   040034                    DAC ACEND
        05163   750010                    GLK
        05164   040036                    DAC LKEND
        05165   641001                    LACS
        05166   040037                    DAC SCEND
        05167   641002                    LACQ
        05170   040035                    DAC MQEND
        05171   544701                    SAD MQCOMK
        05172   741000                    SKP
        05173   605177                    JMP .+4
        05174   204700                    LAC ACCOMK
        05175   540034                    SAD ACEND
        05176   741000                    SKP
        05177   104652                    JMS LRSER1
        05200   100040                  JMS SWITCH
                               /        .EJECT
```

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        05201   205155                  RRANEX-4
        05202   445161                  ISZ RRANEX
        05203   440033                  ISZ SCSTRT
        05204   201313                  LAC FOURS
        05205   540033                  SAD SCSTRT
        05206   741000                  SKP
        05207   605151                  JMP RRANLP
        05210   100060                  JMS SWTCHS
        05211   005120                  RANRIT+6
        05212   445535          RRSTAY  ISZ PASSK
        05213   605114                  JMP RANRIT+2
                                /
                                        .EJECT
                                /RANDOM DATA SEQUENCED
                                /
        05214   201350          RANSEQ  LAC NBIT5
        05215   045535                  DAC PASSK
        05216   105522                  JMS RANGEN
        05217   040030                  DAC ACSTRT
        05220   661000                  EAE!21000       /GET AC SIGN CLR AC
        05221   750010                  GLK
        05222   045446                  DAC SVSIGN
        05223   742020                  RTR
        05224   045447                  DAC SVSIGN+1
        05225   105522                  JMS RANGEN
        05226   501364                  AND NBIT17      /MAKE MQ17=AC0
        05227   345446                  TAD SVSIGN
        05230   040031                  DAC MQSTRT
        05231   201364                  LAC NBIT17
        05232   045450                  DAC SVMASK
        05233   201343                  LAC NBIT0
        05234   045451                  DAC SVMASK+1
        05235   140033                  DZM SCSTRT
        05236   140032                  DZM LKSTRT
        05237   200031          RANSQ0  LAC MQSTRT      /SEQUENCE 0
        05240   652000                  LMQ
        05241   744000                  CLL
        05242   200030                  LAC ACSTRT
        05243   660601                  LLSS 1
        05244   640502                  LRS 2
        05245   660602                  LLSS 2
        05246   640501                  LRS 1
        05247   105452                  JMS SEQCOM
        05250   100040                  JMS SWITCH
        05251   005237                  RANSQ0
        05252   105417                  JMS NXTSEQ
                                /
                                        .EJECT
```

```
                          /SEQUENCE 1
                          /RIGHT 2, L4, R4, L2
                          /
05253   200031            RANSQ1      LAC MQSTRT          /SEQUENCE 1 R2, L4, R4, L2
05254   744000                        CLL
05255   652000                        LMQ                 /SET UP
05256   200030                        LAC ACSTRT
05257   660502                        LRSS+2
05260   660604                        LLSS+4
05261   640504                        LRS+4
05262   660602                        LLSS+2
05263   105452                        JMS SEQCOM          /COMPARE RESULTS
05264   100040                        JMS SWITCH
05265   005253                            RANSQ1
05266   105417                        JMS NXTSEQ
                          /LEFT 3, RIGHT 6, LEFT 6, RIGHT 3
                          /SEQUENCE 2
05267   200031            RANSQ2      LAC MQSTRT
05270   652000                        LMQ
05271   744000                        CLL
05272   200030                        LAC ACSTRT
05273   660603                        LLSS+3
05274   640506                        LRS+6
05275   660606                        LLSS+6
05276   640503                        LRS+3
05277   105452                        JMS SEQCOM
05300   100040                        JMS SWITCH
05301   005267                            RANSQ2
05302   105417                        JMS NXTSEQ
                          /
                                      .EJECT
```

```
                                /SEQUENCE 3
                                /RIGHT 4, LEFT 8, RIGHT 8, LEFT 4
                                /
        05303   200031          RANSQ3     LAC MQSTRT
        05304   744000                     CLL
        05305   652000                     LMQ
        05306   200030                     LAC ACSTRT
        05307   660504                     LRSS+4
        05310   660610                     LLSS+10
        05311   640510                     LRS+10
        05312   660604                     LLSS+4
        05313   105452                     JMS SEQCOM
        05314   100040                     JMS SWITCH
        05315   005303                     RANSQ3
        05316   105417                     JMS NXTSEQ
                                /
                                /
                                /SEQUENCE 4  LEFT 5, RIGHT 10, LEFT 10, RIGHT 5
                                /
        05317   200031          RANSQ4     LAC MQSTRT
        05320   744000                     CLL
        05321   652000                     LMQ
        05322   200030                     LAC ACSTRT
        05323   660605                     LLSS+5
        05324   640512                     LRS+12
        05325   660612                     LLSS+12
        05326   640505                     LRS+5
        05327   105452                     JMS SEQCOM
        05330   100040                     JMS SWITCH
        05331   005317                     RANSQ4
        05332   105417                     JMS NXTSEQ
                                /
                                           .EJECT
                                /SEQUENCE 5  RIGHT 6, LEFT 12, RIGHT 12, LEFT 6
                                /
        05333   200031          RANSQ5      LAC MQSTRT
        05334   652000                      LMQ
        05335   744000                      CLL
        05336   200030                      LAC ACSTRT
        05337   660506                      LRSS+6
        05340   660614                      LLSS+14
        05341   640514                      LRS+14
        05342   660606                      LLSS+6
        05343   105452                      JMS SEQCOM
        05344   100040                      JMS SWITCH
        05345   005333                          RANSQ5
        05346   105417                      JMS NXTSEQ
                                /
                                /
                                /SEQUENCE 6  LEFT 7 RIGHT 14, LEFT 14, RIGHT 7
                                /
        05347   200031          RANSQ6      LAC MQSTRT
        05350   652000                      LMQ
        05351   744000                      CLL
        05352   200030                      LAC ACSTRT
        05353   660607                      LLSS+7
        05354   640516                      LRS+16
        05355   660616                      LLSS+16
        05356   640507                      LRS+7
        05357   105452                      JMS SEQCOM
        05360   100040                      JMS SWITCH
        05361   005347                          RANSQ6
        05362   105417                      JMS NXTSEQ
                                /
                                            .EJECT
```

```
                          /SEQUENCE 7  RIGHT 8, LEFT 16, RIGHT 16, LEFT 8
                          /
        05363   200031    RANSQ7    LAC MQSTRT
        05364   652000              LMQ
        05365   200030              LAC ACSTRT
        05366   744000              CLL
        05367   660510              LRSS+10
        05370   660620              LLSS+20
        05371   640520              LRS+20
        05372   660610              LLSS+10
        05373   105452              JMS SEQCOM
        05374   100040              JMS SWITCH
        05375   005363                  RANSQ7
        05376   105417              JMS NXTSEQ
                          /
                          /
                          /SEQUENCE 8  LEFT 9, RIGHT 18, LEFT 18, RIGHT 9
                          /
        05377   200031    RANSQ8    LAC MQSTRT
        05400   652000              LMQ
        05401   200030              LAC ACSTRT
        05402   744000              CLL
        05403   660611              LLSS+11
        05404   640522              LRS+22
        05405   660622              LLSS+22
        05406   640511              LRS+11
        05407   105452              JMS SEQCOM
        05410   100040              JMS SWITCH
        05411   005377                  RANSQ8
        05412   445535              ISZ PASSK
        05413   605216              JMP RANSEQ+2
        05414   100060              JMS SWTCHS
        05415   005214                  RANSEQ
        05416   605652              JMP NRMLZE
                          /
                                    .EJECT
```

```
                        /SET AC SIGN INTO NEXT AC
                        /AND MQ BITS
                        /
05417   605417          NXTSEQ    JMP .
05420   205446                    LAC SVSIGN
05421   744010                    CLL!RAL
05422   045446                    DAC SVSIGN          /TO FILL MQ
05423   205447                    LAC SVSIGN+1
05424   744020                    CLL!RAR
05425   045447                    DAC SVSIGN+1
05426   205450                    LAC SVMASK
05427   744002                    STL
05430   740010                    RAL
05431   045450                    DAC SVMASK
05432   500031                    AND MQSTRT          /CLR MQ BIT
05433   345446                    TAD SVSIGN          /MAKE MQ = AC 0
05434   040031                    DAC MQSTRT
05435   205451                    LAC SVMASK+1
05436   744002                    STL
05437   740020                    RAR
05440   045451                    DAC SVMASK+1
05441   500030                    AND ACSTRT          /CLR AC BIT
05442   345447                    TAD SVSIGN+1        /MAKE ACX = AC 0
05443   040030                    DAC ACSTRT
05444   440033                    ISZ SCSTRT          /INDICATE NEXT SEQUENCE
05445   625417                    JMP* NXTSEQ
05446   000000          SVSIGN    0
05447   000000                    0
05450   000000          SVMASK    0
05451   000000                    0
                        /
                                  .EJECT
```

```
                                   /RANDOM DATA SEQUENCED
                                   /COMMON COMPARE AND ERROR TYPE
                                   /
        05452    605452            SEQCOM     JMP .
        05453    240034                       DAC ACEND
        05454    750010                       GLK
        05455    040036                       DAC LKEND
        05456    641001                       LACS
        05457    040037                       DAC SCEND
        05460    641002                       LACQ
        05461    040035                       DAC MQEND
        05462    540031                       SAD MQSTRT          /MQ SAME AS START
        05463    741000                       SKP
        05464    605467                       JMP .+3             /ERROR MQ
        05465    200037                       LAC SCEND
        05466    740200                       SZA
        05467    605473                       JMP .+4             /ERROR SC
        05470    200030                       LAC ACSTRT
        05471    540034                       SAD ACEND
        05472    741000                       SKP
        05473    605500                       JMP .+5             /ERROR AC
        05474    661000                       EAE!21000           /GET AC SIGN CLR AC
        05475    750010                       GLK
        05476    540036                       SAD LKEND           /LINK END = AC SIGN?
        05477    625452                       JMP* SEQCOM         /ALL OK - EXIT
        05500    101134                       JMS ERROR
        05501    001577                           TYRDSQ
        05502    001442                           SPACE3
        05503    740033                       SCSTRT+740000
        05504    405452                       SEQCOM+400000
        05505    001447                           HDR5
        05506    500032                       LKSTRT+500000
        05507    600030                       ACSTRT+600000
        05510    600031                       MQSTRT+600000
        05511    001512                           TYSTRT
        05512    500036                       LKEND+500000
        05513    600034                       ACEND+600000
        05514    600035                       MQEND+600000
        05515    001607                           TYRES
        05516    001636                           TYLACS
        05517    740037                       SCEND+740000
        05520    000000                       0
        05521    625452                       JMP* SEQCOM         /ERROR EXIT
                                   /
                                              .EJECT
```

```
                        /RANDOM NUMBER GENERATOR
                        /18 BIT
05522   605522          RANGEN      JMP .
05523   205533                      LAC RANNO
05524   744020                      CLL!RAR
05525   741400                      SZL
05526   241321                      XOR BIT0
05527   245534                      XOR RANNO+1
05530   305534                      ADD RANNO+1
05531   045533                      DAC RANNO
05532   625522                      JMP* RANGEN
05533   736425          RANNO       736425
05534   335671                      335671
05535   000000          PASSK       0
05536   640500          KLRS        LRS
05537   660600          KLLSS       LLSS
                        /
                        /
05540   000000          SHFBUF      0
05652                               .LOC SHFBUF+112
                        /
                        /
                        /NORMALIZE TEST
                        /DOES NORMS GET AC 0 = 0 TO L
                        /
05652   140031          NRMLZE      DZM MQSTRT
05653   140033                      DZM SCSTRT
05654   201322                      LAC BIT1
05655   040030                      DAC ACSTRT
05656   140032                      DZM LKSTRT
05657   200032                      LAC LKSTRT          /START SCOPE LOOP
05660   740020                      RAR
05661   650000                      CLQ
05662   200030                      LAC ACSTRT
05663   660400                      NORMS-44            /SC = 0
05664   641002                      LACQ
05665   040035                      DAC MQEND           /SAVE RESULTS
05666   641001                      LACS
05667   040037                      DAC SCEND
05670   750010                      GLK
05671   144702                      DZM SCCOMK
05672   040036                      DAC LKEND
05673   740200                      SZA                 /AC SIGN IS 0
05674   106242                      JMS NORMSE
05675   100040                      JMS SWITCH          /END SCOPE LOOP
05676   005657                      NRMLZE+5
05677   200032                      LAC LKSTRT
05700   440032                      ISZ LKSTRT
05701   741200                      SNA
05702   605657                      JMP NRMLZE+5
                        /
                                    .EJECT
```

```
                                  /DOES NORMS GET AC0=1 TO L
        05703    750001           NRMLZ1     CLC
        05704    040031                      DAC MQSTRT
        05705    140033                      DZM SCSTRT
        05706    140032                      DZM LKSTRT
        05707    750001                      CLC
        05710    040030                      DAC ACSTRT
        05711    200032                      LAC LKSTRT          /START SCOPE LOOP
        05712    740020                      RAR
        05713    200030                      LAC ACSTRT
        05714    650004                      CLQ+4               /SET MQ = 1'S
        05715    660400                      NORMS-44
        05716    040034                      DAC ACEND
        05717    641002                      LACQ
        05720    040035                      DAC MQEND
        05721    641001                      LACS
        05722    040037                      DAC SCEND
        05723    750010                      GLK
        05724    144702                      DZM SCCOMK
        05725    040036                      DAC LKEND
        05726    741200                      SNA
        05727    106242                      JMS NORMSE
        05730    100040                      JMS SWITCH          /END SCOPE LOOP
        05731    005711                      NRMLZ1+6
        05732    200032                      LAC LKSTRT
        05733    440032                      ISZ LKSTRT
        05734    741200                      SNA
        05735    605711                      JMP NRMLZ1+6
                                  /
                                             .EJECT
```

```
                                    /WILL NORM STOP SHIFT WITH
                                    /AC 0 AND AC 1 UNEQUAL?  01, 10
                                    /
     05736    140031                NRML22     DZM MQSTRT
     05737    140032                           DZM LKSTRT
     05740    201274                           LAC SEVSEV
     05741    044702                           DAC SCCOMK
     05742    201322                           LAC BIT1
     05743    040030                           DAC ACSTRT
     05744    201342                           LAC BIT17
     05745    040033                           DAC SCSTRT
     05746    200031                           LAC MQSTRT            /START SCOPE LOOP
     05747    652000                           LMQ
     05750    744000                           CLL
     05751    200030                           LAC ACSTRT            /SET UP COMPLETE
     05752    640401                           NORM=43                         /SC = 1
     05753    040034                           DAC ACEND
     05754    641002                           LACQ
     05755    040035                           DAC MQEND             /SAVE RESULTS
     05756    750010                           GLK
     05757    040036                           DAC LKEND
     05760    641001                           LACS
     05761    040037                           DAC SCEND
     05762    541274                           SAD SEVSEV            /SC = -17
     05763    741000                           SKP
     05764    106214                           JMS NORMER
     05765    100040                           JMS SWITCH            /END SCOPE LOOP
     05766    005746                           NRML22+10
     05767    200030                           LAC ACSTRT
     05770    740001                           CMA
     05771    040030                           DAC ACSTRT
     05772    200031                           LAC MQSTRT
     05773    740001                           CMA
     05774    040031                           DAC MQSTRT
     05775    740200                           SZA
     05776    605746                           JMP NRML22+10
                                    /
                                               .EJECT
```

```
                                 /DOES NORM NOT STOP SHIFT
                                 /ON AC 0 = AC1  00, 11,
                                 /
        05777    140031          NRML23      DZM MQSTRT
        06000    140032                      DZM LKSTRT
        06001    201341                      LAC BIT16          / NORMALIZE SC = 2
        06002    040033                      DAC SCSTRT
        06003    201274                      LAC SEVSEV
        06004    044702                      DAC SCCOMK
        06005    201323                      LAC BIT2
        06006    040030                      DAC ACSTRT
        06007    200031                      LAC MQSTRT         /START SCOPE LOOP
        06010    652000                      LMQ
        06011    744000                      CLL
        06012    200030                      LAC ACSTRT         /COMPLETE SET UP
        06013    660402                      NORMS-42           /SC = 2
        06014    040034                      DAC ACEND
        06015    641001                      LACS
        06016    040037                      DAC SCEND          /SAVE RESULTS
        06017    750010                      GLK
        06020    040036                      DAC LKEND
        06021    641002                      LACQ
        06022    040035                      DAC MQEND
        06023    741100                      SPA
        06024    740001                      CMA                /MQ = ALL 0'S OR ALL 1'S
        06025    740200                      SZA
        06026    606034                      JMP .+6            /ERROR IN MQ
        06027    200034                      LAC ACEND
        06030    741100                      SPA                /AC NEGATIVE?
        06031    740001                      CMA                /MAKE POSITIVE
        06032    541322                      SAD BIT1           /AC NORMALIZE CORRECT?
        06033    741000                      SKP
        06034    606040                      JMP .+4            /AC IN ERROR
        06035    200037                      LAC SCEND
        06036    541274                      SAD SEVSEV         /SC = -1?
        06037    741000                      SKP
        06040    106242                      JMS NORMSE
        06041    100040                      JMS SWITCH         /END SCOPE LOOP
        06042    005660                      NRMLZE+6
        06043    200030                      LAC ACSTRT
        06044    740001                      CMA
        06045    040030                      DAC ACSTRT
        06046    200031                      LAC MQSTRT
        06047    740001                      CMA
        06050    040031                      DAC MQSTRT
        06051    740200                      SZA
        06052    606007                      JMP NRML23+10
                                 /
                                             .EJECT
```

```
                          /WILL NORMALIZE NORMALIZE A POSITIVE
                          /NUMBER WITH A 1 FROM AC BIT 1 TO AC 17 WITH SC=44 AT START
                          /AND A NEGATIVE NUMBER  WITH A0 IN AC BIT 1
                          /TO AC1
                          /AC = MQ AT NORMS START.
                          /AC & MQ SHOULD EQUAL
                          /200000 OR 577777 AT END.
        06053   140032    NRMLZ4     DZM LKSTRT
        06054   201314               LAC FOUR4
        06055   040033               DAC SCSTRT
        06056   201322               LAC BIT1
        06057   040030               DAC ACSTRT
        06060   040031               DAC MQSTRT
        06061   201316    NR4A       LAC THREE4
        06062   044702               DAC SCCOMK          /TO COMPARE SC
        06063   200031    NR4B       LAC MQSTRT          /SCOPE LOOP START
        06064   652000               LMQ
        06065   744000               CLL
        06066   200030               LAC ACSTRT          /SET UP COMPLETE
        06067   660444               NORMS               /SC = 44
        06070   040034               DAC ACEND
        06071   641002               LACQ
        06072   040035               DAC MQEND /SAVE RESULTS
        06073   750010               GLK
        06074   040036               DAC LKEND
        06075   641001               LACS
        06076   040037               DAC SCEND
        06077   544702               SAD SCCOMK
        06100   741000               SKP
        06101   606115               JMP NR4C  /SC, ERROR
        06102   200034               LAC ACEND
        06103   741100               SPA
        06104   740001               CMA
        06105   541322               SAD BIT1  /AC SHOULD BE = 20000.
        06106   741000               SKP
        06107   606115               JMP NR4C
        06110   200035               LAC MQEND
        06111   741100               SPA
        06112   740001               CMA
        06113   541322               SAD BIT1  /MQ SHOULD BE = 200000
        06114   741000               SKP
        06115   106242    NR4C       JMS NORMSE
        06116   100040               JMS SWITCH
        06117   006063               NR4B
        06120   200031               LAC MQSTRT
        06121   652000               LMQ
        06122   744000               CLL
        06123   200030               LAC ACSTRT          /SHIFT AC & MQ
        06124   444702               ISZ SCCOMK          /WHEN AC NOT EQUAL MQ
        06125   660501               LRSS+1
        06126   040030               DAC ACSTRT          /CHANGE SIGNS
        06127   641002               LACQ
        06130   040031               DAC MQSTRT
        06131   540030               SAD ACSTRT          /AC AND MQ STILL EQUAL
        06132   606063               JMP NR4B  /DO, AGAIN.
        06133   740100              SMA                  /DONE ALL NEGATIVES YET,
        06134   606141              JMP NRML#5           /YES, DO NEXT TEST.
        06135   201344              LAC NBIT1 /2ND SERIES, POSITIVES DONE, DO NEGATIVES.
        06136   040030              DAC ACSTRT           /NEGATIVE NUMBERS
        06137   040031              DAC MQSTRT
        06140   606061              JMP NR4A
                             /
                                    .EJECT
```

```
                                /WILL A COMPLEMENT BIT PATTERN NORMALIZE
                                /MQ = 252525 AND 525252 AC = 0'S OR 1'S
                                /
06141   140030                  NRMLZ5     DZM ACSTRT
06142   201320                             LAC COMBIT          /252525 PATTERN
06143   040031                             DAC MQSTRT
06144   201314                             LAC FOUR4
06145   040033                             DAC SCSTRT
06146   140032                             DZM LKSTRT
06147   200031                             LAC MQSTRT          /SCOPE LOOP START
06150   652000                             LMQ
06151   744000                             CLL
06152   200030                             LAC ACSTRT
06153   660444                             NORMS
06154   040034                             DAC ACEND
06155   641001                             LACS
06156   040037                             DAC SCEND
06157   750010                             GLK
06160   040036                             DAC LKEND
06161   641002                             LACQ
06162   040035                             DAC MQEND
06163   741100                             SPA
06164   740001                             CMA
06165   740200                             SZA
06166   606172                             JMP .+4
06167   200034                             LAC ACEND           /ACEND SHOULD
06170   540031                             SAD MQSTRT          /= MQSTRT
06171   741000                             SKP
06172   606177                             JMP .+5             /AC ERROR
06173   201317                             LAC FIVE6
06174   044702                             DAC SCCOMK
06175   540037                             SAD SCEND /SC INDICATE SHIFT 18
06176   741000                             SKP
06177   106242                             JMS NORMSE
06200   100040                             JMS SWITCH          /END SCOPE LOOP
06201   006147                             NRMLZ5+6
06202   750001                             CLC
06203   040030                             DAC ACSTRT
06204   200031                             LAC MQSTRT
06205   740001                             CMA
06206   040031                             DAC MQSTRT
06207   741100                             SPA
06210   606147                             JMP NRMLZ5+6
06211   100060                             JMS SWTCHS          /TEST REPEAT SEQUENCE
06212   005652                                 NRMLZE
06213   606270                             JMP INTEST          /GO TO INTERRUPT TEST
                                /
                                           .EJECT
                                /NORMALIZE ERROR TYPEOUTS
                                /
      06214   606214            NORMER    JMP .
      06215   101134                      JMS ERROR
      06216   001646                          TYNORM
      06217   740033                      SCSTRT+740000
      06220   406214                      NORMER+400000       /ERROR ADDRESS
      06221   001447                          HDR5
      06222   500032                      LKSTRT+500000
      06223   600030                      ACSTRT+600000
      06224   600031                      MQSTRT+600000
      06225   001457                          TYPATR
      06226   500036                      LKEND+500000
      06227   600034                      ACEND+600000
      06230   600035                      MQEND+600000
      06231   001607                          TYRES
      06232   001636                          TYLACS
      06233   744702                      SCCOMK+740000
      06234   001461                          TYCOR
      06235   001636                          TYLACS
      06236   740037                      SCEND+740000
      06237   001607                          TYRES
      06240   000000                      0
      06241   626214                      JMP* NORMER
                                /
                                /
                                /NORMALIZE SIGNED ERROR TYPEOUTS
                                /
      06242   606242            NORMSE    JMP .
      06243   101134                      JMS ERROR
      06244   001466                          TYNRMS
      06245   740033                      SCSTRT+740000
      06246   406242                      NORMSE+400000
      06247   001447                          HDR5
      06250   500032                      LKSTRT+500000
      06251   600030                      ACSTRT+600000
      06252   600031                      MQSTRT+600000
      06253   001457                          TYPATR
      06254   500036                      LKEND+500000
      06255   600034                      ACEND+600000
      06256   600035                      MQEND+600000
      06257   001607                          TYRES
      06260   001636                          TYLACS
      06261   744702                      SCCOMK+740000
      06262   001461                          TYCOR
      06263   001636                          TYLACS
      06264   740037                      SCEND+740000
      06265   001607                          TYRES
      06266   000000                      0
      06267   626242                      JMP* NORMSE
                                /
                                          .EJECT
```

```
                                 /TEST PROGRAM INTERRUPT
                                 /AFTER EAE OPERATIONS
                                 /
        06270    700401          INTEST     TSF                         /PRINTER FLAG?
        06271    741000                     SKP                         /NO
        06272    606276                     JMP .+4
        06273    760000                     LAW 0
        06274    700406                     TLS                         /TYPE NULL
        06275    700401                     TSF                         /WAIT PRINTER FLAG
        06276    606275                     JMP .-1
        06277    206515                     LAC (JMP INTS1
        06300    040001                     DAC 1                       /LOAD INT JMP
        06301    700042                     ION
        06302    640000                     EAE
        06303    740000                     NOP
        06304    700002                     IOF                         /SHOULD NOT GET HERE
        06305    101134                     JMS ERROR
        06306    001472                         TYINTE
        06307    001514                         TYNOP
        06310    406302                     400000+.-6
        06311    000000                     0
        06312    700401          INTS1      TSF                         /WAIT IN CASE
        06313    606312                     JMP .-1                     /OF ERROR
        06314    100040                     JMS SWITCH
        06315    006301                     INTEST+11
        06316    201342                     LAC BIT17
        06317    040031                     DAC MQSTRT
        06320    140030                     DZM ACSTRT
        06321    140032                     DZM LKSTRT
        06322    201315                     LAC FOURS
        06323    040033                     DAC SCSTRT
        06324    206516                     LAC (JMP INTS2
        06325    040001                     DAC 1
        06326    200031          INTS2L     LAC MQSTRT                  /PREPARE FOR LLS
        06327    652000                     LMQ
        06330    754000                     CLA!CLL
        06331    700042                     ION
        06332    640643                     LLS+43                      /EXECUTE
        06333    740000                     NOP
        06334    700002                     IOF                         /SHOULD NOT GET HERE
        06335    101134                     JMS ERROR
        06336    001472                         TYINTE
        06337    001553                         TYLLS
        06340    740033                     SCSTRT+740000
        06341    406332                     .-7+400000
        06342    000000                     0
        06343    606401                     JMP INTS2E
                                 /
                                            .EJECT
        06344   040034          INTS2   DAC ACEND               /SAVE RESULTS
        06345   641001                  LACS
        06346   040037                  DAC SCEND
        06347   641002                  LACQ
        06350   040035                  DAC MQEND
        06351   740200                  SZA                     /MQ SHIFT OK?
        06352   606356                  JMP .+4
        06353   200034                  LAC ACEND
        06354   541321                  SAD BIT0                /AC SHIFT OK?
        06355   741000                  SKP
        06356   606362                  JMP .+4
        06357   200037                  LAC SCEND               /SC GO TO 0?
        06360   741200                  SNA
        06361   606401                  JMP INTS2E
        06362   101134                  JMS ERROR
        06363   001502                      INDAT
        06364   001553                      TYLLS
        06365   740033                  SCSTRT+740000
        06366   001447                      HDR5
        06367   500032                  LKSTRT+500000
        06370   600030                  ACSTRT+600000
        06371   600031                  MQSTRT+600000
        06372   001457                      TYPATR
        06373   500032                  LKSTRT+500000
        06374   600034                  ACEND+600000
        06375   600035                  MQEND+600000
        06376   001636                      TYLACS
        06377   740037                  SCEND+740000
        06400   000000                  0
        06401   700401          INTS2E  TSF                     /WAIT IN CASE OF
        06402   606401                  JMP .-1                 /ERROR TYPEOUT
        06403   100040                  JMS SWITCH
        06404   006326                      INTS2L
                                        .EJECT
```

```
06405   700401                  TSF                                     /TESTING INTERUPT BEING DELAYED
06406   741000                  SKP                                     /TWO INSTRUCTIONS AFTER
06407   626413                  JMP .+4                                 /NORMALIZE IS DONE.
06410   760000                  LAW 0
06411   700406                  TLS
06412   700401                  TSF                                     /HAVE FLAG ON TO CAUSE INTERUPT.
06413   606412                  JMP .-1
06414   206517          QNRM    LAC (JMP QNRM2                          /SET JUMP FOR INTERUPT.
06415   040001                  DAC 1
06416   201322                  LAC BIT1
06417   700042                  ION
06420   640444          QNRM1   NORM                                    /DO INITIALIZE
06421   440001                  ISZ 1                                   /ISZ SHOULD BE DONE BEFORE INTERUPT.
06422   440000                  ISZ 0
06423   700002                  IOF                                     /SHOULD NOT COME HERE.
06424   101134                  JMS ERROR                  /NO INTERUPT OCCURRED.
06425   001472                          TYINTE
06426   001646                          TYNORM
06427   406420                  QNRM1+400000
06430   000000                  0
06431   606440                  JMP QNRM3
06432   741000          QNRM2   SKP                                     /IF INTERUPT HAPPENS BEFORE ISZ, DO SKP.
06433   606440                  JMP QNRM3                  /OK, INTERUPT DELAYED ONE INSTRUCTION.
06434   101134                  JMS ERROR                  /NO DELAY OF INTERUPT AFTER NORMALIZE.
06435   001612                          TYQINT
06436   001646                          TYNORM
06437   406420                  QNRM1+400000
06440   700401          QNRM3   TSF                                     /WAIT FOR TYPING TO END.
06441   606440                  JMP .-1
06442   100040                  JMS SWITCH                              /CHECK LOOP
06443   006414                  QNRM
06444   100060                  JMS SWTCHS
06445   006270                  INTEST
06446   750004                  LAS
06447   501327                  AND BIT6
06450   741200                  SNA                        /TYPE AT END SET?
06451   606455                  JMP .+4
06452   760052                  LAW 52
06453   101716                  TY1
06454   441261                  ISZ CHARK
06455   606461                  JMP .+4
06456   101240                  JMS CRLF
06457   201363                  LAC NBIT16
06460   041261                  DAC CHARK
06461   750004                  LAS
06462   501326                  AND BIT5                   /CYCLE ALL TESTS
06463   741200                  SNA                        /=1?
06464   605002                  JMP RANSWF                 /NO, STAY IN RANDOMS
06465   600225                  JMP NOPAC                  /START SET UP TEST
        000000                  .END
06471   007777          *L
06472   207207          *L
06473   777700          *L
06474   151200          *L
06475   000077          *L
```

```
        06476    000040    *L
        06477    000200    *L
        06500    000300    *L
        06501    000240    *L
        06502    000007    *L
        06503    000260    *L
        06504    000215    *L
        06505    000212    *L
        06506    003244    *L
        06507    005540    *L
        06510    005651    *L
        06511    005537    *L
        06512    005537    *L
        06513    005651    *L
        06514    005537    *L
        06515    606312    *L
        06516    606344    *L
        06517    606432    *L
                                    NO ERROR LINES
```

```
ACCOMK   04700
ACEND    00034
ACLMQ    00704
ACLMQE   00732
ACONEQ   01017
ACORMQ   00641
ACSTRT   00030
ALSERR   03175
ALSLNK   02663
ALSMQT   02760
ALSZER   02604
ALSØ1    02626
BITØ     01321
BIT1     01322
BIT1Ø    01333
BIT11    01334
BIT12    01335
BIT13    01336
BIT14    01337
BIT15    01340
BIT16    01341
BIT17    01342
BIT2     01323
BIT3     01324
BIT4     01325
BIT5     01326
BIT6     01327
BIT7     01330
BIT8     01331
BIT9     01332
CHARK    01261
CLOF    700004
CLON    700044
CLSF    700001
COMBIT   01320
COMMA    03307
COMPMQ   00763
CRCODE   01465
CRLF     01240
DECONT   02047
EAEABS   01045
EAECAC   00246
EAECLQ   00264
EAERMQ   00202
EAESLK   00533
EEM     707702
ENDSHF   03267
ERCONT   01163
ERLOOP   01145
ERROR    01134
FIVE6    01317
FOUR1    01304
FOUR3    01315
FOUR4    01314
FOUR5    01313
```

```
HDR1      01366
HDR2      01375
HDR3      01411
HDR4      01427
HDR5      01447
HSALS     03114
HSALSE    03134
HSALSL    03127
INDAT     01502
INTEST    06270
INTS1     06312
INTS2     06344
INTS2E    06401
INTS2L    06326
KALL7     01365
KALS01    02732
KLLSS     05537
KLLSS1    03767
KLRS      05536
KRB      700312
KSF      700301
K18       01300
LEM      707704
LKEND     00036
LKSTRT    00032
LLSACT    03406
LLSERR    03745
LLSSEQ    04527
LLSSER    03770
LLSSEX    03617
LLSSL1    03606
LLSSL2    03671
LLSSX2    03703
LLSTS1    03310
LLSTS2    03342
LLSTS3    03465
LLSTS4    03526
LLSTS5    03575
LLSTS6    03656
LNKALS    02721
LRANEX    05057
LRANLP    05046
LRSERR    04630
LRSER1    04652
LRSSEQ    04566
LRSTS1    04016
LRSTS2    04050
LRSTS3    04122
LRSTS4    04175
LRSTS5    04236
LRSTS6    04313
LRSTS7    04373
LRSTS8    04450
LRST5L    04254
LRST6L    04333
```

```
LRST7E   Ø4417
LRST7L   Ø4405
LRST8E   Ø4476
LRST8L   Ø4463
MIN5     Ø1257
MIN6     Ø1260
MQCOMK   Ø4701
MQEND    ØØØ35
MQSTRT   ØØØ31
MQ1TAC   ØØ313
NBITØ    Ø1343
NBIT1    Ø1344
NBIT1Ø   Ø1355
NBIT11   Ø1356
NBIT12   Ø1357
NBIT13   Ø136Ø
NBIT14   Ø1361
NBIT15   Ø1362
NBIT16   Ø1363
NBIT17   Ø1364
NBIT2    Ø1345
NBIT3    Ø1346
NBIT4    Ø1347
NBIT5    Ø135Ø
NBIT6    Ø1351
NBIT7    Ø1352
NBIT8    Ø1353
NBIT9    Ø1354
NDSETU   Ø1112
NOPAC    ØØ225
NOPAC1   ØØ341
NOPLK1   ØØ577
NOPLNK   ØØ443
NOPMQ    ØØ366
NOPMQ1   ØØ414
NOPSC    Ø2225
NOPSC1   Ø2555
NORMER   Ø6214
NORMSE   Ø6242
NRMLZE   Ø5652
NRMLZ1   Ø57Ø3
NRMLZ2   Ø5736
NRMLZ3   Ø5777
NRMLZ4   Ø6Ø53
NRMLZ5   Ø6141
NR4A     Ø6Ø61
NR4B     Ø6Ø63
NR4C     Ø6115
NSNERR   Ø3Ø77
NUCT     Ø6466
NUVAL    Ø6467
NXTSEQ   Ø5417
ONESEV   Ø13Ø7
OPS     1Ø1762
OPT     1Ø1762
```

```
OTY       02107
PASSK     05535
PCF      700202
PSA      700204
PSB      700244
PSF      700201
QNRM      06414
QNRM1     06420
QNRM2     06432
QNRM3     06440
QONEAC    00510
RANGEN    05522
RANNO     05533
RANRIT    05112
RANSEQ    05214
RANSHF    05002
RANSQ0    05237
RANSQ1    05253
RANSQ2    05267
RANSQ3    05303
RANSQ4    05317
RANSQ5    05333
RANSQ6    05347
RANSQ7    05363
RANSQ8    05377
RCF      700102
RESULT    03245
RLSTAY    05110
RL6       02115
RRANEX    05161
RRANLP    05151
RRB      700112
RRSTAY    05212
RSA      700104
RSB      700144
RSF      700101
SALSRP    03244
SAVERR    01276
SCCOMK    04702
SCEND     00037
SCERR     02520
SCSTRT    00033
SCT000    02355
SCT001    02373
SCT003    02411
SCT007    02427
SCT017    02445
SCT037    02463
SCT040    02337
SCT060    02321
SCT070    02303
SCT074    02265
SCT076    02246
SCT077    02501
SCTST1    02200
```

```
SEGCOM   25452
SETLLS   05025
SETLRS   05131
SETUP    00200
SEVEN    01271
SEVFIV   01311
SEVNTY   01302
SEVN4    01303
SEVONE   01310
SEVSEV   01274
SEVSIX   01275
SGNSHF   03042
SHFBUF   05540
SIMALS   03216
SIXONE   01306
SIXTY    01301
SPAC     02022
SPACE2   02075
SPACE3   01442
SPACE4   01444
SVCHAR   01263
SVER     01277
SVMASK   05450
SVSIGN   05446
SWITCH   00040
SWTCHS   00060
TCALL    01215
TCF     700402
TCR     102101
TCTWO    01224
TDIGIT  102070
TEMY1    06470
THREE    01312
THREE4   01316
THREE7   01305
TIN     102101
TLS     700406
TOCTAL   02026
TOCT1    02035
TSF     700401
TSP     102022
TSR     101673
TWORD   102026
TWO40    01272
TWO60    01273
TYABS    01626
TYALS    01667
TYALSQ   01662
TYCLA    01517
TYCLQ    01523
TYCMQ    01527
TYCOR    01461
TYCRLF   02101
TYCSC    01632
TYDELE   01244
```

```
PAGE100     EAE-P1

TYINCO   01463
TYINTE   01472
TYLACQ   01547
TYLACS   01636
TYLLS    01553
TYLLSS   01557
TYLMQ    01622
TYLRS    01563
TYLRSS   01573
TYNOP    01514
TYNORM   01646
TYNRMS   01466
TYPATR   01457
TYPCHR   01716
TYPCON   01762
TYPCO3   02001
TYPECN   01167
TYPLS1   01656
TYPOCT   02070
TYPSAV   01755
TYPTSR   01673
TYPTYT   02013
TYQINT   01612
TYRDSQ   01577
TYRES    01607
TYRMQ    01533
TYSCER   01642
TYSIMR   01567
TYSLK    01537
TYSMQ    01543
TYSSC    01652
TYSTRT   01512
TYT     102013
TY1     101716
.EOT     00000
```

```
.EOT      00000
ACSTRT    00030
MQSTRT    00031
LKSTRT    00032
SCSTRT    00033
ACEND     00034
MQEND     00035
LKEND     00036
SCEND     00037
SWITCH    00040
SWTCHS    00060
SETUP     00200
EAERMQ    00202
NOPAC     00225
EAECAC    00246
EAECLQ    00264
MQ1TAC    00313
NOPAC1    00341
NOPMQ     00366
NOPMQ1    00414
NOPLNK    00443
QONEAC    00510
EAESLK    00533
NOPLK1    00577
ACORMQ    00641
ACLMQ     00704
ACLMQE    00732
COMPMQ    00763
ACONEQ    01017
EAEABS    01045
NOSETU    01112
ERROR     01134
ERLOOP    01145
ERCONT    01163
TYPECN    01167
TCALL     01215
TCTWO     01224
CRLF      01240
TYDELE    01244
MIN5      01257
MIN6      01260
CHARK     01261
SVCHAR    01263
SEVEN     01271
TWO40     01272
TWO60     01273
SEVSEV    01274
SEVSIX    01275
SAVERR    01276
SVER      01277
K18       01300
SIXTY     01301
SEVNTY    01302
SEVN4     01303
FOUR1     01304
```

```
THREE7    Ø13Ø5
SIXONE    Ø13Ø6
ONESEV    Ø13Ø7
SEVONE    Ø131Ø
SEVFIV    Ø1311
THREE     Ø1312
FOUR5     Ø1313
FOUR4     Ø1314
FOUR3     Ø1315
THREE4    Ø1316
FIVE6     Ø1317
COMBIT    Ø132Ø
BITØ      Ø1321
BIT1      Ø1322
BIT2      Ø1323
BIT3      Ø1324
BIT4      Ø1325
BIT5      Ø1326
BIT6      Ø1327
BIT7      Ø133Ø
BIT8      Ø1331
BIT9      Ø1332
BIT1Ø     Ø1333
BIT11     Ø1334
BIT12     Ø1335
BIT13     Ø1336
BIT14     Ø1337
BIT15     Ø134Ø
BIT16     Ø1341
BIT17     Ø1342
NBITØ     Ø1343
NBIT1     Ø1344
NBIT2     Ø1345
NBIT3     Ø1346
NBIT4     Ø1347
NBIT5     Ø135Ø
NBIT6     Ø1351
NBIT7     Ø1352
NBIT8     Ø1353
NBIT9     Ø1354
NBIT1Ø    Ø1355
NBIT11    Ø1356
NBIT12    Ø1357
NBIT13    Ø136Ø
NBIT14    Ø1361
NBIT15    Ø1362
NBIT16    Ø1363
NBIT17    Ø1364
KALL7     Ø1365
HDR1      Ø1366
HDR2      Ø1375
HDR3      Ø1411
HDR4      Ø1427
SPACE3    Ø1442
SPACE4    Ø1444
```

```
HDR5      Ø1447
TYPATR    Ø1457
TYCOR     Ø1461
TYINCO    Ø1463
CRCODE    Ø1465
TYNRMS    Ø1466
TYINTE    Ø1472
INDAT     Ø15Ø2
TYSTRT    Ø1512
TYNOP     Ø1514
TYCLA     Ø1517
TYCLQ     Ø1523
TYCMQ     Ø1527
TYRMQ     Ø1533
TYSLK     Ø1537
TYSMQ     Ø1543
TYLACQ    Ø1547
TYLLS     Ø1553
TYLLSS    Ø1557
TYLRS     Ø1563
TYSIMR    Ø1567
TYLRSS    Ø1573
TYRDSQ    Ø1577
TYRES     Ø16Ø7
TYQINT    Ø1612
TYLMQ     Ø1622
TYABS     Ø1626
TYCSC     Ø1632
TYLACS    Ø1636
TYSCER    Ø1642
TYNORM    Ø1646
TYSSC     Ø1652
TYPLS1    Ø1656
TYALSQ    Ø1662
TYALS     Ø1667
TYPTSR    Ø1673
TYPCHR    Ø1716
TYPSAV    Ø1755
TYPCON    Ø1762
TYPCO3    Ø2ØØ1
TYPTYT    Ø2Ø13
SPAC      Ø2Ø22
TOCTAL    Ø2Ø26
TOCT1     Ø2Ø35
DECONT    Ø2Ø47
TYPOCT    Ø2Ø7Ø
SPACE2    Ø2Ø75
TYCRLF    Ø21Ø1
OTY       Ø21Ø7
RL6       Ø2115
SCTST1    Ø22ØØ
NOPSC     Ø2225
SCTO76    Ø2246
SCTO74    Ø2265
SCTO7Ø    Ø23Ø3
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SCTO6Ø   Ø2321
SCTO4Ø   Ø2337
SCTOØØ   Ø2355
SCTOØ1   Ø2373
SCTOØ3   Ø2411
SCTOØ7   Ø2427
SCTO17   Ø2445
SCTO37   Ø2463
SCTO77   Ø25Ø1
SCERR    Ø252Ø
NOPSC1   Ø2555
ALSZER   Ø26Ø4
ALSØ1    Ø2626
ALSLNK   Ø2663
LNKALS   Ø2721
KALSØ1   Ø2732
ALSMQT   Ø276Ø
SGNSHF   Ø3Ø42
NSNERR   Ø3Ø77
HSALS    Ø3114
HSALSL   Ø3127
HSALSE   Ø3134
ALSERR   Ø3175
SIMALS   Ø3216
SALSRP   Ø3244
RESULT   Ø3245
ENDSHF   Ø3267
COMMA    Ø33Ø7
LLSTS1   Ø331Ø
LLSTS2   Ø3342
LLSACT   Ø34Ø6
LLSTS3   Ø3465
LLSTS4   Ø3526
LLSTS5   Ø3575
LLSSL1   Ø36Ø6
LLSSEX   Ø3617
LLSTS6   Ø3656
LLSSL2   Ø3671
LLSSX2   Ø37Ø3
LLSERR   Ø3745
KLLSS1   Ø3767
LLSSER   Ø377Ø
LRSTS1   Ø4Ø16
LRSTS2   Ø4Ø5Ø
LRSTS3   Ø4122
LRSTS4   Ø4175
LRSTS5   Ø4236
LRST5L   Ø4254
LRSTS6   Ø4313
LRST6L   Ø4333
LRSTS7   Ø4373
LRST7L   Ø44Ø5
LRST7E   Ø4417
LRSTS8   Ø445Ø
LRST8L   Ø4463
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LRSTBE   Ø4476
LLSSEQ   Ø4527
LRSSEQ   Ø4566
LRSERR   Ø463Ø
LRSER1   Ø4652
ACCOMK   Ø47ØØ
MQCOMK   Ø47Ø1
SCCOMK   Ø47Ø2
RANSHF   Ø5ØØ2
SETLLS   Ø5Ø25
LRANLP   Ø5Ø46
LRANEX   Ø5Ø57
RLSTAY   Ø511Ø
RANRIT   Ø5112
SETLRS   Ø5131
RRANLP   Ø5151
RRANEX   Ø5161
RRSTAY   Ø5212
RANSEQ   Ø5214
RANSQØ   Ø5237
RANSQ1   Ø5253
RANSQ2   Ø5267
RANSQ3   Ø53Ø3
RANSQ4   Ø5317
RANSQ5   Ø5333
RANSQ6   Ø5347
RANSQ7   Ø5363
RANSQ8   Ø5377
NXTSEQ   Ø5417
SVSIGN   Ø5446
SVMASK   Ø545Ø
SEQCOM   Ø5452
RANGEN   Ø5522
RANNO    Ø5533
PASSK    Ø5535
KLRS     Ø5536
KLLSS    Ø5537
SHFBUF   Ø554Ø
NRMLZE   Ø5652
NRMLZ1   Ø57Ø3
NRMLZ2   Ø5736
NRMLZ3   Ø5777
NRMLZ4   Ø6Ø53
NR4A     Ø6Ø61
NR4B     Ø6Ø63
NR4C     Ø6115
NRMLZ5   Ø6141
NORMER   Ø6214
NORMSE   Ø6242
INTEST   Ø627Ø
INTS1    Ø6312
INTS2L   Ø6326
INTS2    Ø6344
INTS2E   Ø64Ø1
QNRM     Ø6414
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QNRM1     Ø642Ø
QNRM2     Ø6432
QNRM3     Ø644Ø
NUCT      Ø6466
NUVAL     Ø6467
TEMY1     Ø647Ø
TSR      1Ø1673
TY1      1Ø1716
OPS      1Ø1762
OPT      1Ø1762
TYT      1Ø2Ø13
TSP      1Ø2Ø22
TWORD    1Ø2Ø26
TDIGIT   1Ø2Ø7Ø
TCR      1Ø21Ø1
TIN      1Ø21Ø1
CLSF     7ØØØØ1
CLOF     7ØØØØ4
CLON     7ØØØ44
RSF      7ØØ1Ø1
RCF      7ØØ1Ø2
RSA      7ØØ1Ø4
RRB      7ØØ112
RSB      7ØØ144
PSF      7ØØ2Ø1
PCF      7ØØ2Ø2
PSA      7ØØ2Ø4
PSB      7ØØ244
KSF      7ØØ3Ø1
KRB      7ØØ312
TSF      7ØØ4Ø1
TCF      7ØØ4Ø2
TLS      7ØØ4Ø6
EEM      7Ø77Ø2
LEM      7Ø77Ø4
```