

ACF11

DIAGNOSTIC
MD-11-DZAFA-C

EP-DZAFA-C-DL-A

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IDENTIFICATION

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ABSTRACT

THIS PROGRAM IS A DIAGNOSTIC AND EXERCISER FOR THE AFC-11 LOW LEVEL ANALOG MULTIPLEXER SYSTEM. THE PROGRAM IS COMPOSED OF FOUR SECTIONS:

AFC-11 INTERFACE LOGIC TEST
AFC-11 DATA REPEATABILITY TEST
CALIBRATION AND ADJUSTMENT ROUTINES
DATA COLLECTION ROUTINES

IT IS THE PURPOSE OF THIS DIAGNOSTIC TO EXERCISE ALL FUNCTIONS OF THE AFC-11.

2. REQUIREMENTS

2.1 EQUIPMENT

FDP-11 STANDARD COMPUTER WITH ASR-33 TELETYPE (OR EQUIVALENT).
ADJUSTABLE PRECISION VOLTAGE SOURCE, EDC MVDCS, OR EQUIVALENT.
OSCILLOSCOPE, TEXTRONIX 453 OR EQUIVALENT WITH DIRECT PROBES.
DIGITAL TEST CABLE MUST BE INSTALLED.

TRIANGLE WAVE GENERATOR, WAVETEK VCG 111, OR EQUIVALENT
(OPTIONAL - REQUIRED FOR MONOTONICITY TEST)

2.2 THE PROGRAM REQUIRES A MINIMUM OF 4K OF MEMORY, AND WILL USE UP TO 8K IF AVAILABLE.

3. LOADING PROCEDURE

THE STANDARD PROCEDURE FOR LOADING BINARY TAPES IS TO BE USED.

4.1 STARTING ADDRESS

THE STARTING ADDRESS FOR ALL TESTS IS 000200.

ALL SWITCHES ARE SET TO 0 (DOWN). THIS SETTING WILL ALLOW ERROR MESSAGES TO BE TYPED AND ALLOW THE PROGRAM TO PROCEED TO THE NEXT TEST.

4.3.1 LOAD PROGRAM INTO COMPUTER MEMORY

4.3.2 SET SWITCHES TO 000200

4.3.3 PRESS LOAD ADDRESS KEY

4.3.4 SET SWITCHES AS DESCRIBED IN 4.2

4.3.5 PRESS START KEY

4.3.6 THE PROGRAM WILL RESPOND BY TYPING

"AFC-11 DIAGNOSTIC
XXXX CHANNELS CAN BE TESTED
*A-D LENGTH:"

THE PROGRAM WILL WAIT FOR THE OPERATOR TO ENTER THE NUMBER OF DATA BITS (NOT INCLUDING SIGN) OF THE A-D CONVERTER. WHEN THIS HAS BEEN DONE, THE PROGRAM WILL TYPE "-" TO INDICATE THAT IT HAS ENTERED THE KEYBOARD MONITOR MODE

XXXX= MAXIMUM NUMBER OF CHANNELS THAT CAN BE TESTED SEQUENTIAL-
IALLY BY THE DATA REPEATABILITY TEST.

5. OPERATING PROCEDURES

S.1 TEST SELECTION

SET SWITCHES AS DESIRED FOR RUNNING TEST (SEE SECTION 6).
WITH THE PROGRAM OPERATING IN THE KEYBOARD MONITOR MODE, TEST
SELECTION IS ACCOMPLISHED BY TYPING THE NAME OF THE DESIRED TEST
FOLLOWED BY CR (CARRIAGE RETURN). TYPE 'CR' TO TERMINATE ALL
TELETYPE INPUTS.

IF AN INCORRECT NAME IS TYPED, THE PROGRAM WILL RESPOND BY TYPING A QUESTION MARK (?) AND WILL THEN RETURN TO THE KEYBOARD MONITOR, WAITING FOR A NEW NAME TO BE ENTERED.

IF A TYPING ERROR IS MADE AND DETECTED BEFORE OR IS TYPED, STRIKING THE RUBOUT KEY WILL ERASE THE PREVIOUS INPUT AND THE NAME OF THE DESIRED TEST MAY BE RETYPED.

5.2 TESTS AVAILABLE

TABLE 1 LISTS ALL VALID TEST NAMES TOGETHER WITH A BRIEF DE-

DESCRIPTION OF EACH TEST.

TABLE I

<u>TEST</u>	<u>FUNCTION</u>
LOGIC	TEST OF THE MULTIPLEXER CONTROL LOGIC AND ANALOG TO DIGITAL CONVERTER CONTROL LOGIC
REPET	ANALOG DATA REPEATABILITY TEST
AMCAL	SWITCH GAIN AMPLIFIER CALIBRATION ROUTINE
ADCAL	ANALOG TO DIGITAL CONVERTER CALIBRATION ROUTINE
PXTIM	MULTIPLEXER TIMING ADJUSTMENT ROUTINE
DATA	A SET OF ROUTINES FOR COLLECTION AND DISPLAY OF DATA ON ONE CHANNEL
MONOT	ANALOG TO DIGITAL CONVERTER MONOTONICITY TEST
DECODE	MULTIPLEXER CHANNEL ADDRESSING TEST
OLoad	AFC OVERSCALE TEST

5.3 TEST INITIALIZATION

THE FOLLOWING TESTS REQUIRE NO FURTHER KEYBOARD INPUTS AFTER THEY HAVE BEEN SELECTED: "ADCAL", "MONOT" AND "MYTIM". WHEN ANY ONE OF THESE TESTS IS SELECTED, THE PROGRAM WILL RESPOND BY TYPING R TO INDICATE THAT THE TEST IS RUNNING.

"DECOD" AND "AMCAL" REQUESTS SPECIFIC INPUT DATA AFTER THEY HAVE BEEN SELECTED. THE PROGRAM TYPES THE FOLLOWING MESSAGE:

*SYSTEM UNIT ADDRESS:

THE EXPECTED INPUT IS A NUMBER FROM 0-31 (DECIMAL), FOLLOWED BY 'CR'. ANY OTHER INPUT WILL CAUSE THE PROGRAM TO TYPE "?", AND THEN REPEAT THE INPUT REQUEST.

AFTER A CORRECT INPUT, THE PROGRAM WILL TYPE R TO INDICATE THAT THE TEST IS RUNNING.

THE FOLLOWING TESTS DO NOT REQUEST SPECIFIC DATA WHEN SELECTED. THEY WAIT FOR THE OPERATOR TO SELECT THE PARAMETER HE WISHES TO ENTER: "REPET" AND "DATA". WHEN EITHER ONE OF THESE TESTS IS SELECTED, THE PROGRAM TYPES AN ASTERISK (*) AND WAITS FOR THE OPERATOR TO SELECT A KEYBOARD OPTION.

5.3.1 KEYBOARD OPTIONS

"REPET", "OLOAD" AND "DATA" DO NOT REQUEST SPECIFIC INFORMATION FROM THE OPERATOR WHEN SELECTED. THESE ROUTINES REQUIRE THE USE OF THE "KEYBOARD OPTION" FEATURE OF THE PROGRAM TO INPUT CONTROL PARAMETERS FOR THE TEST TO BE RUN. A KEYBOARD OPTION IS SELECTED BY TYPING ONE OR TWO LETTERS FOLLOWED BY 'CR'. DEPENDING UPON THE OPTION SELECTED, THE PROGRAM WILL EITHER TYPE A DATA REQUEST, OUTPUT DATA TO THE TELETYPE, OR TYPE "R" TO INDICATE THAT A FUNCTION IS BEING PERFORMED.

IF AN INVALID OPTION IS SELECTED, THE PROGRAM WILL RESPOND BY TYPING "?", FOLLOWED BY * AND WILL WAIT FOR ANOTHER OPTION TO BE SELECTED.

TABLE 2 LISTS THE AVAILABLE OPTIONS, TOGETHER WITH THE DATA REQUEST TYPE, AND THE INPUT FORMAT REQUIRED, IF ANY.

OPTION -----	TABLE 2 MESSAGE -----	FORMAT -----
A-TYPE AVERAGE OF DATA	NONE	NONE
AD-SELECT A-D CONVERTER LENGTH	*A-D LENGTH:	XX(CR)
C-SELECT CHANNEL OR CHANNELS	*CHANNEL(S):	XXXX(CR) OR XXXX,YYYY(CR)
CC-CONTINUE TEST D-DISPLAY CHANNEL IN DATA LIGHTS	NONE NONE	NONE NONE
EM-SELECT ERROR REPORT MODE	*ERROR MODE:	X(CR)
ER-SELECT ERROR LIMIT	ERROR LIMIT:	XX(CR)
G-SELECT AMPLIFIER GAIN	*GAIN:	XXXX(CR)
H-TYPE HISTOGRAM OF DATA	NONE	NONE
I-INITIALIZE PARAMETERS	ALL REQUESTS	
L-LIST ALL DATA POINTS INDIVIDUALLY	FOR "REPET" NONE	NONE
LC-CONTINUOUSLY SAMPLE AND LIST ONE CHANNEL	NONE	NONE
N-SELECT NUMBER OF SAMPLES	*SAMPLES:	XXXX(CR)
P-TYPE ALL TEST PARAMETERS		
S*-START TEST	NONE	NONE
T-INPUT DATA	NONE	NONE
V-SELECT VERTICAL SCALE FACTOR	*VSF:	XXX(CR)
(C)CONTROL/C)-RETURN CONTROL TO KEYBOARD (P)CONTROL P)-RETURN CONTROL TO CURRENT TEST (R)CONTROL R)-REPORT ERROR STATUS		

5.3.1.1 INPUT FORMAT DESCRIPTION

TABLE 3 LISTS THE OPTIONS THAT REQUIRE INPUT DATA TO BE ENTERED VIA TELETYPE, TOGETHER WITH THE SPECIFIC FORMAT REQUIRED.

OPTION -----	TABLE 3 FORMAT -----
C	XXXX=0-1023(DECIMAL) IF TWO NUMBERS ARE REQUIRED, THE SECOND MUST BE GREATER THAN OR EQUAL TO THE FIRST YYYY=0-1023 (DECIMAL) WHEN TWO VALUES ARE REQUIRED
NOTE: THE MAXIMUM NUMBER OF CHANNELS IS DEFINED AT PROGRAM START.	
G	XXXX=1,2,10,20,50,100,200,1000
N	XXXX=1-1000 (DECIMAL)
NOTE: THE MAXIMUM NUMBER OF SAMPLES =1000 OR TWICE THE MAXIMUM NUMBER OF CHANNELS, WHICHEVER IS SMALLER.	
EM	X=0,1
ER	XX=0-40 (DECIMAL)
'	XXX=0-100 (DECIMAL) OR A

5.3.1.2 PROGRAM RESPONSE TO OPTION SELECTION

THE FOLLOWING OPTIONS CAUSE DATA TO BE TYPED ON THE TELE-
PRINTER: A,H,L,LC,P. AFTER THE OUTPUT IS COMPLETED, THE PROGRAM
WILL TYPE * AND WAIT FOR ANOTHER OPTION TO BE SELECTED.

THE FOLLOWING OPTIONS CAUSE THE PROGRAM TO REQUEST DATA: C,I,G,N,EM,ER,AD.
AFTER A CORRECT INPUT IS RECEIVED, THE PROGRAM WILL TYPE * AND WAIT
FOR ANOTHER OPTION TO BE SELECTED. IF INCORRECT DATA IS ENTERED,
THE PROGRAM WILL TYPE ? AND WILL THEN REPEAT THE DATA REQUEST.

THE FOLLOWING OPTIONS CAUSE THE SELECTED TEST TO START OR RE-
START: ST,CC FOR EITHER OF THESE OPTIONS, THE PROGRAM WILL TYPE
"R" TO INDICATE THAT THE TEST IS IN PROGRESS, AND WILL NOT RETURN
CONTROL TO THE KEYBOARD.

THE T OPTION CAUSES THE PROGRAM TO INPUT A SELECTED NUMBER OF
DATA SAMPLES FROM A SINGLE ANALOG CHANNEL AT A FIXED GAIN.
THE PROGRAM WILL TYPE "R" TO INDICATE THAT DATA IS BEING INPUTTED
AND WILL TYPE * AND WAIT FOR ANOTHER OPTION TO BE SELECTED WHEN
ALL SAMPLES HAVE BEEN TAKEN.
THE D OPTION ALLOWS THE OPERATOR TO VIEW THE PERFORMANCE OF A
SINGLE CHANNEL AS A PATTERN OF DATA IN THE DATA LIGHTS.
THE PROGRAM TYPES "R" TO INDICATE THAT THE ROUTINE IS RUNNING AND
WILL NOT RETURN CONTROL TO THE KEYBOARD UNTIL CONTROL C OR CONTROL

P ARE TYPED.

5.3.1.3 OPTION APPICABILITY

TEST ----	OPTIONS -----
LOGIC	↑C
REPET	↑C, ↑P, ↑R, AD, C, CC, EM, ER, I, N, P, ST
AMCAL	↑C, ↑P
ADCAL	NONE
MONOT	↑C
DATA	↑C, ↑P, A, AD, C, D, G, H, L, LC, P, T, V
DECOD	↑C, ↑P
OLoad	↑C, ↑P, C, G

5.3.1.4 TEST RESELECTION

IF IT IS DESIRED TO RETURN TO THE KEYBOARD MONITOR TO SELECT A NEW TEST, STRIKE THE CONTROL AND C KEYS SIMULTANEOUSLY. THE PROGRAM WILL TYPE ↑C FOLLOWED BY "." AND WILL WAIT FOR A NEW TEST TO BE SELECTED.

IF "DATA" IS IN PROGRESS, SET SW00=1 (UP) TO RETURN CONTROL TO KEYBOARD MONITOR.

5.3.1.5 TEST PARAMETER MODIFICATION

IT IS POSSIBLE TO CHANGE ONE OR MORE PARAMETERS OF THE FOLLOWING TESTS WITHOUT COMPLETE REINITIALIZATION: "REPET", "AMCAL", "DATA", AND "DECOD". THIS IS DONE BY STRIKING THE CONTROL AND P KEYS SIMULTANEOUSLY. THE PROGRAM WILL TYPE ↑P FOLLOWED BY * AND WILL WAIT FOR SELECTION OF THE PARAMETER TO BE MODIFIED.

IF "REPET" ARE IN PROGRESS, TYPE "ST" TO RESTART THE TEST IF ONE OR MORE OF THE FOLLOWING PARAMETER HAVE BEEN MODIFIED: C, G, N, M, IF ONLY ER, EM, OR BOTH HAVE BEEN MODIFIED, TYPE "CR" TO RESTART.

IF "DECOD" OR "AMCAL" IS IN PROGRESS, CONTROL P WILL CAUSE THE PROGRAM TO REQUEST A SYSTEM UNIT ADDRESS, AND THE TEST WILL RESTART AS SOON AS 'CR' IS INPUTTED FROM THE KEYBOARD.

IF "DATA" IS IN PROGRESS, AND "D" OPTION HAS BEEN SELECTED, SET SW00=1 (UP) TO MODIFY PARAMETERS.

J01

5.3.2 INITIALIZATION PROCEDURE

THE FOLLOWING TABLE LISTS THE TESTS THAT REQUIRE THE USE OF KEYBOARD OPTION TOGETHER WITH THE ORDER IN WHICH THE OPTION SHOULD BE SELECTED, AND THE PROPER INPUT FORMAT FOR THE SPECIFIC TEST.

TEST	OPTION	FORMAT
----	-----	-----
REPET	I (SEE NOTE) OR C G N ER EM ST	XXXX,YYYY(CR) XXXX(CR) XXXX(CR) XX(CR) X(CR) NONE
DATA	C G N T V A,D,H,L,L,C	XXXX(CR) XXXX(CR) XXXX(CR) NONE XXX(CR) OR A NONE
CLOAD	C G ST	XXXX(CR) XXXX(CR) NONE

NOTE: IF I IS SELECTED, THE PROGRAM WILL SEQUENTIALLY RESPOND WITH REQUESTS FOR C,G,N,ER, AND EM. WHEN THE EM INPUT IS TERMINATED, THE TEST WILL BEGIN.

5.4 PROGRAM CONTROL SWITCHES

5.4.1 SWITCH OPTIONS

SR15	=1, HALT ON ERROR
SR14	=1, LOOP ON TEST
SR13	=1, SUPPRESS ERROR TYPEOUT
SR11	=1, INHIBIT ITERATIONS
SR10	=1, ESCAPE TO NEXT TEST ON ERROR
SR09	
SR08	
SR07	=1, HIGH GAIN CALIBRATION, =0, LOW GAIN CALIBRATION
SR06	=1, SUPPRESS END OF PASS TYPEOUT
SR05	
SR04	
SR03	
SR02	
SR01	
SR00	=1, RETURN TO KEYBOARD CONTROL

5.0 DETAILED TEST DESCRIPTION AND OPERATING PROCEDURES

6.1 MULTIPLEXER LOGIC TEST "LOGIC"

6.1.1 DESCRIPTION

"LOGIC" IS A TEST OF THE MULTIPLEXER AND ANALOG TO DIGITAL CONVERTER CONTROL LOGIC. THE FOLLOWING SEQUENCE OF TESTS IS EXECUTED EACH PASS:

ALL REGISTERS IN INTERFACE (EXCEPT A-D DATA BUFFER) ARE CHECKED FOR PROPER OPERATION OF INITIALIZE. ANALOG TO DIGITAL CONVERTER CONTROL LOGIC IS TESTED TO VERIFY CORRECT OPERATION OF TIMING FUNCTIONS.

ANALOG TO DIGITAL CONVERTER AND MULTIPLEXER CONTROL LOGIC IS TESTED TO VERIFY CORRECT OPERATION OF INTERRUPT CIRCUITS.

MULTIPLEXER TIMING LOGIC IS TESTED TO VERIFY CORRECT OPERATION. CHANNEL ADDRESS REGISTER IS TESTED TO VERIFY THAT ALL READ/WRITE BITS FUNCTION.

6.1.2 OPERATION

6.1.2.1 NORMAL SWITCH SETTING: SW15-SW11=0(DOWN)

AFTER "LOGIC" HAS BEEN SELECTED, THE PROGRAM WILL BEGIN EXECUTING THE TEST IMMEDIATELY. EACH SUBTEST WILL BE ITERATED A NUMBER OF TIMES (DETERMINED BY PROGRAM) AND THEN THE NEXT SUBTEST WILL BE EXECUTED. WHEN ALL SUBTESTS HAVE BEEN COMPLETED, THE PROGRAM WILL TYPE "LOGIC" AND THEN RESTART BY EXECUTING THE FIRST TEST IN SEQUENCE.

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IF AN ERROR OCCURRS, THE PROGRAM WILL TYPE THE PC AND STATUS OF THE TEST THAT FAILED, AND CONTINUE THAT TEST. IF THE SAME TEST FAILS AGAIN, THE SAME INFORMATION WILL BE TYPED.

6.1.2.1 OPERATION WITH SW15=1 (UP).

SAME AS 6.1.2.1 EXCEPT PROGRAM WILL HALT AFTER EACH ERROR. TO CONTINUE TESTING, PRESS CONT SWITCH.

6.1.2.4 OPERATION WITH SW11=1 (UP)

SAME AS 6.1.2.1 EXCEPT EACH SUBTEST WILL BE EXECUTED ONLY ONCE PER PASS.

6.1.2.5 OPERATION WITH SW10=1(UP)

SAME AS 6.1.2.1 EXCEPT AFTER AN ERROR IS DETECTED, THE NEXT SEQUENTIAL SUBTEST WILL BE EXECUTED

6.1.2.6 OPERATION WITH SN06=1 (UP)

SAME AS 6.1.2.1 EXCEPT NO END OF PASS TIMEOUT WILL OCCUR.

6.1.3 SCOPE LOOP OPERATION

BEFORE SELECTING "LOGIC", SET SW15=1 (UP) TO HALT ON ERROR.
SELECT "LOGIC".
THE PROGRAM WILL RUN UNTIL AN ERROR IS DETECTED.
AN ERROR MESSAGE WILL BE TYPED, AND THE PROGRAM WILL HALT.
TO LOOP ON THE FAILING TEST, SET SW15=0 (DOWN)
AND SET SW14 AND SW13=1 (UP) TO SUPPRESS ERROR TIMEOUT
AND LOOP ON THE FAILING SUBTEST.
PRESS CONTINUE.

TO RETURN TO KEYBOARD CONTROL IN THIS CASE, RESTART PROGRAM
AT ADDRESS 200.

6.2 DATA REPEATABILITY TEST - "REPET"

6.2.1 TEST DESCRIPTION

"REPET" IS A TEST OF THE DATA REPEATABILITY OF THE AFC-11 SYSTEM. REPEATABILITY IS DETERMINED BY TAKING AN AVERAGE OF DATA ON EACH ANALOG CHANNEL AND THEN COMPARING INDIVIDUAL SAMPLES ON EACH CHANNEL WITH THAT CHANNEL AVERAGE. IF THE DIFFERENCE IS LESS THAN OR EQUAL TO A SELECTED ERROR LIMIT, NO ERROR OCCURS. IF THE DIFFERENCE IS GREATER THAN THE ERROR LIMIT, AN ERROR HAS OCCURED.

6.2.2 TEST INITIALIZATION

WHEN "REPET" IS SELECTED, THE PROGRAM WILL TYPE "*" AND WAIT FOR A RESPONSE FROM THE OPERATOR. THE OPERATOR INITIALIZES TEST PARAMETERS BY TYPING "I(CR)" AND SEQUENTIALLY RESPONDING TO INPUT REQUESTS, OR BY INDIVIDUAL PARAMETERS SELECTION. (SEE 5.3.2). IF THE "I" OPTION HAS BEEN SELECTED, NO FURTHER ACTION IS REQUIRED. IF INDIVIDUAL PARAMETERS HAVE BEEN SELECTED, THE OPERATOR TYPES "ST(CR)" TO START THE TEST.

6.2.3 TEST OPERATION

6.2.3.1 ERROR MODE 0

AFTER INITIALIZATION, THE PROGRAM WILL TAKE AN AVERAGE OF N SAMPLES ON EACH CHANNEL (N HAS BEEN OPERATOR SELECTED). WHEN ALL AVERAGES HAVE BEEN COMPUTED, THE PROGRAM WILL TAKE ONE(1) SAMPLE ON EACH CHANNEL AND COMPARE THE DATA TO THE AVERAGE FOR THAT CHANNEL. AFTER 100 COMPARISONS ON EACH CHANNEL, THE PROGRAM WILL TYPE "REPET" AND CONTINUE THE COMPARISON.

IF AN ERROR OCCURS, THE PROGRAM WILL TYPE AN ERROR MESSAGE AND CONTINUE TESTING. THE ERROR MESSAGE IS IN THE FOLLOWING FORMAT

XXXX YYY ZZZ

WHERE XXXX IS A DECIMAL NUMBER CORRESPONDING TO THE CHANNEL ON WHICH THE ERROR OCCURED.

YYY IS THE AVERAGE TAKEN ON THAT CHANNEL (IN VOLTS WITH RESPECT TO AMPLIFIER INPUT)

ZZZ IS THE VALUE (IN VOLTS) OF THE INDIVIDUAL SAMPLE TAKEN ON THE FAILING CHANNEL.

ALL ERRORS WILL BE REPORTED SEQUENTIALLY.

6.2.3.2 ERROR MODE 1

SAME AS 6.2.3.1 EXCEPT NO ERRORS ARE REPORTED.

TO DETERMINE THE TOTAL NUMBER OF ERRORS THAT HAVE OCCURED,
TYPE CONTROL R. THE PROGRAM WILL RESPOND BY TYPING

PASSES:

TOTAL ERRORS:

*

THE TOTAL NUMBER OF CHANNELS TESTED =
CHANNEL RANGE X PASSES X 100.

AND WILL WAIT FOR OPERATOR ACTION.

TO CONTINUE TESTING USING THE SAME TABLE OF AVERAGES, TYPE
CC(CR). THE PROGRAM WILL RESUME TESTING, AND THE PASS AND
ERROR COUNTER WILL BE UPDATED FROM WHERE THEY WERE.

TO RESTART, TYPE ST(CR). PASS AND ERROR COUNTS WILL BE CLEARED,
AND A NEW TABLE OF AVERAGES WILL BE TAKEN.

6.2.4 PARAMETER MODIFICATION

TO MODIFY A PARAMETER DURING THE TEST, TYPE CONTROL P. THE PROGRAM
WILL TYPE "*" AND WAIT FOR OPERATOR ACTION. AFTER ANY OR ALL
PARAMETERS HAVE BEEN MODIFIED, TYPE ST(CR) OR CC(CR) TO EITHER RESTART OR
CONTINUE THE TEST.

TO LIST ALL PARAMETERS, TYPE P(CR).

6.2.5 SIGNAL CONDITIONING MODULES

6.2.5.1 A903 DIRECT VOLTAGE TO VOLTAGE MODULE

THE VOLTAGES TYPED BY THE PROGRAM ARE THOSE THAT
APPEAR AT THE INPUT OF THE CHANNEL IN QUESTION.

6.2.5.2 A904 10 TO 1 VOLTAGE TO VOLTAGE MODULE

THE VOLTAGE AT THE INPUT OF THE CHANNEL IN QUESTION
IS TEN (10) TIMES THE VOLTAGE TYPED BY
THE PROGRAM.

6.2.5.3 A905 CURRENT TO VOLTAGE MODULE

THE CURRENT AT THE INPUT OF THE CHANNEL IN QUESTION
IS THE VOLTAGE TYPED BY THE PROGRAM DIVIDED BY TEN (10).

6.3 DATA COLLECTION - "DATA"

DATA IS A GROUP OF ROUTINES FOR COLLECTING AND DISPLAYING ANALOG INFORMATION IN DIGITAL FORM. INFORMATION MAY BE DISPLAYED IN THE COMPUTER DATA LIGHTS, TYPED IN NUMERICAL FORMAT, OR PRESENTED PICTORALLY BY HISTOGRAM.

6.3.1 OPERATION

TO INPUT DATA FOR DISPLAY AND ANALYSIS, USE THE C, G AND N OPTIONS TO SELECT CHANNEL GAIN AND NUMBER OF SAMPLES. USE THE T OPTION TO INPUT A TABLE OF DATA. THE D OPTION TO DISPLAY DATA CONTINUOUSLY IN THE COMPUTER DATA LIGHTS, OR THE LC OPTION TO CONTINUOUSLY TYPE THE VOLTAGE ON A GIVEN CHANNEL.

6.3.2 HISTOGRAM FORMAT

THE FORMAT OF THE HISTOGRAM IS SHOWN IN FIGURE 1.

EACH DATA POINT IS PRESENTED BY AN ASTERISK (*). VSF IS THE VERTICAL SCALE FACTOR. WITH A VSF OF 1, EACH * REPRESENTS ONE SAMPLE. WITH A VSF OF 4, EACH * REPRESENTS BETWEEN 1 AND 4 SAMPLES.

THE HISTOGRAM IS A DISPLAY OF THE DIFFERENCE BETWEEN THE VALUE OF EACH SAMPLE AND THE VALUE OF THE AVERAGE OF ALL SAMPLES. EACH DIVISION ON THE HISTOGRAM HAS AS ITS VALUE THE RESOLUTION OF THE SYSTEM AT A SPECIFIC GAIN. THAT IS, AT A GAIN OF 1, FOR AN 11 BIT + SIGN A-D CONVERTER, EACH DIVISION IS EQUAL TO 4.882MV, AND AT A GAIN OF 1000, EACH DIVISION IS EQUAL TO 4.882 UV. FOR A 12 BIT + SIGN A-D CONVERTER, THE RESOLUTIONS ARE 2.441 MV AND 2.441 UV RESPECTIVELY.

THE HISTOGRAM HAS A RANGE OF + OR -10X RESOLUTION DIFFERENCE FROM THE AVERAGE. OVERANGE AND UNDERANGE ARE COUNTERS THAT INDICATE THE NUMBER OF SAMPLES, IF ANY, THAT EXCEED THE HISTOGRAM LIMITS. THEY WILL BE TYPED ONLY IF A SAMPLE POINT EXCEEDS THE ABOVE LIMITS.

FIGURE 1



OVERANGE= UNDERANGE=

AVERAGE=

6.3.3 HISTOGRAM VERTICAL SCALING

THE VERTICAL SCALE FACTOR MAY BE SET BY OPERATOR TO ANY VALUE BETWEEN 1 AND 100 USING THE V KEYBOARD OPTION. AN ALTERNATIVE IS TO LET THE PROGRAM DO AUTOMATIC SCALING BY TYPING A AFTER THE V OPTION HAS BEEN SELECTED.

6.3.4 SIGNAL CONDITIONING MODULES

SEE 6.2.5 FOR INTERPRETATION OF VOLTAGES TYPED BY PROGRAM.

6.4 CALIBRATION, ADJUSTMENT, AND SCOPE LOOP ROUTINES

6.4.1 MULTIPLEXER TIMING ADJUSTMENT - MXTIM

6.4.1.1 DESCRIPTION

"MXTIM" PROVIDES A STABLE TIME BASE FOR ADJUSTMENT OF THE ONE SHOT IN THE MULTIPLEXER TIMING CHAIN. IN ADDITION, THIS ROUTINE MAY BE USED FOR SCOPING ON ANY POINT IN THE TIMING CHAIN.

WHEN "MXTIM" IS SELECTED, IT WILL BEGIN RUNNING IMMEDIATELY.

6.4.1.2 TIMING ADJUSTMENT

LOAD AND START PROGRAM (IF THIS HAS NOT ALREADY BEEN DONE).
CONNECT OSCILLOSCOPE PROBE (X1) TO AM11-ED4F2
CONNECT OSCILLOSCOPE GROUND TO AM11-ED4C2
SET VERTICAL DISPLAY FOR 2 V/CM.
SET HORIZONTAL DISPLAY FOR 1 MS/CM.
SYNC INTERNALLY.
SELECT MXTIM AT THE TELETYPE KEYBOARD.

ADJUST THE UPPER POTENTIOMETER ON THE M3020 DUAL DELAY MULTI-VIBRATOR (LOCATED AT AM11-ED4) FOR A 2 MS WIDE PULSE.

MOVE OSCILLOSCOPE PROBE TO AM11-ED3T2. ADJUST LOWER POTENTIOMETER ON M3020 (LOCATED AT AM11-ED3) FOR A 3 MS WIDE PULSE.

MOVE OSCILLOSCOPE PROBE TO AM11-ED4T2. SET HORIZONTAL DISPLAY ON OSCILLOSCOPE FOR 1 US/CM. ADJUST THE LOWER POTENTIOMETER ON THE M3020 (LOCATED AT AM11-ED4) FOR A 1/2 US WIDE PULSE.

MOVE THE OSCILLOSCOPE PROBE TO AM11-ED3F2. ADJUST THE UPPER POTENTIOMETER ON THE M3020 (LOCATED AT AM11-ED3) FOR A 1/2 US. WIDE PULSE.

6.4.2 ANALOG TO DIGITAL CONVERTER ADJUSTMENT - ADCAL

6.4.2.1 DESCRIPTION

"ADCAL" PROVIDES A DISPLAY OF THE A-D CONVERTER OUTPUT IN THE COMPUTER DATA LIGHTS.

WHEN "ADCAL" IS SELECTED, IT STARTS RUNNING IMMEDIATELY.

6.4.2.2 ANALOG TO DIGITAL CONVERTER CALIBRATION (A877)

REFER TO A-SP-AFC11-0-4 CALIBRATION PROCEDURE

6.4.2.3 OPERATION WITH SWS=1

SAME AS 6.4.2.2 EXCEPT PROGRAM TYPES OUT
DATA INSTEAD OF DISPLAYING IT IN THE LIGHTS.

6.4.3 BESSEL FILTER CALIBRATION (A223)

REFER TO A-SP-AFC11-0-4 CALIBRATION PROCEDURE

6.4.4 SWITCH GAIN AMPLIFIER CALIBRATION (A219)

REFER TO A-SP-AFC11-0-4 CALIBRATION PROCEDURE

6.5 ANALOG TO DIGITAL CONVERTER MONOTONICITY TEST-"MONOT"

6.5.1 DESCRIPTION

"MONOT" PROVIDES A MEANS FOR DETERMINING THE VOLTAGE SLEW
RATE, OR MINIMUM STATE WIDTH OF AN 11, 12, OR 13 BIT
+SIGN ANALOG TO DIGITAL CONVERTER.

THIS TEST REQUIRES THE USE OF A LOW FREQUENCY (LESS THAN
1 HZ) TRIANGLE SIGNAL GENERATOR AS A VOLTAGE INPUT
FOR THE A-D CONVERTER.

THE A223 BESSEL FILTER SHOULD BE REMOVED, AND THE SIGNAL
GENERATOR OUTPUT SHOULD BE CONNECTED DIRECTLY TO THE
INPUT PINS OF THE CONVERTER.

THE PURPOSE OF THE TEST IS TO DETERMINE IF THE A-D CONVERTER
MISSES ANY STATES AS THE INPUT WAVEFORM RAMPS UP AND DOWN
AT A GIVEN FREQUENCY..

IN OPERATION, THE PROGRAM FIRST PERFORMS ONE CONVERSION
AND SAVES THE RESULT. ANOTHER CONVERSION IS TAKEN,
THE DATA IS SAVED, AND THEN THE RESULTS OF THE TWO
CONVERSIONS ARE COMPARED. IF THE DIFFERENCE BETWEEN THE
TWO CONVERSIONS IS LESS THAN OR EQUAL TO + OR - 1 LSB
FOR THE CONVERTER UNDER TEST, NO ERROR IS REPORTED.
IF THE DIFFERENCE IS GREATER THAN + OR - 1 LSB
A STATE HAS BEEN MISSED, AND AN ERROR HAS OCCURED.

6.5.2 OPERATION

SET THE SIGNAL GENERATOR OUTPUT FOR A RANGE
OF -10 TO +10 VOLTS P-P IF POSSIBLE.
SET THE FREQUENCY TO:
2 HZ FOR AN 11 BIT A-D

1 HZ FOR A 12 BIT A-D
.5 HZ FOR A 13 BIT A-D

SELECT "MONOT"

THE PROGRAM WILL BEGIN RUNNING IMMEDIATELY.

IF NO ERRORS OCCUR, THE PROGRAM WILL CONTINUE TO RUN
UNTIL TERMINATED BY CONTROL C.
NO INDICATION OF END OF PASS IS GIVEN, SINCE END OF PASS
DEPENDS UPON THE INPUT FREQUENCY AND VOLTAGE.

5.5.3 ERRORS

IF AN ERROR OCCURS, THE PROGRAM WILL TYPE:

MONOTONICITY ERROR

1ST 2ND
XXXXXX YYYYYY

WHERE XXXXXX AND YYYYYY ARE THE 2 CONVERSIONS BEING COMPARED.

THE PROGRAM WILL THEN RESYNCHRONIZE WITH THE INPUT SIGNAL AND
CONTINUE THE TEST.
ALL ERRORS ARE REPORTED.

6.6 CHANNEL ADDRESSING TEST-"DECOD"

6.6.1 DESCRIPTION

"DECOD" PROVIDES A MEANS FOR CHECKING INTERFACE CHANNEL ADDRESSING AT THE M151 BLOCK SELECTOR MODULE. THE 5 LSB OF THE CHANNEL ADDRESS AND THE "X" AND "Y" SYSTEM UNIT SELECTBITS ARE TRANSMITTED FROM THE M151 TO THE INTERFACE MAINTENANCE REGISTER BY THE DIGITAL TEST CABLE.

THE PROGRAM VERIFIES THAT BOTH "X" AND "Y" ARE SET FOR THE SELECTED SYSTEM UNIT, AND THAT THE CORRECT CHANNEL IN THE SELECTED SYSTEM UNIT IS ADDRESSED

6.6.2 OPERATION

INSTALL THE DIGITAL TEST CABLE BETWEEN THE AM11 AND THE M151 IN THE SYSTEM UNIT TO BE CHECKED.

SELECT "DECOD".

THE PROGRAM WILL TYPE "*SYSTEM UNIT:"

ENTER THE SYSTEM UNIT NUMBER (IN DECIMAL).

THE PROGRAM WILL TYPE "R" TO INDICATE THAT THE TEST IS BEING EXECUTED. AT THE END OF A PASS, THE PROGRAM WILL TYPE "DECOD", AND WILL CONTINUE TESTING.

6.6.3 ERRORS

THERE ARE TWO POSSIBLE ERRORS THAT MAY OCCUR. THESE ARE:
A) "X" OR "Y" SYSTEM UNIT SELECT BITS ARE NOT ON
B) CHANNEL ADDRESS IS INCORRECT.

IF A) OCCURS, THE PROGRAM WILL TYPE "X BAD", OR "Y BAD", OR BOTH.

IF B) OCCURS, THE PROGRAM WILL TYPE XX YY WHERE XX IS THE EXPECTED CHANNEL ADDRESS AND YY IS THE RECEIVED CHANNEL ADDRESS (IN DECIMAL).

AFTER AN ERROR OCCURS, THE PROGRAM WILL RESUME TESTING

6.6.4 SWITCH OPTIONS

SW14 =1. LOOP ON CURRENT TEST FUNCTION
 SW13 =1. SUPPRESS ERROR TYPEOUT
 SW09 =1. LOOP WITH CURRENT ADDRESS

7. RESTRICTIONS

7.1 STARTING

DIGITAL TEST CABLE MUST BE INSTALLED

7.2 OPERATING

ALL TESTS MUST BE SELECTED FROM THE TELETYPE KEYBOARD.

IF THE REPEATABILITY TEST IS RUN, A MINIMUM OF EIGHT (8) CHANNELS MUST BE SELECTED.

8.0 OVERSCALE TEST-"OLOAD"

8.1 DESCRIPTION

"OLOAD" PROVIDES A MEANS OF TESTING THE 'OVERSCALE' FEATURE OF THE AFC. THIS IS DONE VIA TESTING A USER SELECTED GAIN AND CHANNEL INPUT.

8.2 OPERATION

THE STATE OF THE OVERSCALE BIT (13) IS MONITERED AND AND REPORTED VIA THE TELEPRINTER. A '1' IS TYPED IF THE BIT IS SET AND A '0' IS TYPED IF THE BIT IS CLEARED. THE PRINTOUT OCCURS ONLY ON ENCOUNTERING A CHANGE OF STATE OF THE OVERSCALE BIT. THE INITIAL STATE OF THE BIT IS ASSUMED TO BE CLEARED SO THAT THE FIRST PRINTOUT WILL NOT OCCUR UNTIL AN OVERSCALE CONDITION IS DETECTED.

8.3 ERRORS

NONE

.ENDR

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```

904
905      .TITLE  AFC11
906      .ABS
907
908      :AFC11 DIAGNOSTIC
909      :COPYRIGHT 1971,1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
910
911      ;SWITCH REGISTER FUNCTIONS
912
913      ;SW15  =1,HALT ON ERROR
914      ;SW14  =1,LOOP ON CURRENT TEST
915      ;SW13  =1,SUPPRESS ERROR TYPEOUT
916      ;SW12  =1,SUPPRESS TRACE TRAPPING
917      ;SW11  =1,SUPPRESS ITERATIONS
918      ;SW10  =1,ESCAPE TO NEXT TEST ON ERROR
919      ;SW07  =1,HIGH GAIN CALIBRATION
920              :=0,LOW GAIN CALIBRATION
921      ;SW05  =1,TYPE OUT DATA IN ADCAL TEST
922      ;SW06  =1,SUPPRESS END OF PASS TYPEOUT
923      ;SW00  =1,RETURN TO KEYBOARD CONTROL
924
925      .SYMBOL DEFINITIONS
926      SW15=100000
927      SW14=40000
928      SW13=20000
929      SW12=10000
930      SW11=4000
931      SW10=2000
932      SW09=1000
933      SW08=400
934      SW07=200
935      SW06=100
936      SW05=40
937      SW04=20
938      SW03=10
939      SW02=4
940      SW01=2
941      MAX4K=16776-DATAB/2
942
943      .REGISTER DEFINITIONS
944      R0=%0
945      R1=%1
946      R2=%2
947      R3=%3
948      R4=%4
949      R5=%5
950      SP=%6
951      PC=%7
952
953      ;LOCATION EQUIVALENCIES
954      SWR=177570
955      PS=177776
956      STACK=DATAB+200
957      RADIX=DIVIS

```

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940	015506	BINWRD=DIVIDL
941	015510	DIGIT=DIVIDH
942	015506	QUOT=DIVIDL
943	015510	REMANO=DIVIDH
944	011614	PRODH=MPYERL
945	011620	PRODL=MPCND
946	016504	ENDCOC=DATAB
948		;CONTROL REGISTER BIT FUNCTIONS
949	000100	ENABLE=100
950	000200	DONE=200
951		
952		;INSTRUCTION DEFINITIONS
953		
954	005746	PUSH1SP=5746
955	005726	POP1SP=5726
956	010046	PUSHRO=10046
957	012600	POPPO=12600
958	024646	PUSH2SP=24646
959	022626	POP2SP=22626
960	000240	NCP=240
961	000257	CLCVNZ=257
962		
963		
964		
965		;REFERENCE NUMBER DEFINITION
966		
967	000000	N=0
968	000000	XN=N
969		
970		;EMT GENERATOR
971		
972	000000	X=0
973	000001	M=1
974	000001	XM=M
975		
976		
977		
978		;EMT DEFINITION TABLE
979		
980	104000	ERRORC=EMT+X
981	000001	X=X+1
982	104001	SCOPE=EMT+X
983	000002	X=X+1
984	104002	SCOPEF=EMT+X
985	000003	X=X+1
986	104003	TYPE=EMT+X
987	000004	X=X+1
988	104004	SAVOSP=EMT+X
989	000005	X=X+1
990	104005	OCTASC=EMT+X
991	000006	X=X+1
992	104006	RESOS=EMT+X
993	000007	X=X+1
994	104007	EXTRACT=EMT+X
995	000010	X=X+1

996	104010	ERROR=EMT+X
997	000011	X=X+1
998	104011	BCDASC=EMT+X
999	000012	X=X+1
1000	104012	ADLNTH=EMT+X
1001	000013	X=X+1
1002	104013	INSTR=EMT+X
1003	000014	X=X+1
1004	104014	INSTER=EMT+X
1005	000015	X=X+1
1006	104015	BCDBN=EMT+X
1007	000016	X=X+1
1008	104016	DIVIDU=EMT+X
1009	000017	X=X+1
1010	104017	SUAD=EMT+X
1011	000020	X=X+1
1012	104020	DECBOD=EMT+X
1013	000021	X=X+1
1014	104021	AVRG=EMT+X
1015	000022	X=X+1
1016	104022	DECBCC=EMT+X
1017	000023	X=X+1
1018	104023	BCDASO=EMT+X
1019	000024	X=X+1
1020	104024	DIVIDE=EMT+X
1021	000025	X=X+1
1022	104025	AVREG=EMT+X
1023	000026	X=X+1
1024	104026	DISPAT=EMT+X
1025	000027	X=X+1
1026	104027	BCDASN=EMT+X
1027	000030	X=X+1
1029	104030	MUL*PY=EMT+X
1029	000031	X=X+1
1030		
1031		
1032		
1033		:TRAP CATCHER
1034	000000	.=0
1035	000000	.+2
1036	000002	HALT
1037	000004	.+2
1038	000006	HALT
1039	000010	.+2
1040	000012	HALT
1041	000014	.+2
1042	000016	HALT
1043	000020	.+2
1044	000022	HALT
1045	000024	.+2
1046	000026	HALT
1047	000030	.+2
1048	000032	HALT
1049	000034	.+2
1050	000036	HALT
1051	000040	.+2

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1052	000042	000000	HALT
1053	000044	000046	.+2
1054	000046	000000	HALT
1055	000050	000052	.+2
1056	000052	000000	HALT
1057	000054	000056	.+2
1058	000056	000000	HALT
1059	000060	000062	.+2
1060	000062	000000	HALT
1061	000064	000066	.+2
1062	000066	000000	HALT
1063	000070	000072	.+2
1064	000072	000000	HALT
1065	000074	000076	.+2
1066	000076	000000	HALT
1067	000100	000102	.+2
1068	000102	000000	HALT
1069	000104	000106	.+2
1070	000106	000000	HALT
1071	000110	000112	.+2
1072	000112	000000	HALT
1073	000114	000116	.+2
1074	000116	000000	HALT
1075	000120	000122	.+2
1076	000122	000000	HALT
1077	000124	000126	.+2
1078	000126	000000	HALT
1079	000130	000132	.+2
1080	000132	000000	HALT
1081	000134	000136	.+2
1082	000136	000000	HALT
1083	000140	000142	.+2
1084	000142	000000	HALT
1085	000144	000146	.+2
1086	000146	000000	HALT
1087	000150	000152	.+2
1088	000152	000000	HALT
1089	000154	000156	.+2
1090	000156	000000	HALT
1091	000160	000162	.+2
1092	000162	000000	HALT
1093	000164	000166	.+2
1094	000166	000000	HALT
1095	000170	000172	.+2
1096	000172	000000	HALT
1097	000174	000176	.+2
1098	000176	000000	HALT
1099	000200	000202	.+2
1100	000202	000000	HALT
1101	000204	000206	.+2
1102	000206	000000	HALT
1103	000210	000212	.+2
1104	000212	000000	HALT
1105	000214	000216	.+2
1106	000216	000000	HALT
1107	000220	000222	.+2

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1108	000222	000000	HALT
1109	000224	000226	.+2
1110	000226	000000	HALT
1111	000230	000232	.+2
1112	000232	000000	HALT
1113	000234	000236	.+2
1114	000236	000000	HALT
1115	000240	000242	.+2
1116	000242	000000	HALT
1117	000244	000246	.+2
1118	000246	000000	HALT
1119	000250	000252	.+2
1120	000252	000000	HALT
1121	000254	000256	.+2
1122	000256	000000	HALT
1123	000260	000262	.+2
1124	000262	000000	HALT
1125	000264	000266	.+2
1126	000266	000000	HALT
1127	000270	000272	.+2
1128	000272	000000	HALT
1129	000274	000276	.+2
1130	000276	000000	HALT
1131	000300	000302	.+2
1132	000302	000000	HALT
1133	000304	000306	.+2
1134	000306	000000	HALT
1135	000310	000312	.+2
1136	000312	000000	HALT
1137	000314	000316	.+2
1138	000316	000000	HALT
1139	000320	000322	.+2
1140	000322	000000	HALT
1141	000324	000326	.+2
1142	000326	000000	HALT
1143	000330	000332	.+2
1144	000332	000000	HALT
1145	000334	000336	.+2
1146	000336	000000	HALT
1147	000340	000342	.+2
1148	000342	000000	HALT
1149	000344	000346	.+2
1150	000346	000000	HALT
1151	000350	000352	.+2
1152	000352	000000	HALT
1153	000354	000356	.+2
1154	000356	000000	HALT
1155	000360	000362	.+2
1156	000362	000000	HALT
1157	000364	000366	.+2
1158	000366	000000	HALT
1159	000370	000372	.+2
1160	000372	000000	HALT
1161	000374	000376	.+2
1162	000376	000000	HALT
1163	000400	000402	.+2

N02.

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1164	000402	000000	HALT
1165	000404	000406	.+2
1166	000406	000000	HALT
1167	000410	000412	.+2
1168	000412	000000	HALT
1169	000414	000416	.+2
1170	000416	000000	HALT
1171	000420	000422	.+2
1172	000422	000000	HALT
1173	000424	000426	.+2
1174	000426	000000	HALT
1175	000430	000432	.+2
1176	000432	000000	HALT
1177	000434	000436	.+2
1178	000436	000000	HALT
1179	000440	000442	.+2
1180	000442	000000	HALT
1181	000444	000446	.+2
1182	000446	000000	HALT
1183	000450	000452	.+2
1184	000452	000000	HALT
1185	000454	000456	.+2
1186	000456	000000	HALT
1187	000460	000462	.+2
1188	000462	000000	HALT
1189	000464	000466	.+2
1190	000466	000000	HALT
1191	000470	000472	.+2
1192	000472	000000	HALT
1193	000474	000476	.+2
1194	000476	000000	HALT
1195	000500	000502	.+2
1196	000502	000000	HALT
1197	000504	000506	.+2
1198	000506	000000	HALT
1199	000510	000512	.+2
1200	000512	000000	HALT
1201	000514	000516	.+2
1202	000516	000000	HALT
1203	000520	000522	.+2
1204	000522	000000	HALT
1205	000524	000526	.+2
1206	000526	000000	HALT
1207	000530	000532	.+2
1208	000532	000000	HALT
1209	000534	000536	.+2
1210	000536	000000	HALT
1211	000540	000542	.+2
1212	000542	000000	HALT
1213	000544	000546	.+2
1214	000546	000000	HALT
1215	000550	000552	.+2
1216	000552	000000	HALT
1217	000554	000556	.+2
1218	000556	000000	HALT
1219	000560	000562	.+2

0000562	0000000
0000564	0000566
0000566	0000000
0000570	0000572
0000572	0000000
0000574	0000576
0000576	0000000
0000600	0000602
0000602	0000000
0000604	0000606
0000606	0000000
0000610	0000612
0000612	0000000
0000614	0000616
0000616	0000000
0000620	0000622
0000622	0000000
0000624	0000626
0000626	0000000
0000630	0000632
0000632	0000000
0000634	0000636
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0000640	0000642
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0000660	0000662
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0000664	0000666
0000666	0000000
0000670	0000672
0000672	0000000
0000674	0000676
0000676	0000000
0000700	0000702
0000702	0000000
0000704	0000706
0000706	0000000
0000710	0000712
0000712	0000000
0000714	0000716
0000716	0000000
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0000722	0000000
0000724	0000726
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0000730	0000732
0000732	0000000
0000734	0000736
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0000740	0000742

[illegible]

000000	000000	IF
000001	000001	IF
000002	000002	IF
000003	000003	IF
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000010	000010	IF
000011	000011	IF
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: STANDARD INTERRUPT VECTORS

000014	000014	.=14	TRACES	: TRACE TRAP SERVICE
000016	000016		340	
000024	000024	.=24	PFAIL	: POWER FAIL HANDLER
000026	000026		340	
000030	000030		EMTSRV	: EMT DISPATCH SERVICE
000032	000032		340	
000060	000060	.=60	KEYINT	: KEYBOARD INTERRUPT SERVICE
000062	000062		340	
000064	000064	.=200	JMP	START
000066	000066			
000068	000068			
000070	000070			
000072	000072			
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E03

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DZAFAC.P11 TYPE ROUTINE

1366 001242 177566 *F3: 177566
1367

.SBTTL MONITOR

;PROGRAM MONITOR

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1371
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1374
1375 001244 012706 001000 START: MOV #1000,SP ;POSITION STACK
1376 001250 012767 000340 176520 MOV #340,PS
1377 001256 005737 000042 TST #42 ;TEST FOR AUTO LOAD
1378 001262 001402 BEQ .+6 ;BRANCH IF NORMAL LOAD
1379 001254 000167 000242 JMP LOGIC1 ;OTHERWISE RUN LOGIC TEST
1380 001270 005067 176502 CLR PS ;ENABLE INTERRUPTS
1381 001274 012777 000100 014456 MOV #100,ATKCSR ;ENABLE KEYBOARD INTERRUPTS
1382 001302 005767 014300 TST MTRFLG ;INHIBIT RETYPING ON RESTART
1383 001306 001035 BNE MONIT
1384 001310 012767 000001 014270 MOV #1,MTRFLG ;INHIBIT HEADER TYPE OUT.
1385
1386
1387 ;DETERMINE NUMBER OF CHANNELS THAT CAN BE TESTED
1388 ;SIMULTANEOUSLY
1389
1390 001316 012767 001342 176460 MOV #START1,4 ;SET UP TIME OUT RETURN
1391 001324 012704 020000 MOV #20000,R4 ;TEST FIRST LOCATION OF SECOND
1392 001330 005714 TST (R4) ;4K. IF TRAP OCCURS, ONLY 4K
1393 001332 012767 002000 014362 MOV #1024,MAXCHN ;NO TRAP. 1024 CHANNELS CAN BE TESTED
1394 001340 000403 BR START2
1395 001342 012767 000135 014352 START1: MOV #MAX4K,MAXCHN ;=MAXIMUM NUMBER OF CHANNELS
1396 001350 012767 000006 176426 START2: MOV #6,4 ;RESTORE TIMEOUT TRAP
1397 001356 005067 176424 CLR 6 ;SET UP TO HALT AFTER TIMEOUT
1398 001362 104003 TYPE ;TYPE "AFC11 DIAGNOSTIC"
1399 001364 013171 MTITLE
1400 001366 104011 BCDASC ;CONVERT NUMBER OF CHANNELS TO
1401 001370 000001 1 ASCII AND OUTPUT
1402 001372 015722 MAXCHN ;TO TELEPRINTER
1403 001374 104003 TYPE ;TYPE "CHANNELS CAN BE TESTED"
1404 001376 013371 MMAXCH
1405 001400 104012 ADLNGTH
1406 001402 012706 001000 MONIT: MOV #1000,SP ;POSITION STACK
1407 001406 000240 NOP
1408 001410 005067 176362 CLR PS
1409 001414 012777 000100 014336 MOV #100,ATKCSR ;ENABLE KEYBOARD INTERRUPTS
1410 001422 005067 014364 CLR SINTFL ;CLEAR SOFTWARE INTERRUPT FLAG
1411 001426 104013 MONIT1: INSTR ;GET NAME OF TEST
1412 001430 013217 MPER ;TO BE EXECUTED
1413 001432 000006 6
1414 001434 000167 007024 JMP TSTNAM ;CHECK FOR VALID NAME
1415
1416 ;KEYBOARD INTERRUPT SERVICE
1417
1418 001440 127727 014316 000203 KEYINT: CMPB ATKDBR,#203 ;WAS CONTROL C TYPED
1419 001446 001003 BNE KEYINP ;NO, LOOK FOR CONTROL P
1420 001450 000005 RESET ;YES, RESET SYSTEM
1421 001452 000167 011402 JMP CONTC ;TYPE IC AND RETURN TO MONITOR
1422 001456 005767 014312 KEYINP: TST CPFLG ;ARE CONTROL P INTERRUPTS VALID
1423 001462 001406 BEQ KEYINR ;NO, CHECK FOR CONTROL R

```

G03

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DZAFAC.P11 MONITOR

1424	001464	127727	014272	000220	CMPB	ATKDBR, #220	: YES, WAS CONTROL P TYPED
1425	001472	001002			BNE	KEYINR	: NO, LOOK FOR CONTROL R
1426	001474	000167	011422		JMP	CONTR	: TYPE 1P, RETURN TO TEST, WAIT
1427	001500	005767	014272		KEYINR: TST	CRFLG	: ARE CONTROL R INTERRUPTS VALID
1428	001504	001406			BEQ	KEYEX	: NO, EXIT
1429	001506	122777	000222	014246	CMPB	#222, ATKDBR	: YES, WAS CONTROL R TYPED
1430	001514	001002			BNE	KEYEX	: NO, EXIT
1431	001516	000167	011414		JMP	CONTR	: TYPE 1R, REPORT ERRORS
1432	001522	012767	177777	014262	KEYEX: MOV	#-1, SINTFL	: SET SOFTWARE INTERRUPT FLAG
1433	001530	000002			RTI		

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LOGIC1: CLR      CPFLG      :SET UP TO IGNORE
        CLR      CRFLG      :CONTROL R AND CONTROL P INTERRUPTS
        CLR      ERRFLG     :CLEAR ERROR FLAG
        TYPE      :TYPE 'R' TO INDICATE
        MR        :THAT TEST IS RUNNING
        CLR      TSTNO      :CLEAR TEST NUMBER
        CLR      PASCNT     :CLEAR PASS COUNT
        MOV      #TO,RETURN :SET UP SCOPE RETURN FOR FIRST TEST
        MOV      #1,ICOUNT  :SET UP FOR 1 ITERATION

```

```

:INTERFACE INITIALIZATION CHECKS

```

001576 000001

```
INIT1:  TST      2AFCSR      ; WAS CONTROL REGISTER
        BEQ      .+4         ; CLEARED BY INIT
        ERROR          ; NOT CLEARED. ERROR
```

001606 005777 014142
001612 001401
001614 104010

```
INIT2:  TST      2AF CAR      ; WAS CHANNEL ADDRESS REGISTER
        BEQ      .+4          ; CLEARED BY INIT
        ERROR          ; NOT CLEARED. ERROR
```

```
INIT3:  BIT      *-4,JAFCMN      ;CHECK ALL BITS EXCEPT 0 AND 1
        BEQ      .+4             ;WAS MAINTENANCE REGISTER CLEARED BY INIT
        ERROR     ;NOT CLEARED, ERROR
        SCOPE     ;CHECK FOR ITERATIONS, LOOP
```

T1: :REFERENCE DESIGNATION

```
INIT4:  MOV     #100,2AFCSR      ;SET INTERFACE ENABLE BIT
        BIT     #100,2AFCSR      ;WAS INTERFACE ENABLE SET
        BNE     .+4              ;YES, ENABLE SET
        ERROR   ;ENABLE NOT SET, ERROR
INIT5:  CLR     2AFCSR           ;CLEAR CONTROL REGISTER
        BIT     #100,2AFCSR      ;WAS ENABLE CLEARED
        BEQ     .+4
```

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DZAFAC.P11 LOGIC TEST

```

1491 001666 104010 ERROR ;ENABLE NOT CLEARED, ERROR
1492 001670 104001 SCOPE ;CHECK FOR LOOP, ITERATIONS
1493
1494
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1497
1498 001672 ;TEST THAT TIMING INHIBIT BIT CAN BE SET AND CLEARED
1499 T2: ;REFERENCE DESIGNATION
1500 001672 000003 N=N+1
1501 001700 012777 004000 014056 INIT7: MOV #4000,DAFCMN ;SET TIMING INHIBIT BIT
1502 001706 001001 004000 014050 BIT #4000,DAFCMN ;WAS TIMING INHIBIT SET
1503 001710 104010 BNE .+4
1504 001712 005077 014040 INIT8: CLR DAFCMN ;TIMING INHIBIT NOT SET, ERROR
1505 001716 032777 004000 014032 BIT #4000,DAFCMN ;CLEAR MAINTENANCE REGISTER
1506 001724 001401 BEQ .+4 ;WAS TIMING INHIBIT CLEARED
1507 001726 104010 ERROR ;TIMING INHIBIT NOT CLEARED, ERROR
1508 001730 104001 SCOPE ;CHECK FOR ITERATIONS. LOOP
1509
1510 ;ANALOG-DIGITAL CONVERTER LOGIC TESTS
1511
1512 ;TEST FOR DONE BIT SET BY
1513 ;MAINTENANCE REGISTER A-D START
1514 ;TEST FOR DONE BIT CLEARED BY
1515 ;READING A-D BUFFER
1516
1517 001732 T3: ;REFERENCE DESIGNATION
1518 000004 N=N+1
1519 001732 052767 000340 176036 ADT1: BIS #340,PS ;SET UP TIMER
1520 001740 012767 177600 013676 MOV #-200,DELAY ;START CONVERSION
1521 001746 012777 002000 014002 MOV #2000,DAFCMN ;TEST MAINTENANCE REGISTER
1522 001754 032777 002000 013774 BIT #2000,DAFCMN ;A-D START BIT
1523 001762 001001 BNE ADT1A ;START BIT NOT SET, ERROR
1524 001764 104010 ERROR ;WAIT FOR DONE BIT
1525 001766 105777 013756 ADT1A: TSTB DAFCSR
1526 001772 100404 BMI ADT1B
1527 001774 005267 013644 INC DELAY ;UPDATE TIMER
1528 002000 001372 BNE ADT1A
1529 002002 104010 ERROR ;DONE BIT DID NOT SET
1530 002004 005777 013742 ADT1B: TST DAFCDBR ;CLEAR DONE BY READING A-D BUFFER
1531 002010 105777 013734 TSTB DAFCSR ;WAS DONE CLEARED
1532 002014 100001 BPL ADT1C
1533 002016 104010 ERROR ;DONE NOT CLEARED, ERROR
1534 002020 042777 002000 013730 ADT1C: BIC #2000,DAFCMN ;CLEAR A-D START BIT
1535 002026 032777 002000 013722 BIT #2000,DAFCMN ;WAS A-D START CLEARED
1536 002034 001401 BEQ ADT1D
1537 002036 104010 ERROR ;A-D START NOT CLEARED, ERROR
1538 002040 104001 ADT1D: SCOPE ;CHECK FOR ITERATIONS. LOOP
1539
1540
1541 ;TEST FOR AN INTERRUPT WITH INTERFACE
1542 ;ENABLE CLEARED AND DONE SET
1543
1544 002042 T4: ;REFERENCE DESIGNATION
1545 000005 N=N+1
1546 002042 052767 000340 175726 ADT2: BIS #340,PS ;LOCK OUT INTERRUPTS

```

Address	Hex	Hex	Hex	Hex	Label	Assembly	Comment
1547	002057	005777	013676			TST	2AFDBA ;CLEAR DONE BIT
1548	002054	012777	002130	013662		MOV	#ADT2B,2AFCINT ;SET UP LOCAL INTERRUPT RETURN
1549	002052	016777	175710	013656		MOV	PS,2AFCPS ;SET UP INTERRUPT SERVICE LEVEL
1550	002070	005077	013654			CLR	2AFCPSR ;CLEAR CONTROL REGISTER
1551	002074	012777	002000	013654		MOV	#2000,2AFCMN ;START A-D CONVERTER
1552	002102	042767	000340	175666		BIC	#340,PS
1553	002110	105777	013634		ADT2A:	TSTB	2AFCPSR ;WAIT FOR DONE
1554	002114	100375				BPL	ADT2A
1555	002116	000240				NOP	;DELAY ONE CYCLE
1556	002120	052767	000340	175650		BIS	#340,PS
1557	002126	000407				BR	ADT2C ;NO INTERRUPT, CONTINUE
1558	002130	022626			ADT2B:	POP2SP	;RESTOR STACK
1559	002132	016777	013610	013604		MOV	AFCPS,2AFCINT ;RESTOR TRAP CATCHER
1560	002140	005077	013602			CLR	2AFCPS
1561	002144	104010				ERROR	;INTERRUPT OCCURED, ERROR
1562	002146	104001			ADT2C:	SCOPE	;CHECK FOR ITERATIONS, LOOP
1563							
1564							;IS CONTROL REGISTER BUSY BIT SET BY
1565							;STARTING A-D CONVERTER
1566							
1567	002150					T5:	;REFERENCE DESIGNATION
1568		000006				N=N+1	
1569	002150	052767	000340	175620	ADT3:	BIS	#340,PS ;LOCK OUT INTERRUPTS
1570	002156	012777	002000	013572		MOV	#2000,2AFCMN ;START A-D CONVERTER
1571	002164	005777	013550			TST	2AFCPSR ;IS BUSY SET
1572	002170	100001				BPL	ADT3A
1573	002172	104010				ERROR	;BUSY SET, ERROR
1574	002174	105777	013550		ADT3A:	TSTB	2AFCPSR ;WAIT FOR DONE
1575	002200	100375				BPL	ADT3A
1576	002202	104001				SCOPE	;CHECK FOR ITERATIONS, LOOP
1577							
1578							;IS MAINTENANCE REGISTER BUSY BIT SET BY
1579							;STARTING A-D CONVERTER
1580							
1581	002204					T6:	;REFERENCE DESIGNATION
1582		000007				N=N+1	
1583	002204	052767	000340	175564	ADT4:	BIS	#340,PS ;LOCK OUT INTERRUPTS
1584	002212	012777	002000	013536		MOV	#2000,2AFCMN ;START A-D CONVERTER
1585	002220	005777	013532			TST	2AFCMN ;IS BUSY SET
1586	002224	100001				BPL	ADT4A
1587	002226	104010				ERROR	;BUSY SET, ERROR
1588	002230	105777	013514		ADT4A:	TSTB	2AFCPSR ;WAIT FOR DONE
1589	002234	100375				BPL	ADT4A
1590	002236	104001				SCOPE	;CHECK FOR ITERATIONS, LOOP
1591							
1592							
1593							;TEST FOR INTERRUPT WITH INTERRUPT ENABLED
1594							;AND DONE SET
1595							
1596	002240					T7:	;REFERENCE DESIGNATION
1597		000010				N=N+1	
1598	002240	052767	000340	175530	ADT6:	BIS	#340,PS ;SET PROCESSOR PRIORITY=7
1599	002246	012777	002316	013470		MOV	#ADINTA,2AFCINT ;SET UP LOCAL INTERRUPT RETURN
16							

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 DZAFAC.P11 LOGIC TEST

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1603 002276 012777 002000 013452      MOV      #2000,DAFCMN      ;START A-D CONVERTER
1604 002304 105777 013440      ADT6A:  TSTB      DAFCSR      ;CHECK DONE BIT
1605 002310 100375              BPL          ADT6A
1606 002312 104010              ERROR                      ;DONE DID NOT CAUSE INTERRUPT
1607 002314 000405              BR          ADT6B
1608 002316 022626              ADINTA: POP2SP      ;RESTORE STACK POINTER
1609 002320 105777 013424      TSTB      DAFCSR
1610 002324 100401              BMI          ADT6B
1611 002326 104010              ERROR                      ;INTERRUPT WITH DONE NOT SET
1612 002330 005077 013414      ADT6B:  CLR          DAFCSR      ;CLEAR INTERRUPT ENABLE
1613 002334 016777 013406 013402  MOV      AFCPS,DAFCINT ;RESET TRAPCATCHER
1614 002342 005077 013400      CLR          DAFCPS
1615 002346 104001              SCOPE
1616
1617
1618              000007      X=7
1619              000340      STATUS=340
1620              000007      LVL=7
1621              ;NO INTERRUPT SHOULD OCCUR WITH
1622              ;PROCESSOR AT PRIORITY 7
1623              ;AND INTERRUPT ENABLED
1624
1625 002350      T10:                      ;REFERENCE DESIGNATION
1626              N=N+1
1627 002350 052767 000340 175420  ADT7:  BIS          #340,PS      ;LOCK OUT INTERRUPTS
1628 002356 005077 013366              CLR          DAFCSR      ;CLEAR CONTROL REGISTER
1629 002362 105777 013364              TSTB      DAFCDBR      ;RESET DONE BIT
1630 002366 012777 002444 013350  MOV      #ADT7B,DAFCINT ;SET UP LOCAL INTERRUPT RETURN
1631 002374 016777 175376 013344  MOV      PS,DAFCPS      ;SET UP INTERRUPT SERVICE LEVEL
1632 002402 042767 000340 175366  BIC          #340,PS      ;ENABLE INTERRUPTS
1633 002410 052767 000340 175360  BIS          #340,PS      ;SET PROCESSOR 340 TO 7
1634 002416 012777 000100 013324  MOV      #100,DAFCSR      ;ENABLE INTERFACE
1635 002424 012777 002000 013324  MOV      #2000,DAFCMN      ;START A-D CONVERTER
1636 002432 105777 013312      ADT7A:  TSTB      DAFCSR      ;WAIT FOR DONE
1637 002436 100375              BPL          ADT7A
1638 002440 000240              NOP
1639 002442 000402              BR          ADT7C      ;DELAY 1 MORE CYCLE
1640 002444 022626              ADT7B:  POP2SP      ;NO INTERRUPT, CONTINUE
1641 002446 104010              ERROR                      ;RESTORE STACK
1642 002450 005077 013274      ADT7C:  CLR          DAFCSR      ;INTERRUPT OCCURED, ERROR
1643 002454 016777 013266 013262  MOV      AFCPS,DAFCINT ;CLEAR ENABLE
1644 002462 005077 013260      CLF          DAFCPS      ;RESTORE TRAP CATCHER
1645 002466 104001              SCOPE                      ;CHECK FOR LOOP, ITERATIONS
1646              000300      STATUS=STATUS-40
1647              000006      LVL=LVL-1
1648              000010      X=X+1
1649              ;NO INTERRUPT SHOULD OCCUR WITH
1650              ;PROCESSOR AT PRIORITY 6
1651              ;AND INTERRUPT ENABLED
1652
1653 002470      T11:                      ;REFERENCE DESIGNATION
1654              N=N+1
1655 002470 052767 000340 175300  ADT10: BIS          #340,PS      ;LOCK OUT INTERRUPTS
1656 002476 005077 013246              CLR          DAFCSR      ;CLEAR CONTROL REGISTER
1657 002502 105777 013244              TSTB      DAFCDBR      ;RESET DONE BIT
1658 002506 012777 002564 013230  MOV      #ADT10B,DAFCINT ;SET UP LOCAL INTERRUPT RETURN

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1659 002514 016777 175256 013224      MOV      PS,DAFCPS      ;SET UP INTERRUPT SERVIC LEVEL
1660 002522 042767 000340 175246      BIC      #340,PS      ;ENABLE INTERRUPTS
1661 002530 052767 000300 175240      BIS      #300,PS      ;SET PROCESSOR 300 TO 6
1662 002536 012777 000100 013204      MOV      #100,DAFCSR   ;ENABLE INTERFACE
1663 002544 012777 002000 013204      MOV      #2000,DAFCMN  ;START A-D CONVERTER
1664 002552 105777 013172      ADT10A: TSTB     DAFCSR      ;WAIT FOR DONE
1665 002556 100375      BPL      ADT10A
1666 002560 000240      NOP
1667 002562 000402      BR      ADT10C      ;NO INTERRUPT, CONTINUE
1668 002564 022626      ADT10B: POP2SP      ;RESTORE STACK
1669 002566 104010      ERROR      ;INTERRUPT OCCURED, ERROR
1670 002570 005077 013154      ADT10C: CLR      DAFCSR      ;CLEAR ENABLE
1671 002574 016777 013146 013142      MOV      AFCPS,DAFCINT ;RESTORE TRAP CATCHER
1672 002602 005077 013140      CLR      DAFCPS
1673 002606 104001      SCOPE      ;CHECK FOR LOOP, ITERATIONS
1674      000240      STATUS=STATUS-40
1675      000005      LVL=LVL-1
1676      000011      X=X+1
1677      ;NO INTERRUPT SHOULD OCCUR WITH
1678      ;PROCESSOR AT PRIORITY 5
1679      ;AND INTERRUPT ENABLED
1680
1681 002610      T12:      ;REFERENCE DESIGNATION
1682      000013      N=N+1
1683 002610 052767 000340 175160      ADT11: BIS      #340,PS      ;LOCK OUT INTERRUPTS
1684 002616 005077 013126      CLR      DAFCSR      ;CLEAR CONTROL REGISTER
1685 002622 105777 013124      TSTB     DAFCDBR      ;RESET DONE BIT
1686 002626 012777 002704 013110      MOV      #ADT11B,DAFCINT ;SET UP LOCAL INTERRUPT RETURN
1687 002634 016777 175136 013104      MOV      PS,DAFCPS      ;SET UP INTERRUPT SERVIC LEVEL
1688 002642 042767 000340 175126      BIC      #340,PS      ;ENABLE INTERRUPTS
1689 002650 052767 000240 175120      BIS      #240,PS      ;SET PROCESSOR 240 TO 5
1690 002656 012777 000100 013064      MOV      #100,DAFCSR   ;ENABLE INTERFACE
1691 002664 012777 002000 013064      MOV      #2000,DAFCMN  ;START A-D CONVERTER
1692 002672 105777 013052      ADT11A: TSTB     DAFCSR      ;WAIT FOR DONE
1693 002676 100375      BPL      ADT11A
1694 002700 000240      NOP
1695 002702 000402      BR      ADT11C      ;NO INTERRUPT, CONTINUE
1696 002704 022626      ADT11B: POP2SP      ;RESTORE STACK
1697 002706 104010      ERROR      ;INTERRUPT OCCURED, ERROR
1698 002710 005077 013034      ADT11C: CLR      DAFCSR      ;CLEAR ENABLE
1699 002714 016777 013026 013022      MOV      AFCPS,DAFCINT ;RESTORE TRAP CATCHER
1700 002722 005077 013020      CLR      DAFCPS
1701 002726 104001      SCOPE      ;CHECK FOR LOOP, ITERATIONS
1702      000200      STATUS=STATUS-40
1703      000004      LVL=LVL-1
1704      000012      X=X+1
1705      ;AN INTERRUPT SHOULD OCCUR WITH
1706      ;PROCESSOR AT PRIORITY 4
1707      ;AND INTERRUPT ENABLED
1708
1709 002730      T13:      ;REFERENCE DESIGNATION
1710      000014      N=N+1
1711 002730 052767 000340 175040      ADT12: BIS      #340,PS      ;LOCK OUT INTERRUPTS
1712 002736 005077 013006      CLR      DAFCSR      ;CLEAR CONTROL REGISTER
1713 002742 105777 013004      TSTB     DAFCDBR      ;RESET DONE BIT
1714 002746 012777 003034 012770      MOV      #ADT12B,DAFCINT ;SET UP LOCAL INTERRUPT RETURN

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1715	002754	016777	175016	012764	MOV	PS, @AFCPS	;SET UPT INTERRUPT SERVICE LEVEL
1716	002762	012777	000100	012760	MOV	#100, @AFCPSR	;ENABLE INTERFACE
1717	002770	042767	000340	175000	BIC	#340, PS	;ENABLE INTERRUPTS
1718	002776	052767	000200	174772	BIS	#200, PS	;SET PROCESSOR PRIORITY TO 4
1719	003004	012777	002000	012744	MOV	#2000, @AFCMN	;START A-D CONVERTER
1720	003012	105777	012732		ADT12A: TSTB	@AFCPSR	;WAIT FOR DONE
1721	003016	100375			BPL	ADT12A	
1722	003020	000240			NOP		;DELAY 1 CYCLE
1723	003022	052767	000340	174746	BIS	#340, PS	
1724	003030	104010			ERROR		;NO INTERRUPT, ERROR
1725	003032	000401			BR	ADT12C	;GO TO LOOP CHECK
1726	003034	022626			ADT12B: POP2SP		;RESTORE STACK
1727	003036	005077	012706		ADT12C: CLR	@AFCPSR	;CLEAR CONTROL REGISTER
1728	003042	016777	012700	012674	MOV	AFCPS, @AFCINT	;RESTOR TRAP CATCHER
1729	003050	005077	012672		CLR	@AFCPS	
1730	003054	104001			SCOPE		;CHECK FOR ITERATIONS, LOOP
1731		000140			STATUS=STATUS-40		
1732		000003			LVL=LVL-1		
1733		000013			X=X+1		
1734					;AN INTERRUPT SHOULD OCCUR WITH		
1735					;PROCESSOR AT PRIORITY 3		
1736					;AND INTERRUPT ENABLED		
1737							
1738	003056				T14:		;REFERENCE DESIGNATION
1739		000015			N=N+1		
1740	003056	052767	000340	174712	ADT13: BIS	#340, PS	;LOCK OUT INTERRUPTS
1741	003064	005077	012660		CLR	@AFCPSR	;CLEAR CONTROL REGISTER
1742	003070	105777	012656		TSTB	@AFDBR	;RESET DONE BIT
1743	003074	012777	003162	012642	MOV	#ADT13B, @AFCINT	;SET UP LOCAL INTERRUPT RETURN
1744	003102	016777	174670	012636	MOV	PS, @AFCPS	;SET UPT INTERRUPT SERVICE LEVEL
1745	003110	012777	000100	012632	MOV	#100, @AFCPSR	;ENABLE INTERFACE
1746	003116	042767	000340	174652	BIC	#340, PS	;ENABLE INTERRUPTS
1747	003124	052767	000140	174644	BIS	#140, PS	;SET PROCESSOR PRIORITY TO 3
1748	003132	012777	002000	012616	MOV	#2000, @AFCMN	;START A-D CONVERTER
1749	003140	105777	012604		ADT13A: TSTB	@AFCPSR	;WAIT FOR DONE
1750	003144	100375			BPL	ADT13A	
1751	003146	000240			NOP		;DELAY 1 CYCLE
1752	003150	052767	000340	174620	BIS	#340, PS	
1753	003156	104010			ERROR		;NO INTERRUPT, ERROR
1754	003160	000401			BR	ADT13C	;GO TO LOOP CHECK
1755	003162	022626			ADT13B: POP2SP		;RESTORE STACK
1756	003164	005077	012560		ADT13C: CLR	@AFCPSR	;CLEAR CONTROL REGISTER
1757	003170	016777	012552	012546	MOV	AFCPS, @AFCINT	;RESTOR TRAP CATCHER
1758	003176	005077	012544		CLR	@AFCPS	
1759	003202	104001			SCOPE		;CHECK FOR ITERATIONS, LOOP
1760		000100			STATUS=STATUS-40		
1761		000002			LVL=LVL-1		
1762		000014			X=X+1		
1763					;AN INTERRUPT SHOULD OCCUR WITH		
1764					;PROCESSOR AT PRIORITY 2		
1765					;AND INTERRUPT ENABLED		
1766							
1767	003204				T15:		;REFERENCE DESIGNATION
1768		000016			N=N+1		
1769	003204	052767	000340	174564	ADT14: BIS	#340, PS	;LOCK OUT INTERRUPTS
1770	003212	005077	012532		CLR	@AFCPSR	;CLEAR CONTROL REGISTER

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DZAFAC.P11 LOGIC TEST

1771	003216	105777	012530		TSTB	2AFDDBR		:RESET DONE BIT
1772	003222	012777	003310	012514	MOV	#ADT14B,2AFCINT		:SET UP LOCAL INTERRUPT RETURN
1773	003230	016777	174542	012510	MOV	PS,2AFCPS		:SET UPT INTERRUPT SERVICE LEVEL
1774	003236	012777	000100	012504	MOV	#100,2AFCPS		:ENABLE INTERFACE
1775	003244	042767	000340	174524	BIC	#340,PS		:ENABLE INTERRUPTS
1776	003252	052767	000100	174516	BIS	#100,PS		:SET PROCESSOR PRIORITY TO 2
1777	003260	012777	002000	012470	MOV	#2000,2AFCMN		:START A-D CONVERTER
1778	003266	105777	012456		ADT14A: TSTB	2AFCPS		:WAIT FOR DONE
1779	003272	100375			BPL	ADT14A		
1780	003274	000240			NOP			:DELAY 1 CYCLE
1781	003276	052767	000340	174472	BIS	#340,PS		
1782	003304	104010			ERROR			:NO INTERRUPT, ERROR
1783	003306	000401			BR	ADT14C		:GO TO LOOP CHECK
1784	003310	022626			ADT14B: POP2SP			:RESTORE STACK
1785	003312	005077	012432		ADT14C: CLR	2AFCPS		:CLEAR CONTROL REGISTER
1786	003316	016777	012424	012420	MOV	AFCPS,2AFCINT		:RESTOR TRAP CATCHER
1787	003324	005077	012416		CLR	2AFCPS		
1788	003330	104001			SCOPE			:CHECK FOR ITERATIONS, LOOP
1789		000040			STATUS=STATUS-40			
1790		000001			LVL=LVL-1			
1791		000015			X=X+1			
1792					:AN INTERRUPT SHOULD OCCUR WITH			
1793					:PROCESSOR AT PRIORITY 1			
1794					:AND INTERRUPT ENABLED			
1795								
1796	003332				T16:			:REFERENCE DESIGNATION
1797		000017			N=N+1			
1798	003332	052767	000340	174436	ADT15: BIS	#340,PS		:LOCK OUT INTERRUPTS
1799	003340	005077	012404		CLR	2AFCPS		:CLEAR CONTROL REGISTER
1800	003344	105777	012402		TSTB	2AFDDBR		:RESET DONE BIT
1801	003350	012777	003436	012366	MOV	#ADT15B,2AFCINT		:SET UP LOCAL INTERRUPT RETURN
1802	003356	016777	174414	012362	MOV	PS,2AFCPS		:SET UPT INTERRUPT SERVICE LEVEL
1803	003364	012777	000100	012356	MOV	#100,2AFCPS		:ENABLE INTERFACE
1804	003372	042767	000340	174376	BIC	#340,PS		:ENABLE INTERRUPTS
1805	003400	052767	000040	174370	BIS	#40,PS		:SET PROCESSOR PRIORITY TO 1
1806	003406	012777	002000	012342	MOV	#2000,2AFCMN		:START A-D CONVERTER
1807	003414	105777	012330		ADT15A: TSTB	2AFCPS		:WAIT FOR DONE
1808	003420	100375			BPL	ADT15A		
1809	003422	000240			NOP			:DELAY 1 CYCLE
1810	003424	052767	000340	174344	BIS	#340,PS		
1811	003432	104010			ERROR			:NO INTERRUPT, ERROR
1812	003434	000401			BR	ADT15C		:GO TO LOOP CHECK
1813	003436	022626			ADT15B: POP2SP			:RESTORE STACK
1814	003440	005077	012304		ADT15C: CLR	2AFCPS		:CLEAR CONTROL REGISTER
1815	003444	016777	012276	012272	MOV	AFCPS,2AFCINT		:RESTOR TRAP CATCHER
1816	003452	005077	012270		CLR	2AFCPS		
1817	003456	104001			SCOPE			:CHECK FOR ITERATIONS, LOOP
1818		000000			STATUS=STATUS-40			
1819		000000			LVL=LVL-1			
1820		000016			X=X+1			
1821					:AN INTERRUPT SHOULD OCCUR WITH			
1822					:PROCESSOR AT PRIORITY 0			
1823					:AND INTERRUPT ENABLED			
1824								
1825	003460				T17:			:REFERENCE DESIGNATION
1826		000020			N=N+1			

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 LOGIC TEST

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000000 000340 052767 000340 174310 ADT16: BIS #340,PS ;LOCK OUT INTERRUPTS
000001 000340 000340 000340 000340 CLR #AFCSR ;CLEAR CONTROL REGISTER
000002 000340 000340 000340 000340 TSTB #AFDBR ;RESET DONE BIT
000003 000340 000340 000340 000340 MOV #ADT16B, #AFPCINT ;SET UP LOCAL INTERRUPT RETURN
000004 000340 000340 000340 000340 MOV PS, #AFPCPS ;SET UPT INTERRUPT SERVICE LEVEL
000005 000340 000340 000340 000340 MOV #100, #AFCSR ;ENABLE INTERFACE
000006 000340 000340 000340 000340 BIC #340,PS ;ENABLE INTERRUPTS
000007 000340 000340 000340 000340 BIS #0,PS ;SET PROCESSOR PRIORITY TO 0
000008 000340 000340 000340 000340 MOV #2000, #AFPCMN ;START A-D CONVERTER
000009 000340 000340 000340 000340 TSTB #AFCSR ;WAIT FOR DONE
000010 000340 000340 000340 000340 BPL ADT16A ;DELAY 1 CYCLE
000011 000340 000340 000340 000340 NOP ;NO INTERRUPT, ERROR
000012 000340 000340 000340 000340 BIS #240,PS ;GO TO LOOP CHECK
000013 000340 000340 000340 000340 ERROR ADT16C ;RESTORE STACK
000014 000340 000340 000340 000340 BR ADT16C ;CLEAR CONTROL REGISTER
000015 000340 000340 000340 000340 ADT16B: POP2SP ;RESTOR TRAP CATCHER
000016 000340 000340 000340 000340 ADT16C: CLR #AFCSR ;CHECK FOR ITERATIONS, LOOP
000017 000340 000340 000340 000340 MOV #AFPCPS, #AFPCINT
000018 000340 000340 000340 000340 CLR #AFPCPS
000019 000340 000340 000340 000340 SCOPE
000020 000340 000340 000340 000340 STATUS=STATUS-40
000021 000340 000340 000340 000340 LVL=LVL-1
000022 000340 000340 000340 000340 X=X+1

```

:TEST FOR INTERRUPT ON INTERRUPT ENABLED
 :AFTER DONE SET AND PROCESSOR PRIORITY=0

```

000023 000340 000340 000340 000340 T20: ;REFERENCE DESIGNATION
000024 000340 000340 000340 000340 N=N+1
000025 000340 000340 000340 000340 ADT20T1: BIS #340,PS ;LOCK OUT INTERRUPTS
000026 000340 000340 000340 000340 MOV #ADINTJ, #AFPCINT ;SET UP LOCAL INTERRUPT RETURN
000027 000340 000340 000340 000340 MOV PS, #AFPCPS ;SET UP INTERRUPT SERVICE LEVEL
000028 000340 000340 000340 000340 BIC #340,PS ;ALLOW INTERRUPTS
000029 000340 000340 000340 000340 MOV #2000, #AFPCMN ;START A-D CONVERTER
000030 000340 000340 000340 000340 ADT20A: TSTB #AFCSR ;WAIT FOR DONE
000031 000340 000340 000340 000340 BPL ADT20A
000032 000340 000340 000340 000340 MOV #100, #AFCSR ;ENABLE INTERFACE
000033 000340 000340 000340 000340 NOP ;DELAY 1 CYCLE
000034 000340 000340 000340 000340 BIS #340,PS ;LOCK OUT INTERRUPTS
000035 000340 000340 000340 000340 ERROR ADT20B ;INTERRUPT DID NOT OCCUR, ERROR
000036 000340 000340 000340 000340 BR ADT20B ;CONTINUE
000037 000340 000340 000340 000340 ADINTJ: POP2SP ;RESTORE STACK, INTERRUPT OCCURE
000038 000340 000340 000340 000340 ADT20B: CLR #AFCSR ;CLEAR CONTROL REGISTER
000039 000340 000340 000340 000340 MOV #AFPCPS, #AFPCINT ;RESTORE TRAPCATCHER
000040 000340 000340 000340 000340 CLR #AFPCPS
000041 000340 000340 000340 000340 SCOPE ;CHECK FOR ITERATIONS, LOOP

```

:MULTIPLEXER LOGIC TESTS
 :VERIFY A-D DONE IS SET BY
 :STARTING MULTIPLEXER

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000042 000340 000340 000340 000340 T21: ;REFERENCE DESIGNATION
000043 000340 000340 000340 000340 N=N+1
000044 000340 000340 000340 000340 MXT1: BIC #340,PS ;LOCK OUT INTERRUPTS

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C04

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 DZAFAC.P.1 LOGIC TEST

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1893 003724 005067 011714 CLR DELAY :CLEAR TIMER
1894 003730 005077 012014 CLR JAFCSR :CLEAR CONTROL REGISTER
1895 003734 005077 012016 CLR JAFCMN :CLEAR MAINTENANCE REGISTER
1896 003740 005077 012018 CLR JAFCAR :START MULTIPLEXER TIMING
1897 003744 105777 012000 MXT1A: TSTB JAFCSR :WAIT FOR DONE
1898 003750 104004 BMI MXT1B
1899 003752 005267 011666 INC DELAY :DONE NOT SET, UPDATE TIMER
1900 003756 001372 CONTINUE
1901 003760 104010 ERROR :DONE DID NOT SET BEFORE TIME OUT, ERROR
1902 003762 005777 011754 MXT1B: TST JAFDBR :CLEAR DONE BIT
1903 003766 104001 SCOPE :CHECK FOR ITERATIONS, LOOP

:TEST FOR CONTROL REGISTER BUSY
:BIT SET BY STARTING MULTIPLEXER
:AND FOR BUSY BEING CLEARED BY A-D DONE

1904 003770 T22: :REFERENCE DESIGNATION
1905 000023 N=N+1
1906 003770 042767 000340 174000 MXT2: BIC #340,PS :LOCK OUT INTERRUPTS
1907 003776 005077 011752 CLR JAFCAR :START MULTIPLEXER
1908 004002 005777 011742 TST JAFCSR :IS BUSY BIT SET
1909 004006 100401 BMI MXT2A
1910 004010 104010 ERROR :BUSY NOT SET, ERROR
1911 004012 105777 011732 MXT2A: TSTB JAFCSR :WAIT FOR DONE
1912 004016 100375 BPL MXT2A
1913 004020 005777 011724 TST JAFCSR :DID BUSY CLEAR
1914 004024 100001 BPL MXT2B :WHEN DONE WAS SET
1915 004026 104010 ERROR :BUSY STILL SET, ERROR
1916 004030 005777 011716 MXT2B: TST JAFDBR :CLEAR DONE BIT
1917 004034 104001 SCOPE :TEST FOR ITERATIONS, LOOP

:TEST FOR MAINTENANCE REGISTER BUSY
:BIT SET BY STARTING MULTIPLEXER
:AND FOR BUSY RESET BY A-D DONE

1918 004036 T23: :REFERENCE DESIGNATION
1919 000024 N=N+1
1920 004036 042767 000340 173732 MXT3: BIC #340,PS :ENABLE INTERRUPTS
1921 004044 005077 011700 CLR JAFCSR :CLEAR CONTROL REGISTER
1922 004050 005777 011676 TST JAFDBR :CLEAR DONE BIT
1923 004054 005077 011674 CLR JAFCAR :START MULTIPLEXER
1924 004060 005777 011672 TST JAFCMN :IS BUSY SET
1925 004064 100401 BMI MXT3A
1926 004066 104010 ERROR :BUSY NOT SET, ERROR
1927 004070 105777 011654 MXT3A: TSTB JAFCSR :WAIT FOR DONE
1928 004074 100375 BPL MXT3A
1929 004076 005777 011654 TST JAFCMN :WAS BUSY CLEARED
1930 004102 100001 BPL MXT3B :WHEN DONE SET
1931 004104 104010 ERROR :BUSY STILL SET, ERROR
1932 004106 005777 011640 MXT3B: TST JAFDBR :CLEAR DONE BIT
1933 004112 104001 SCOPE :CHECK FOR ITERATIONS, LOOP

:DOES BIT 11 OF MAINTENANCE REGISTER
:INHIBIT MULTIPLEXER TIMING

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1939
1940 004114 T24: ;REFERENCE DESIGNATION
1941 000025 N=N+1
1942 004114 042767 000340 173654 MXT4: BIC #340,PS ;ENABLE INTERRUPTS
1943 004122 005077 011622 CLR JAFCSR ;CLEAR CONTROL REGISTER
1944 004126 005067 011512 CLR DELAY ;CLEAR TIMER
1945 004132 012777 004000 011616 MOV #4000,JAFCMN ;SET TIMING INHIBIT
1946 004140 005077 011610 CLR JAFCAR ;START MULTIPLEXER
1947 004144 005777 011600 TST JAFCSR ;IS BUSY SET
1948 004150 100001 BPL MXT4A
1949 004152 104010 ERROR ;BUSY SET, TIMING NOT INHIBITED
1950 004154 005777 011576 MXT4A: TST JAFCMN ;IS MAINTENANCE BUSY SET
1951 004150 100001 BPL MXT4B
1952 004162 104010 ERROR ;MAINTENANCE BUSY SET, ERROR
1953 004164 005267 011454 MXT4B: INC DELAY ;UPDATE TIMER
1954 004170 001375 BNE MXT4B
1955 004172 105777 011552 TSTB JAFCSR ;IS DONE SET
1956 004176 100003 BPL MXT4C
1957 004200 104010 ERROR ;DONE SET, ERROR
1958 004202 005777 011544 TST JAFDBR ;CLEAR DONE BIT
1959 004206 104001 MXT4C: SCOPE ;CHECK FOR LOOP, ITERATIONS
1960
1961 ;RUN A COUNT PATTERN THRU THE CHANNEL ADDRESS REGISTER
1962 ;AND VERIFY THAT ALL PATTERNS CAN BE SET AND CLEARED
1963
1964
1965 004210 T25: ;REFERENCE DESIGNATION
1966 000026 N=N+1
1967 004210 042767 000340 173560 CAT2: BIC #340,PS ;ENABLE INTERRUPTS
1968 004216 012777 004000 011532 MOV #4000,JAFCMN ;SET TIMING INHIBIT
1969 004224 005077 011520 CLR JAFCSR ;CLEAR CONTROL REGISTER
1970 004230 005777 011516 TST JAFDBR ;CLEAR DONE
1971 004234 005005 CLR R5 ;CLEAR EXPECTED RESULT
1972 004236 005077 011512 CLR JAFCAR ;START AT 0
1973 004242 032705 004000 CAT2A: BIT #4000,R5 ;EXCLUDE BIT 11 FROM TEST
1974 004246 001402 BEQ CAT2B
1975 004250 062705 004000 ADD #4000,R5
1976 004254 005705 CAT2B: TST R5 ;EXCLUDE BIT 15 FROM TEST
1977 004256 100422 BMI CAT2E
1978 004260 005077 011470 CAT2L: BIS R5,JAFCAR ;SET CHANNEL ADDRESS REGISTER
1979 004264 017704 011464 MOV JAFCAR,R4 ;READ CHANNEL ADDRESS REGISTER
1980 004270 020504 CMP R5,R4 ;ARE EXPECTED AND RECEIVED
1981 004272 001403 BEQ CAT2C ;REGISTERS THE SAME
1982 004274 104000 ERRORC ;CHANNEL ADDRESS
1983 004276 104002 SCOPEF ;CHECK FOR LOOP ON SAME DATA
1984 004300 004260 CAT2L
1985 004302 040577 011446 CAT2C: BIC R5,JAFCAR ;CLEAR SELECTED BITS
1986 004306 005777 011442 TST JAFCAR ;WERE SELECTED BITS CLEARED
1987 004312 001403 BEQ CAT2D
1988 004314 104010 ERROR ;CHANNEL ADDRESS ERROR
1989 004316 104002 SCOPEF ;CHECK FOR LOOP WITH SAME DATA
1990 004320 004260 CAT2L
1991 004322 005205 CAT2C: INC R5 ;UPDATE DATA PATTERN
1992 004324 104001 CAT2E: SCOPE ;CHECK FOR ITERATIONS, LOOP
1993
1994

```

:DATA REPEATABILITY TEST PARAMETER SETUP

1995									
1996									
1997	004326	012767	000001	011440	REPETE:	MOV	#1,CPFLG		:ACCEPT CONTROL P INTERRUPTS
1998	004334	005067	011334			CLR	PASSC		:CLEAR PASS COUNT
1999	004340	005067	011324			CLR	ECONTL		:CLEAR ERROR COUNTERS
2000	004344	005067	011322			CLR	ECONTH		
2001	004350	012767	004356	011412		MOV	#REPETP,CPRET		:SET UP CONTROL P RETURN
2002	004356	104026			REPETP:	DISPAT			:GET KEYBOARD COMMAND
2003	004360	014110				REPLST			:POINTER TO COMMAND LIST
2004	004362	000775				BR	REPETP		:GET ANOTHER COMMAND
2005	004364	012777	000100	011366	REPETA:	MOV	#100,ATKCSR		:ENABLE KEYBOARD INTERRUPTS
2006	004372	012767	014162	011264		MOV	#REPPAR,POINT1		:GET INITIALIZATION PARAMETERS
2007	004400	016700	011260		REPETC:	MOV	POINT1,RO		:GET PARAMETER TO BE INPUT
2008	004404	005710				TST	(RO)		:IF 0, INITIALIZATION IS FINISHED
2009	004406	001412				BEQ	REPETB		:START TEST
2010	004410	016746	173362			MOV	PS,-(SP)		:PUT PRESENT PROCESSOR PRIORITY ON STACK
2011	004414	012746	004424			MOV	#REPTRN,-(SP)		:PUT SUBROUTINE ROUTINE RETURN ON STACK
2012	004420	000170	000000			JMP	3(RO)		:GO TO SUBROUTINE
2013	004424	062767	000002	011232	REPTRN:	ADD	#2,POINT1		:UPDATE POINTER
2014	004432	000762				BR	REPETC		:CONTINUE INITIALIZATION
2015	004434	012777	000100	011316	REPETB:	MOV	#100,ATKCSR		:ENABLE KEYBOARD INTERRUPTS

:DATA REPEATABILITY TEST

2016									
2017									
2018	004442	005067	011340		REPETR:	CLR	REPFLG		:CLEAR AVERAGE FLAG
2019	004446	005067	011222			CLR	PASSC		:CLEAR PASS COUNT
2020	004452	005067	011212			CLR	ECONTL		:CLEAR ERROR COUNTERS
2021	004456	005067	011210			CLR	ECONTH		
2022	004462	104003				TYPE			:TYPE "R" TO INDICATE
2023	004464	013514				MR			:THAT TEST HAS STARTED
2024	004466	005767	011314		REPET:	TST	REPFLG		:HAS AVERAGE BEEN TAKEN
2025	004472	001002				BNE	REPETS		:NO, GET AVERAGE FOR EACH CHANNEL
2026	004474	004767	000414			JSR	PC,REPAVG		:GET AVERAGES FOR EACH CHANNEL
2027	004500	012767	000144	011154	REPETS:	MOV	#100,CNTR5		:SET UP FOR 100 PASSES

:INPUT 1 SAMPLE ON EACH CHANNEL

2028									
2029									
2030	004506	016767	011204	011136	REPET1:	MOV	LOCHAN,OUTCHN		:SET UP ADDRESS AND GAIN SELECTION
2031	004514	056767	011166	011130		BIS	LOGAIN,OUTCHN		:WORD FOR FIRST CHANNEL
2032	004522	016767	011210	011130		MOV	CHNCNT,CNTR4		:GET COUNT OF CHANNELS TO BE TESTED
2033	004530	016767	011206	011126		MOV	SAMTAB,POINT1		:SET UP POINTER FOR STORAGE OF INDIVIDUAL SAMPLE
2034	004536	005077	011206			CLR	2AFCSR		:CLEAR CONTROL REGISTER
2035	004542	005077	011210			CLR	2AFCHN		:CLEAR MAINTENANCE REGISTER
2036	004546	016777	011100	011200	REPET2:	MOV	OUTCHN,2AFCAR		:SELECT FIRST CHANNEL
2037	004554	105777	011170		REPET3:	TSTB	2AFCSR		:WAIT FOR DONE FLAG
2038	004560	100375				BPL	REPET3		:DONE NOT SET
2039	004562	017777	011164	011074		MOV	2AFDBR,2POINT1		:READ A-D BUFFER, STORE DATA
2040	004570	062767	000002	011066		ADD	#2,POINT1		:INCREMENT STORAGE POINTER
2041	004576	005267	011050			INC	OUTCHN		:INCREMENT CHANNEL TO BE SAMPLED
2042	004602	005367	011052			DEC	CNTR4		:DECREMENT CHANNEL COUNT
2043	004606	001357				BNE	REPET2		:CONTINUE IF NOT DONE

:COMPARE SAMPLE AND AVERAGE FOR SAME CHANNEL

2044									
2045									
2046	004610	012767	016504	011046		MOV	#DATAB,POINT1		:SET UP POINTER TO AVERAGES

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 224FAC.P11 LOGIC TEST

2051	004616	016767	011120	011042	MOV	SAMTAB.POINT2	:SET UP POINTER TO SAMPLES
2052	004624	016767	011105	011026	MOV	CHNCNT,CNTR4	:SET UP COUNT OF COMPARISONS
2053	004632	016767	011060	011012	MOV	LOCHAN,OUTCHN	:SET UP CHANNEL NUMBER FOR ERROR REPORT
2054	004640	017704	011020		REPET4: MOV	QPOINT1,R4	:GET AVERAGE OF CHANNEL
2055	004644	167704	011016		SUB	QPOINT2,R4	:SUBTRACT SAMPLE FOR THAT CHANNEL
2056	004650	005704			TST	R4	:GET ABSOLUTE VALUE OF DIFFERENCE
2057	004652	002001			SGE	REPE4A	
2058	004654	005404			NEG	R4	
2059	004656	016701	011046		REPE4A: MOV	ADRES,R1	:CORRECT DIFFERENCE
2060	004662	006001			REPE4B: ROR	R1	:BETWEEN AVERAGE AND SAMPLE
2061	004664	103402			BCS	REPE4C	:FOR A-D RESOLUTION
2062	004666	006004			ROR	R4	
2063	004670	000774			BR	REPE4B	
2064	004672	020467	011042		REPE4C: CMP	R4, RERES	:COMPARE DIFFERENCE TO PRESET
2065	004676	003027			BGT	REPERR	:LIMITS, IF DIFFERENCE > LIMIT, ERROR
2066	004700	062767	000002	010756	REPETS: ADD	#2, POINT1	:UPDATE POINTER TO AVERAGE
2067	004706	062767	000002	010752	ADD	#2, POINT2	:UPDATE POINTER TO SAMPLE
2068	004714	005267	010732		INC	OUTCHN	:UPDATE CHANNEL NUMBER
2069	004720	005367	010734		DEC	CNTR4	:DECREMENT CHANNEL COUNT
2070	004724	001345			BNE	REPET4	:CONTINUE IF NOT 0
2071	004726	005367	010730		DEC	CNTR5	:DECREMENT TEST COUNT
2072	004732	001265			BNE	REPET1	:TAKE ANOTHER SET OF SAMPLES IF NOT 0
2073	004734	005267	010734		INC	PASSC	:UPDATE PASS COUNT
2074	004740	032767	000100	172622	BIT	#100, SWR	:IF SW06=1
2075	004746	001247			BNE	REPET	:SUPPRESS TYPING "REPET"
2076	004750	104003			TYPE	"REPET"	:TYPE "REPET" TO INDICATE
2077	004752	013464			MREPET		:THAT 100 TESTS HAVE BEENN
2078	004754	000644			BR	REPET	:ON EACH CHANNEL; CONTINUE
2079							
2080							
2081							
2082							
2083	004756	005767	011014		REPERR: TST	CRFLG	:IF CONTROL R FLAG IS
2084	004762	001016			BNE	REPET7	:SET, DO NOT PRINT ERROR
2085	004764	104011			BCDASC		:OUTPUT CHANNEL NUMBER
2086	004766	000001			I		
2087	004770	015652			OUTCHN		
2088	004772	017767	010656	001156	MOV	QPOINT1,DATA1	:GET AVERAGE FOR CHANNEL
2089							
2090	005000	017767	010662	001152	MOV	QPOINT2,DATA2	:GET SMAPLE ON THAT CHANNEL
2091	005006	104022			DECBCC		:OUTPUT
2092	005010	000002			2		
2093	005012	006156			DATA1		
2094	005014	006160			DATA2		
2095	005016	000730			BR	REPETS	:CONTINUE
2096	005020	005267	010644		REPET7: INC	ECONTL	:UPDATE ERROR COUNTER
2097	005024	100325			BPL	REPETS	:CONTINUE
2098	005026	005067	010636		CLR	ECONTL	:CLEAR LOW COUNT
2099	005032	005267	010634		INC	ECONTH	:UPDATE HIGH COUNT
2100	005036	000720			BR	REPETS	:CONTINUE
2101							
2102							
2103							
2104							
2105	005040	104003			REPORT: TYPE		:TYPE "PASSES"
2106	005042	013602			MPASS		

;REPORT ERRORS AFTER CONTROL R

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 DZAFAC.P11 LOGIC TEST

2107	005044	104027		BUDASN		:OUTPUT NUMBER OF PASSES
2108	005046	000001		1		
2109	005050	015674		PASSC		
2110	005052	104003		TYPE		:TYPE "TOTAL ERRORS"
2111	005054	013614		MERROR		
2112	005056	005767	010610	TST	ECONTH	:IS HIGH COUNT 0
2113	005062	001407		SEQ	REPORT1	
2114	005064	104023		BCDASD		:CONVERT LOW AND HIGH COUNTS
2115						
2116	005066	000001		1		:AND OUTPUT
2117	005070	015672		ECONTH		
2118	005072	104023		BCDASC		
2119	005074	000001		1		
2120	005076	015670		ECONTH		
2121	005100	000403		BR	REPORT2	:CONTINUE
2122	005102	104027		REPORT1: BCDASN		:OUTPUT LOW COUNT
2123	005104	000001		1		
2124	005106	015670		ECONTH		
2125	005110	000167	:77242	REPORT2: JMP	REPETP	:GET NEW COMMAND
2126						
2127						
2128						
2129						
2130						
2131						
2132						
2133						
2134						
2135						
2136						
2137						
2138						
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2158						
2159						
2160						
2161						
2162						

:INPUT AVERAGES FOR REPEATABILITY TEST							
005114	012767	000001	010664	REPAVG:	MOV	#1, REPFLG	:SET AVERAGE TAKEN FLAG
005122	005077	010622			CLR	DAFCR	:CLEAR CONTROL REGISTER
005126	005077	010624			CLR	DAFCMN	:CLEAR MAINTENANCE REGISTER
005132	012704	016504			MOV	#DATAB, R4	:SET UP PCINTER TO STORE AVERAGES
005136	016703	010574			MOV	CHNCNT, R3	:GET NUMBER OF AVERAGES TO BE TAKE
005142	005077	010602			CLR	DAFCR	:CLEAR CONTROL REGISTER
005146	005077	010604			CLR	DAFCMN	:CLEAR MAINTENANCE REGISTER
005152	005024			REPAVA:	CLR	(R4)+	:CLEAR AVERAGE TABLE
005154	005024				CLR	(R4)+	
005156	005303				DEC	R3	
005160	001374				BNE	REPAVA	
005162	016767	010514	010472		MOV	SAMPLE, CNTR5	:GET NUMBER OF SAMPLES FOR EACH CHANNEL
005170	016767	010542	010462	REPAV1:	MOV	CHNCNT, CNTR4	:GET CHANNEL COUNT
005176	012704	016504			MOV	#DATAB, R4	:SET UP POINTER FOR AVERAGE STORAGE
005202	016767	010510	010442		MOV	LOCHAN, OUTCHN	:GET ADDRESS OF FIRST CHANNEL
005210	056767	010472	010434		BIS	LOGAIN, OUTCHN	:GET GAIN FOR SAMPLING
005216	016777	010430	010530	REPAVB:	MOV	OUTCHN, DAFCAR	:SAMPLE THE CHANNEL
005224	105777	010520		REPAVC:	TSTB	DAFCR	:WAIT FOR MULTIPLEXER
005230	100375				BPL	REPAVC	:TO FINISH
005232	017703	010514			MOV	DAFDBR, R3	:READ A-D CONVERTER BUFFER
005236	062703	020000			ADD	#20000, R3	:SCALE UP TO COREE
005242	000257				CLCVNZ		:FOR NEGATIVE VALUES
005244	060324				ADD	R3, (R4)+	:FORM PARTIAL SUM
005246	005524				ADC	(R4)+	
005250	005267	010371			INC	OUTCHN	:GO TO NEXT CHANNEL
005254	005367	010400			DEC	CNTR4	:ALL CHANNELS DONE
005260	001356				BNE	REPAVB	:NO, SAMPLE NEXT CHANNEL
005262	005357	010374			DEC	CNTR5	:ARE ALL SAMPLES TAKEN
005266	001340				BNE	REPAV1	:NO, GET MORE
005270	016767	010442	010362		MOV	CHNCNT, CNTR4	:ALL SAMPLES DONE, GET CHANNEL COUNT
005276	012704	016504			MOV	#DATAB, R4	:GET POINTER TO TOTALS
005302	012703	016504			MOV	#DATAB, R3	
005306	016767	010370	010176	REPAVD:	MOV	SAMPLE, DIVIS	:SET UP TO GENERATE AVERAGES

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 02AFAC.P11 LOGIC TEST

2163	005314	012467	010166		MOV	(R4)+,DIVIDL	:GET GRAND TOTAL FOR CHANNEL
2164	005320	012467	010164		MOV	(R4)+,DIVIDH	
2165	005324	104016			DIVIDU		:DIVIDE BY SAMPLES TO GET AVERAGE
2166	005326	006367	010156		ASL	REMAND	:ROUND OF RESULT
2167	005332	005767	010152		TST	REMAND	
2168	005336	100404			BMI	REPAV3	
2169	005340	026767	010144	010334	CMP	REMAND,SAMPLE	
2170	005346	002402			BLT	REPAV4	
2171	005350	005267	010132		INC	QUOT	
2172	005354	162767	020000	010124	REPAV3: SUB	*20000,QUOT	:CORRECT SIGN OF RESULT
2173	005362	036767	010344	010116	REPAV4: BIT	ADBIT,QUOT	:CORRECT AVERAGE FOR
2174	005370	001406			BEQ	REPAV5	:A-D RESOLUTION
2175	005372	066767	010334	010106	ADD	ADBIT,QUOT	
2176	005400	046767	010330	010100	BIC	ADMSK,QUOT	
2177	005406	016723	010074		REPAV5: MOV	QUOT,(R3)+	:SAVE AVERAGE
2178	005412	005367	010242		DEC	CNTR4	:ALL AVERAGES COMPUTED
2179	005416	001333			SNE	REPAVD	:IF NOT, CONTINUE
2180	005420	000207			R+S	PC	:RETURN
2181							
2182							

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 DZAFAC.F11 A-D CONVERTER CAL

```

2183          .SBTTL  A-D CONVERTER CAL
2184
2185
2186          ;A-D CONVERTER CLAIBRATION
2187
2188 005422 104003      ADCAL:  TYPE
2189 005424 013514      MR
2190
2191 005426 005067 010342      CLR      CPFLG
2192 005432 005067 010340      CLR      CRFLG
2193 005436 012777 005522 010300      MOV      #ADCALI,DAFCINT
2194 005444 005077 010276      CLR      DAFCPS
2195 005450 012777 000100 010302      ADCALI: MOV      #100,ATKCSR
2196 005456 012777 004000 010272      MOV      #4000,DAFCMN
2197 005464 012777 000100 010356      MOV      #100,DAFCSR
2198 005472 005067 172300      CLR      PS
2199 005476 012777 002000 010252      MOV      #2000,DAFCMN
2200 005504 000001      WAIT
2201 005506 032767 000001 172054      BIT      #1,SWR
2202 005514 001755      BEQ      ADCALI
2203 005516 000167 173660      JMP      MONIT
2204 005522 017700 010224      ADCALI: MOV      DAFCDBR,RO
2205 005526 032767 000040 172034      BIT      #40,SWR
2206 005534 001002      BNE      ADCALT
2207 005536 000005      RES
2208 005540 000002      RTI
2209 005542 010067 000010      ADCALT: MOV      %0,ADCALN
2210 005546 104005      OCTASC
2211 005550 000001      !
2212 005552 005556      ADCALN
2213 005554 000002      RTI
2214 005556 000000      ADCALN:000000
2215
2216
2217

```

;TYPE R TO INDICATE
 ;THAT TEST IS RUNNING

;IGNORE CONTROL P AND
 ;CONTROL R INTERRUPTS
 ;SET UP INTERRUPT VECTOR
 ;AND PROCESSOR STATUS
 ;ENABLE KEYBOARD INTERRUPTS
 ;INHIBIT MUX TIMING
 ;ENABLE AFC INTERRUPTS
 ;CLEAR PROCESSOR STATUS
 ;START A-D CONVERTER
 ;WAIT FOR INTERRUPT
 ;IF SW00=1, RETURN TO
 ;KEYBOARD CONTROL
 ;RETURN TO MONITOR
 ;GET DATA
 ;DISPLAY OR TYPE OUT DATA

;DISPLAY DATA

;SET UP FOR TYPEOUT
 ;GOTO TYPEOUT ROUTINE
 ;WORD COUNT
 ;DATA TO BE TYPED
 ;RETURN

.SBTTL AMCAL

; SWITCH GAIN AMPLIFIER CALIBRATION

```

2218
2219
2220
2221
2222
2223 005560 C12767 005600 010202 AMCAL: MOV #AMCALP,CPRET ;SET UP CONTROL P
2224 005566 012767 000001 010200 AMCAL: MOV #1,CPFLG ;RETURN
2225 005574 005067 010176 AMCALP: CLR CRFLG ;INGNORE CONTROL R INTERRUPT
2226 005600 104017 AMCALP: SUAD ;GET ADDRESS OF AMPLIFIER
2227 005602 104003 AMCALP: TYPE ;TYPE "R" TO INDICATE THAT TEST IS RUNNING
2228 005604 013514 MR
2229 005606 016767 010066 010036 AMCAL: MOV SYSUNB,OUTCHN ;GET ADDRESS OF AMPLIFIER
2230 005614 012777 000100 010136 AMCAL: MOV #100,ATKCSR ;ENABLE KEYBOARD INTERRUPTS
2231 005622 005077 010130 AMCAL: CLR JAFCHN ;ENABLE MUX TIMING
2232 005626 005077 010116 AMCAL: CLR JAFCSR ;DISABLE MUX INTERRUPTS
2233 005632 005067 010144 AMCAL: CLR GFLG ;CLEAR HIGH GAIN FLAG
2234 005636 005067 172134 AMCAL: CLR PS ;ENABLE INTERRUPTS
2235 005642 032767 000200 171720 AMPG0: BIT #200,SWR ;IFSW10=1, DO GAINS OF
2236 005650 001007 AMPC2: BNE AMPC2 ;50 AND 1000
2237 005652 012767 070000 010026 AMPC1: MOV #70000,LOGAIN ;SETUP FOR GAINS OF
2238 005660 012767 050000 010026 AMPC1: MOV #50000,HIGAIN ;1 AND 20
2239 005666 000405 AMPC2: BR AMPG01 ;SET GAIN AND ADDRESS AMPLIFIER
2240 005670 012767 030000 010010 AMPC2: MOV #30000,LOGAIN ;SET UP FOR GAINS OF
2241 005676 005067 010012 AMPC2: CLR HIGAIN ;50 AND 1000
2242 005702 005767 010074 AMPG01: TST GFLG ;HAS HIGHER GAIN BEEN DONE
2243 005706 001016 AMPG01: BNE HIOUT ;IF NOT, DO IT
2244 005710 005267 C10066 AMPG01: INC GFLG ;SET HIGH GAIN FLAG
2245 005714 016705 007766 AMPG01: MOV LOGAIN,R5 ;SET UP TO DO LOW GAIN
2246 005720 056705 007726 AMPG01: BIS OUTCHN,R5 ;SET CHANNEL
2247 005724 010577 010024 AMPG02: MOV R5,JAFCAR ;ADDRESS AMPLIFIER
2248 005730 012703 020000 AMPG02: MOV #20000,R3 ;WAIT FOR CHANNEL TO SETTLE
2249 005734 005303 AMPG02: DEC R3
2250 005736 001376 AMPG02: BNE .-2
2251
2252 005740 000167 177676 HIOUT: JMP AMPG0 ;DO NEXT GAIN
2253 005744 016705 007744 HIOUT: MOV HIGAIN,R5 ;DO HIGH GAIN
2254 005750 056705 007676 HIOUT: BIS OUTCHN,R5
2255 005754 005067 010022 HIOUT: CLR GFLG
2256 005760 000761 HIOUT: BR AMPG02
2257
2258
2259
2260
2261

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 DZAFAC.P11 MONOT

```

2262          .SBTTL  MONOT
2263
2264
2265          ;A-D CONVERTER MONOTONICITY TEST
2266
2267          MONOT:  TYPE
2268                  MR
2269                  CLR      TYPFLG          ;CLEAR ERROR MESSAGE FLAG
2270                  CLR      CPFLG          ;IGNORE CONTROL P AND
2271                  CLR      CRFLG          ;CONTROL R INTERRUPTS
2272                  CLR      ADFCSR         ;DISABLE AFC INTERRUPT
2273                  MOV      #100,ATKCSR    ;ENABLE KEYBOARD INTERRUPTS
2274                  CLR      PS            ;ENABLE INTERRUPTS
2275                  MOV      #4000,ADFCMN   ;DISABLE MUX TIMING
2276                  MOV      #2000,ADFCMN   ;START A-D CONVEF
2277                  MONOTA: TSTB ADFCSR     ;WAIT FOR DONE
2278                  BPL      MONOTA
2279                  MOV      ADFDBR,DATA1    ;SAVE FIRST CONVERSION
2280                  MONOT2: MOV      #2000,ADFCMN ;START A-D CONVERTER
2281                  MONOTC: TSTB ADFCSR     ;WAIT FOR DONE
2282                  BPL      MONOTC
2283                  MOV      ADFDBR,DATA2    ;SAVE SECOND CONVERSION
2284                  MOV      DATA1,R1
2285                  SUB      DATA2,R1
2286                  BPL      MONOT3
2287                  NEG      R1
2288                  MONOT3: CMP      R1,ADRES ;COMPARE CONVERSIONS
2289                  BLE      MONOTO         ;GENERATE ABSOLUTE VALJE
2290                  TST      TYPFLG        ;OF DIFFERENCE
2291                  BNE      MONOT4         ;IS DIFFERENCE >+OR
2292                  ; -1LSB
2293                  ;YES, ERROR
2294
2295                  MONOT4: OCTASC          ;OUTPUT VALUES OF SAMPLES
2296                  2
2297                  DATA1
2298                  DATA2
2299                  BR      MONOT1
2300                  MONOTO: MOV      DATA2,DATA1 ;RESTART AND RESYNC
2301                  ;NO ERROR, SET UP FOR NEXT SAMPLE
2302                  BR      MONOT2         ;CONTINUE
2303                  DATA1: 0
2304                  DATA2: 0
2305
2306
2307
2308          ;MULTIPLEXER TIMING ADJUSTMENT
2309
2310          MXTIM: TYPE
2311                  MR
2312                  CLR      CPFLG          ;IGNOR CONTROL R
2313                  CLR      CRFLG          ;CONTROL P INTERRUPTS
2314                  CLR      ADFCMN        ;ENABLE MUX TIMING
2315                  CLR      ADFCSR         ;DISABLE MUX INTERRUPTS
2316                  MOV      #100,ATKCSR    ;ENABLE KEYBOARD INTERRUPTS
2317                  CLR      PS            ;CLEAR PROCESSOR STATUS

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DZAFAC.P11 MONOT

2318	006220	016705	000012	MXTIM1: MOV	DELAY1,R5	:SET UP TIMER
2319	006224	005077	007524		JAF CAR	:START MUX.
2320	006230	005305		MXTIMA: DEC	R5	:STALL
2321	006232	001376		BNE	MXTIMA	
2322	006234	000771		BR	MXTIM1	:CONTINUE
2323	006236	001750		DELAY1: 1000.		
2324						
2325						
2326						

M04

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 DZAFAC.P11 DECODE

.SBTTL DECODE

:ADDRESSS DECODING TEST

2327									
2328									
2329									
2330									
2331									
2332									
2333									
2334	006240	012767	006260	007522	DECODE:	MOV	#DECODEP,CPRET		;SET UP CONTROL P RETURN
2335	006246	012767	000001	007520		MOV	#1,CPFLG		;ACCEPT CONTROL P INTERRUPTS
2336	006254	005067	007516			CLR	CRFLG		;IGNORE CONTROL R INTERRUPTS
2337	006260	104017			DECODEP:	SUAD			;GET SYSTEM UNIT ADDRESS
2338	006262	104003				TYPE			;TYPE "R" TO INDICATE
2339	006264	013514				MR			;THAT TEST IS RUNNING
2340									
2341	006266	012767	004000	007366		MOV	#4000,CNTRS		
2342	006274	005067	171476			CLR	PS		;ENABLE INTERRUPTS
2343	006300	012777	000100	007452		MOV	#100,ATKCSR		;ENABLE KEYBOARD INTERRUPTS
2344	006306	012777	004000	007442		MOV	#4000,DAFCMN		;DISABLE AFC TIMING
2345	006314	016777	007360	007432	DECODEA:	MOV	SYSUNB,DAFCAR		;SELECT SYSTEM UNIT
2346	006322	032777	000001	007426		BIT	#1,DAFCMN		;TEST "Y" BIT
2347	006330	001012				BNE	DECODEB		; "Y" BIT =1, CONTINUE
2348	006332	032767	020000	171230		BIT	#20000,SWR		;TYPE ERROR MESSAGE ?
2349	006340	001002				BNE	DECOA1		;NO, CHECK FOR LOOP
2350	006342	104003				TYPE			;TYPE "X" BAD"
2351	006344	013704				MYBAD			
2352	006346	032767	040000	171214	DECOA1:	BIT	#40000,SWR		;CHECK FOR LOOP
2353	006354	001357				BNE	DECODEA		;LOOP
2354	006356	016777	007316	007370	DECODEB:	MOV	SYSUNB,DAFCAR		;SELECT SYSTEM UNIT
2355	006364	032777	000002	007364		BIT	#2,DAFCMN		;CHECK X BIT
2356	006372	001012				BNE	DECODEC		; "X"=1, CONTINUE
2357	006374	032767	020000	171166		BIT	#20000,SWR		;TYPE ERROR MESSAGE ?
2358	006402	001002				BNE	DECOB1		;NO, CHECK FOR LOOP
2359	006404	104003				TYPE			;TYPE "X" BAD
2360	006406	013674				MXBAD			

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DZAFAC.P11 DECODE

2361	006410	032767	040000	171152	DECOB1:	BIT	#40000,SWR	;CHECK FOR LOOP
2362	006416	001357				BNE	DECOB8	;LOOP
2363	006420	016767	007254	007224	DECODC:	MOV	SYSUN9,OUTCHN	;SET UP TO ADDRESS
2364	006426	012767	000040	007224		MOV	#32.,CNTR4	;EACH CHANNEL IN SYSTEM UNIT
2365	006434	016777	007212	007312	DECOD1:	MOV	OUTCHN,JAFCAR	;ADDRESS A CHANNEL
2366	006442	017767	007310	177506		MOV	JAFCMN,DATA1	;READ BACK MAINTENANCE REGISTER
2367	006450	006267				ASR	DATA1	;REPOSITION DATA
2368	006454	006267				ASR	DATA1	
2369	006460	042767		177470		BIC	#177740,DATA1	;CLEAR UNWANTED BITS
2370	006466	016767	007160	177464		MOV	OUTCHN,DATA2	;SET UP FOR COMPARE
2371	006474	042767		177456		BIC	#177740,DATA2	
2372	006502	126767		177450		CMPB	DATA1,DATA2	;COMPARE EXPECTED AND RECEIVED DATA
2373	006510	001414				BEQ	DECODED	
2374	006512	032767	020000	171050		BIT	#20000,SWR	;ERROR, CHECK FOR TYPEOUT
2375	006520	001004				BNE	DECODE	
2376	006522	104011				BCDASC		;OUTPUT EXPECTED AND RECEIVED DATA
2377	006524	000002				2		
2378	006526	006160				DATA2		
2379	006530	006156				DATA1		
2380	006532	032767	001000	171030	DECCDE:	BIT	#1000,SWR	;CHECK FOR LOOP WITH SAME DATA
2381	006540	001335				BNE	DECOD1	;LOOP
2382	006542	005267	007104		DECODD:	INC	OUTCHN	;SET UP FOR NEXT CHANNEL
2383								
2384	006546	005367	007106			DEC	CNTR4	;CONTINUE
2385	006552	001330				BNE	DECOD1	
2386	006554	005367	007102			DEC	CNTR5	
2387	006560	001255				BNE	DECODA	
2388	006562	104003				TYPE		;TYPE "DECODE"
2389	006564	013504				MDECODE		
2390	006566	012767	004000	007066		MOV	#4000,CNTR5	
2391	006574	000647				BR	DECODA	
2392								
2393								
2394								

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:DATA-A SET OF ROUTINES FOR COLLECTING
 :AND DISPLAYING INFORMATION INPUT
 :FROM THE AFC11

006576	005367	007174	DATA:	CLR	CRFLG	:IGNORE CONTROL R INTERRUPT
006577	005367	000001	MOV	#1,CPFLG		:ACCEPT CONTROL P INTERRUPT
006578	005367	006616	MOV	#DATAP,CPRET		:SET UP CONTROL P RETURN
006579	005367		DATAP:	DISPAT		:GO TO COMMAND DECODE
006580	005367			DATLST		:LIST OF COMMANDS AND POINTERS
006581	005367		BR	DATAP		:CONTINUE COMMAND IN T

:INPUT "N" SAMPLES ON A GIVEN CHANNEL
 : AT A FIXED GAIN

006624	104003		TAKEN:	TYPE		
006625	013514			MR		
006626	005077	007114		CLR	JAFCSR	
006627	005077	007116		CLR	JAFCMN	
006628	012704	016504		MOV	#DATAB,R4	:TABLE FOR DATA STORAGE
006629	016701	007032		MOV	SAMPLE,R1	:NUMBER OF SAMPLES TO BE INPUT
006630	016703	007042		MOV	LOCHAN,R3	:CHANNEL TO BE SAMPLED
006631	056703	007026		BIS	LOGAIN,R3	:SET GAIN BITS
006632	012702	020000	TAKEN1:	MOV	#20000,R2	:DELAY BETWEEN CONVERSIONS
006633	010377	007064		MOV	R3,JAFCAR	:START MULTIPLEXER
006634	105777	007054	TAKEN2:	TSTB	JAFCSR	:WAIT FOR DONE
006635	100375			BPL	TAKEN2	
006636	017724	007050		MOV	JAFDBR,(R4)+	:SAVE DATA SAMPLE
006637	005301			DEC	R1	:ALL SAMPLES IN
006638	001001			BNE	TAKEN3	:NO, GET ANOTHER
006639	000002			RTI		:YES, EXIT
006640	005302		TAKEN3:	DEC	R2	:STALL
006641	001376			BNE	TAKEN3	
006642	000761			BR	TAKEN1	

:LIST "N" SAMPLES OF DATA

006716	012701	016504	LIST:	MOV	#DATAB,R1	:GET POINTER TO STORED DATA
006717	016702	006754		MOV	SAMPLE,R2	:GET NUMBER OF SAMPLES TO BE LISTED
006718	012167	177224	LIST1:	MOV	(R1)+,DATA1	:GET DATA
006719	104020			DEC9CD		:CONVERT DATA TO DECIMAL
006720	000001			DATA1		
006721	006156			DEC	R2	
006722	005302			BNE	LIST1	
006723	001371			RTI		
006724	000002					

:COMPUTE AVERAGE OF "N" SAMPLES. OUTPUT TO TTY

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006746 104021 006532 177200 AVREGG: AVRG      ; COMPUTE AVERAGE OF DATA
006750 016767      MOV      QUOT,DATA1    ; GET AVERAGE
006756 104003      TYPE      ; TYPE "AVERAGE="
006760 013255      MAVRG      ; CONVERT TO DECIMAL AND OUTPUT
006762 104022      DECBCC
006764 000001      DATA1
006766 006156      RTI
006770 000002

; DISPLAY ONE CHANNEL CONTINUOUSLY IN COMPUTER DATA LIGHTS

006772 104003 DISPLY: TYPE      ; TYPE "R" TO INDICATE
006774 013514      MR        ; THAT TEST IS RUNNING

006776 005077 006746 CLR      JAFCSR      ; CLEAR CONTROL REGISTER
006780 005077 006750 CLR      JAFCMN     ; CLEAR MAINTENANCE REGISTER
006784 016704 006704 MOV      LOCHAN,R4    ; GET ADDRESS OF CHANNEL TO BE DISPLAYED
006788 056704 006670 BIS      LOGAIN,R4    ; GET GAIN
006792 012777 000100 006734 DISPL1: MOV      #100,J1KCSR ; ENABLE KEYBOARD INTERRUPTS
006796 010477 006724 MOV      R4,JAFCAR  ; START MULTIPLEXER
006800 105777 006714 DISPL2: TSTB     JAFCSR      ; WAIT FOR DONE
006804 100375      BPL      DISPL2
006808 017700 006710 MOV      JAFCSR,R0    ; READ A-D BUFFER
006812 000005      RESET      ; DISPLAY DATA
006816 032767 000001 170516 BIT      #1,SWR      ; IF SACC=1, RETURN TO KEYBOARD CONTROL
006820 001761      BEQ      DISPL1
006824 000167 177536 JMP      DATAP

; CONTINUOUSLY SAMPLE AND LIST ONE CHANNEL

006828 005077 006664 LISTC: CLR      JAFCSR      ; CLEAR CONTROL REGISTER
006832 005077 006666 CLR      JAFCMN     ; CLEAR MAINTENANCE REGISTER
006836 016767 006622 006554 MOV      LOCHAN,OUTCHN ; GET ADDRESS OF CHANNEL
006840 056767 006604 006546 BIS      LOGAIN,OUTCHN ; GET GAIN
006844 016777 006542 006642 LISTC1: MOV      OUTCHN,JAFCAR ; SELECT CHANNEL
006848 105777 006632 LISTC3: TSTB     JAFCSR      ; WAIT FOR DONE
006852 100375      BPL      LISTC3
006856 017767 006626 177030 MOV      JAFDBR,DATA1 ; GET DATA
006860 104020      DECBCC      ; CONVERT TO DECIMAL AND OUTPUT
006864 000001      DATA1
006868 006156      BR      LISTC1
006872 000763

; COMPUTE AVERAGE OF "N" DATA POINTS

006876 012704 016504 AVREGG: MOV      #DATAB,R4 ; GET POINTER TO TABLE OF DATA
006880 016703 006534      MOV      SAMPLE,R3 ; GET NUMBER OF SAMPLES

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2507	007146	005001			CLR	R1	
2508	007150	005002			CLR	R2	
2509	007152	012400			MOV	(R4)+,R0	:GENERATE TOTAL OF ALL DATA
2510	007154	062700	020000		ADD	#20000,R0	:SCALE UP FOR NEGATIVE NUMBERS
2511	007160	060001			ADD	R0,R1	
2512	007162	005502			ADC	R2	
2513	007164	005303			DEC	R3	
2514	007166	001371			BNE	AVRG1	
2515	007170	016767	006506	006314	MOV	SAMPLE, DIVIS	:SET UP TO DIVIDE
2516	007176	010267	006306		MOV	R2, DIVIDH	:TOTAL BY NUMBER OF SAMPLES
2517	007202	010167	006300		MOV	R1, DIVIDL	
2518	007206	104016			DIVIDU		:DO DIVISION
2519	007210	006367	006274		ASL	REMANO	:ROUND OF AVERAGE
2520	007214	000404			BMI	AVRG2A	
2521	007216	026767	006266	006456	CMP	REMANO, SAMPLE	
2522							
2523	007224	002402			BLT	AVRG2	
2524	007226	005267	006254		INC	QUOT	
2525	007232	162767	020000	006246	AVRG2A: SUB	#20000, QUOT	:CORRECT SIGN OF RESULT
2526	007240	000002			RTI		
2527							
2528							
2529							
2530							:TELETYPE HISTOGRAM OUTPUT ROUTINE
2531	007242	012704	016352		HISTO: MOV	#TEMPAB, R4	:CLEAR HISTOGRAM
2532	007246	005024			HISTOA: CLR	(R4)+	:TEMPORARY TABLES
2533	007250	020427	016504		CMP	R4, #DATAB	
2534	007254	002774			BLT	HISTOA	
2535	007256	005067	000560		CLR	ORANGE	:CLEAR OVER-RANGE
2536	007262	005067	000556		CLR	URANGE	:AND UNDER RANGE COUNTERS
2537	007266	104021			AVRG		:COMPUTE AVERAGE OF DATA
2538	007270	036767	006436	006210	BIT	ADBIT, QUOT	
2539	007276	001406			BEQ	HISTOB	
2540	007300	066767	006426	006200	ADC	ADBIT, QUOT	:CORRECT AVERAGE OF DATA
2541	007306	046767	006422	006172	BIC	ADMSK, QUOT	:FOR A-D RESOLUTION
2542							
2543							:GENERATE TABLE OF DIFFERENCES BETWEEN
2544							:AVERAGE AND INDIVIDUAL DATA POINTS
2545							
2546	007314	012704	016504		HISTOB: MOV	#DATAB, R4	
2547	007320	016703	006356		MOV	SAMPLE, R3	
2548	007324	016702	006156		HISTOC: MOV	QUOT, R2	:GET AVERAGE OF DATA
2549	007330	162402			SUB	(R4)+, R2	:SUBTRACT DATA
2550	007332	005402			NEG	R2	:NEGATE DIFFERENCE
2551	007334	016701	006370		MOV	ADRES, R1	
2552	007340	006001			HISTC1: ROR	R1	
2553	007342	103402			BCS	HISTC2	
2554	007344	006202			ASR	R2	
2555	007346	000774			BR	HISTC1	
2556	007350	020227	000012		HISTC2: CMP	R2, #12	:WILL DIFFERENCE FIT GRAPH
2557	007354	003403			BLE	HISTOD	:DIFFERENCE IS NOT TOO LARGE
2558	007356	003267	000460		INC	ORANGE	:DIFFERENCE IS TOO LARGE
2559	007362	000412			BR	HISTOF	
2560	007364	022702	177766		HISTCC: CMP	#-12, R2	:WILL DIFFERENCE FIT GRAPH
2561	007370	003403			BLE	HISTOE	:DIFFERENCE IS NOT TOO SMALL
2562	007372	003267	000446		INC	URANGE	:DIFFERENCE IS TOO NEGATIVE

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2553	007376	000404			BR	HISTOF	
2554	007400	006302			HISTOE: ASL	R2	
2555	007402	066702	000442		ADD	HTABA,R2	:PUT A POINT IN DIFFERENCE TABLE
2556	007406	005212			INC	(R2)	
2557	007410	005303			HISTOF: DEC	R3	
2558	007412	001344			BNE	HISTOC	
2559							
2560							:SET UP VERTICAL SCALE FACTOR
2561							
2562	007414	005767	006364		TST	VSFFLG	:HAS VERTICAL SCALE FACTOR BEEN SET UP
2563	007420	001015			BNE	HISTOG	:MANUALLY
2564	007422	012704	014344		MOV	#SCLTAB,R4	:NO GET TABLE OF SCALE FACTORS
2565	007426	012767	000001	006270	MOV	#1,VSF	:START WITH VSF=1
2566	007434	005714			HISTVA: TST	(R4)	:ARE WE AT END OF TABLE
2567	007436	001406			BEQ	HISTOG	
2568	007440	022467	006236		CMP	(R4)+,SAMPLE	:IS VSF TOO SMALL
2569	007444	002003			BGE	HISTOG	
2570	007446	062467	006252		ADD	(R4)+,VSF	:YES. INCREASE VSF
2571	007452	000770			BR	HISTVA	
2572							
2573							:TYPE VERTICAL SCALE FACTOR
2574							
2575	007454	104003			HISTOG: TYPE		
2576	007456	013422			MVSF		
2577	007460	104027			BCCASN		
2578	007462	000001			1		
2579	007464	015724			VSF		
2580							:FIND LARGEST ENTRY IN TABLE OF DIFFERENCES
2581							
2582							
2583	007466	012704	016430		MOV	#HTAB,R4	
2584	007472	012703	016430		MOV	#HTAB,R3	
2585	007476	012702	000025		MOV	#21,R2	
2586	007502	012467	006000		HISTG1: MOV	(R4)+,DIVIDL	
2587	007506	015767	006212	005776	MOV	VSF,DIVIS	
2588	007514	104024			DIVIDE		
2589	007516	005767	005766		TST	REMANO	
2590	007522	001402			BEQ	HISTG2	
2591	007524	005267	005756		INC	QUOT	
2592	007530	016723	005752		HISTG2: MOV	QUOT,(R3)+	
2593	007534	005302			DEC	R2	
2594	007536	001361			BNE	HISTG1	
2595	007540	012704	016430		MOV	#HTAB,R4	
2596	007544	011402			MOV	(R4),R2	
2597	007546	022402			HISTOH: CMP	(R4)+,R2	
2598	007550	003402			BLE	HISTOI	
2599	007552	014402			MOV	-(R4),R2	
2600	007554	005724			TST	(R4)+	
2601	007556	020427	016504		HISTOI: CMP	R4,#DATAH	
2602	007562	002771			BLT	HISTOH	
2603	007564	005202			INC	R2	
2604	007566	010267	000254		MOV	R2,TEMP1	
2605							:SET UP 1 LINE OF

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: TELETYPE OUTPUT AT A TIME

2619					
2620					
2621	007572	12701	000025	HISTOK:	MOV #21, R1
2622	007576	012704	016352		MOV #TEMPAB, R4
2623	007502	112724	000015		MOVB #15, (R4)+
2624	007506	112724	000012		MOVB #12, (R4)+
2625	007612	112724	000136		MOVB #136, (R4)+
2626	007616	012703	016430		MOV #HTAB, R3
2627	007622	112714	000040	HISTOM:	MOVB #40, (R4)
2628	007626	026723	000214		CMP TEMP1, (R3)+
2629	007632	003002			BGT HISTON
2630	007634	152714	000052		BISB #52, (R4)
2631	007640	005204		HISTON:	INC R4
2632	007642	005301			DEC R1
2633	007644	001366			BNE HISTOM
2634	007646	012704	016403		MOV #TEMPAB+25, R4
2635	007652	122744	000136	HISTN1:	CMPB #136, -(R4)
2636	007656	001403			BEQ HISTOP
2637	007660	122714	000052		CMPB #52, (R4)
2638	007664	001372			BNE HISTN1
2639	007666	005204		HISTOP:	INC R4
2640	007670	112714	000000		MOVB #0, (R4)
2641	007674	104003			TYPE
2642	007676	016352			TEMPAB
2643	007700	005367	000142		DEC TEMP1
2644	007704	003332			BGT HISTOK
2645	007706	012704	016352		MOV #TEMPAB, R4
2646	007712	112724	000015		MOVB #15, (R4)+
2647	007716	112724	000012		MOVB #12, (R4)+
2648	007722	112724	000136		MOVB #136, (R4)+
2649	007726	012703	000012		MOV #10, R3
2650	007732	112724	000053	HISTOR:	MOVB #53, (R4)+
2651	007736	005303			DEC R3
2652	007740	001374			BNE HISTOR
2653	007742	112724	000136		MOVB #136, (R4)+
2654	007746	012703	000012		MOV #10, R3
2655	007752	112724	000053	HISTOS:	MOVB #53, (R4)+
2656	007756	005303			DEC R3
2657	007760	001374			BNE HISTOS
2658	007762	112724	000000		MOVB #0, (R4)+
2659	007766	104003			TYPE
2660	007770	016352			TEMPAB
2661	007772	016767	005732 176156		MOV ADRES, DATA1
2662	010000	104022		HISTOT:	DECBCCL
2663	010002	000001			I
2664	010004	006156			DATA1
2665	010006	104003			TYPE
2666	010010	013431			MVDIV
2667	010012	104003			TYPE
2668	010014	013453			MURANGE
2669	010016	104027			BCDASN
2670	010020	000001			I
2671	010022	010044			URANGE
2672	010024	104003			TYPE
2673	010026	013436			MCRANG
2674	010030	104027			BCDASN

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26.75	010032	000001	1
26.76	010034	010042	ORANGE
26.77	010036	104025	AVREG
26.78	010040	000002	RTI
26.79	010042	000000	ORANGE: 0
26.80	010044	000000	URANGE: 0
26.81	010046	000000	TEMP1: 0
26.82	010050	016454	HTAB: HTAB+24

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2. 33      :OVERLOAD TEST
2684      :THIS TEST WILL WAIT FOR A CHANNEL AND GAIN INPUT TO BE ENTERED VIA THE
2685      :TELETYPE AND THEN TAKE CONTINUOUS CONVERSIONS ON THE SELECTED CH. TESTING
2686      :THE STATE OF THE OVERLOAD BIT. THE STATE OF THE OVERLOAD IS REPORTED VIA
2687      :THE TELETYPE BY PRINTING A '1' IF THE BIT IS SET AND A '0' IF CLEARED.
2688
2689 010052 005067 005720 OLOAD: CLR CRFLG ;INHIBIT 'CNTR R' REQUESTS
2690 010056 012767 000001 005710 MOV #1, CPFLG ;ENABLE 'CNTR P' REQUESTS
2691 010064 012767 010052 005675 MOV #OLOAD, CPRET ;SET UP 'IP' RETURN ADDRESS
2692 010072 104026 OLOADP: DISPAT ;GET THE CH. AND GAIN
2693 010074 014226 OLOLST
2694 010076 000775 BR OLOADP
2695 010100 016767 005612 005560 OLOADT: MOV LOCHAN, POINT2 ;GET ADDRESS CHA. TO BE TESTED
2696 010106 056767 005574 005552 BIS LOGAIN, POINT2 ;ADD THE GAIN
2697 010114 012777 000100 005636 MOV #100, #KCSR ;ENABLE KEYBOARD INTERRUPTS
2698 010122 005067 167650 CLR PS
2699 010126 005067 005532 CLR POINT1
2700 010132 012767 000106 005454 OLOAD1: MOV #106, ICOUNT ;SET UP TO TYPE "70" DIGITS PER LINE
2701 010140 042777 020000 005602 OLOAD2: BIC #20000, #AFCSR ;CLR THE OLOAD BIT
2702 010146 16777 005514 005600 MOV POINT2, #AFCAR ;START THE CONVERSIONS
2703 010154 105777 005570 TSTB #AFCSR ;WAIT FOR DONE
2704 010160 100375 BPL -4
2705 010162 005777 005564 TST #AFDBR ;CLR DONE
2706 010166 032777 020000 005554 BIT #20000, #AFCSR ;TEST IF THE OVERLOAD BIT SET
2707 010174 001003 BNE OLOAD3 ;BRANCH IF SET
2708 010176 005067 005444 CLR INCNT ;OTHERWISE CLR TEMP
2709 010202 000403 BR OLOAD4
2710 010204 012767 000001 005434 OLOAD3: MOV #1, INCNT ;TYPE '1' IF SET
2711 010212 026767 005446 005426 OLOAD4: CMP POINT1, INCNT ;HAS FLAG CHANGED STATES?
2712 010220 001747 BEQ OLOAD2 ;NO, RETEST CH.
2713 010222 016767 005420 005434 MOV INCNT, POINT1 ;YES, UPDATE POINTER
2714 010230 104027 BCDAS
2715 010232 000001 INCNT
2716 010234 015646 DEC ICOUNT
2717 010236 005367 005352 DEC OLOAD2
2718 010242 100336 BPL OLOAD2
2719 010244 104003 TYPE
2720 010246 013244 MCRLF
2721 010250 000730 BR OLOAD1
2722
2723      ;INPUT ASCII CHARACTER STRING
2724
2725
2726 010252 011605 INSTR: MOV (SP), R5 ;GET PC OF MESSAGE POINTER
2727 010254 012567 000010 MOV (R5)+, MSG ;GET MESSAGE POINTER
2728 010260 012567 005362 MOV (R5)+, INCNT ;GET EXPECTED CHARACTER COUNT
2729 010264 010516 MOV R5, (SP) ;SET UP RETURN
2730 010266 104003 INSTR1: TYPE ;TYPE MESSAGE
2731 010270 000000 MSG: 0
2732 010272 012704 014422 INSTR2: MOV #INBUF, R4
2733 010276 016703 005344 MOV INCNT, R3
2734 010302 005024 INSTR: CLR (R4)+ ;CLEAR INPUT BUFFER
2735 010304 005303 DEC R3
2736 010306 001375 BNE INSTR
2737 010310 005067 005334 CLR CHRCNT ;CLEAR RECEIVED CHARACTER COUNT
2738 010314 012704 014422 MOV #INBUF, R4 ;SET UP TO RECEIVE

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2739 010320 016703 005322      MOV      INCNT,R3
2740 010324 105777 005430      INSTRB: TSTB   @TKCSR      ;GET A CHARACTER FROM
2741 010330 100403              BMI      INSTR3
2742 010332 005767 005454      TST      SINTFL
2743 010336 100372              BPL      INSTRB      ;TTY KEYBOARD
2744 010340 005067 005446      INSTR3: CLR      SINTFL
2745 010344 127727 005412 00024J CMPB   @TKDBR,#240      ;IS IT A SPECIAL CHARACTER
2746 010352 100424              BMI      SPCHR
2747 010354 122777 000337 005400 CMPB   #337,@TKDBR
2748 010362 100420              BMI      SPCHR
2749 010364 105777 005374      INSTRC: TSTB   @TPCSR      ;NOT SPECIAL
2750 010370 100375              BPL      INSTRC      ;ECHO CHARACTER
2751 010372 117777 005364 005366 MOVB   @TKDBR,@TPDBR
2752 010400 017701 005356      MOV      @TKDBR,R1
2753 010404 042701 000200      BIC      #200,R1
2754 010410 110124              MOVB   R1,(R4)+      ;SAVE CHARACTER
2755 010412 005303              DEC      R3          ;ALL CHARACTERS IN
2756 010414 001417              SEQ      INSTRC      ;TOO MANY
2757 010416 005267 005226      INC      CHRCNT      ;UPDATE RECEIVE COUNT
2758 010422 000740              BR       INSTRB      ;GET ANOTHER
2759 010424 012702 013152      SPCHR: MOV      #SPLST,R2      ;GET SPECIAL CHARACTER LIST
2760 010430 027722 005326      SPCHRA: CMP      @TKDBR,(R2)+      ;COMPARE
2761 010434 001002              BNE      SPCHR1      ;NO MATCH
2762 010436 000172 000000      JMP      @R2          ;MATCH, EXECUTE FUNCTION
2763 010442 062702 000002      SPCHR1: ADD      #2,R2
2764 010446 005712              TST      (R2)
2765 010450 001725              BEQ      INSTRB      ;LOOK FOR END OF LIST
2766 010452 000766              BR       SPCHRA
2767 010454 104003              INSTRC: TYPE      ;INPUT STRING ERROR
2768 010456 013225              MCMARK      ;TYPE "?"
2769 010460 000702              BR       INSTR1      ;TRY AGAIN
2770 010462 000002      INSTRB: RTI
2771
2772
2773
2774      ;CHECK TEST NAME FOR VALIDITY
2775      ;IF CORRECT, EXECUTE SELECTED TEST
2776
2777 010464 012705 013714      TSTNAM: MOV      #TSTLST,R5      ;GET TEST DISPATCH LIST
2778 010470 012704 014422      TSTNAA: MOV      #INBUF,R4      ;GET INPUT BUFFER
2779 010474 022425              CMP      (R4)+,(R5)+      ;TEST FIRST TWO LETTERS
2780 010476 001010              BNE      TSTNA1      ;NO MATCH
2781 010500 022425              CMP      (R4)+,(R5)+      ;TEST 2ND 2 LETTERS
2782 010502 001010              BNE      TSTNA2      ;NO MATCH
2783 010504 022425              CMP      (R4)+,(R5)+      ;TEST LAST 2 LETTERS
2784 010506 001010              BNE      TSTNA3      ;NO MATCH
2785 010510 012706 001000      MOV      #1000,SP      ;MATCH, REPOSITION STACK
2786 010514 000175 000000      JMP      @R5          ;GO TO TEST
2787 010520 062705 000002      TSTNA1: ADD      #2,R5
2788 010524 062705 000002      TSTNA2: ADD      #2,R5
2789 010530 005725              TSTNA3: TST      (R5)+
2790 010532 001356              BNE      TSTNAA
2791 010534 104014              INSTRC:      ;INVALID NAME
2792 010536 000752              BR       TSTNAM
2793
2794

```

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```

2795
2796
2797
2798
2799
2800
2801 010540 011605
2802 010542 012567 000162
2803 010546 010516
2804 010550 012704 014422
2805 010554 012703 010724
2806 010560 016767 000144 000144
2807 010566 012767 000004 005054
2808 010574 005002
2809 010576 005001
2810 010600 105714
2811 010602 001441
2812 010604 122714 000054
2813 010610 001012
2814 010612 022767 000004 005030
2815 010620 001437
2816 010622 105724
2817 010624 001435
2818 010626 122714 000054
2819 010632 001432
2820 010634 000424
2821 010636 121427 000060
2822 010642 002426
2823 010644 121427 000071
2824 010650 003723
2825 010652 14114 000060
2826 010656 005367 004766
2827 010662 002416
2828 010664 112400
2829 010666 060201
2830 010670 060100
2831 010672 010001
2832 010674 006301
2833 010676 010102
2834 010700 006302
2835 010702 006302
2836 010704 000735
2837 010706 010023 000016
2838 010710 005367
2839 010714 001324
2840 010716 000002
2841 010720 104014
2842 010722 000712
2843 010724 000000
2844 010726 000000
2845 010730 000000
2846 010732 000000
2847
2848
2849
2850

```

;4 DIGIT BCD TO BINARY CONVERSION
 ;WILL CONVERT N BCD WORDS TO BINARY
 ;AND STORE EACH WORD IN A SEPARATE LOCATION

```

BCDBNN: MOV (SP),R5
        MOV (R5)+,BCDCNT ;NUMBER OF WORDS TO BE CONVERTED
        MOV R5,(SP)
BCDBN1: MOV #INBUF,R4 ;POINTER TO ASCII
        MOV #BCDTAB,R3 ;TABLE FOR STORAGE OF CONVERTED WORD
        MOV BCDCNT,CNTR2
BCDBN2: MOV #4,CHRCNT ;4 DIGITS PER WORD, AT MOST
        CLR R2
        CLR R1 ;CLEAR MULTIPLICATION REGISTERS
BCDBN3: TSTB (R4) ;END OF DTAT ?
        BEQ BCDEXT ;YES, EXIT
        CMPB #54,(R4) ;IS CHARACTER ",", "?"
        BNE BCDBN4 ;NO
        CMP #4,CHRCNT
        BEQ BCDEXT
        TSTB (R4)+
        BEQ BCDEXT
        CMPB #54,(R4)
        BEQ BCDEXT
        BR BCDEXT
BCDBN4: CMPB (R4),#60
        BLT BCDEXT
        CMPB (R4),#71
        BGT BCDEXT
        BICB #60,(R4)
        DEC CHRCNT
        BLT BCDEXT
        MOVB (R4)+,R0
        ADD R2,R1
        ADD R1,R0
        MOV R0,R1
        ASL R1
        MOV R1,R2
        ASL R2
        ASL R2
        BR BCDBN3
BCDEXT: MOV R0,(R3)+
        DEC CNTR2
        BNE BCDBN2
        RTI
BCDEXT: INSTER
        BR BCDBN1
BCDTAB:
BCDWD1: 0
BCDWD2: 0
BCDCNT: 0
CNTR2: 0

```

;CONVERT DECIMAL FRACTION TO ASCII BCD

K05

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```

2851                                     ;SET UP SIGN AND DECIMAL POINT
2852
2853 010734 011605 DECBC: MOV (SP),R5
2854 010736 012567 004700 MOV (R5)+,WRDCNT
2855 010742 012703 016016 MOV #MBCD+2,R3
2856 010746 112723 000040 MOV #40,(R3)+
2857 010752 013567 004530 DECBB1: MOV 2(R5)+,BINWRD
2858 010756 016700 004722 MOV LOGGN,R0
2859 010762 116067 014324 000540 MOVBN GNEXP(0),DECEXP
2860 010770 116067 014334 000530 MOVBN GNSCL(0),SCALEF
2861 010776 105767 000526 TSTB DECEXP
2862 011002 100903 BPL DECB1
2863 011004 052767 177400 000516 BIS #177400,DECEXP
2864 011012 005067 000506 DECB1: CLR DECSGN
2865 011016 005767 004464 TST BINWRD
2866 011022 003005 BGT DECB1
2867 011024 001572 BEQ DECO
2868 011026 005467 004454 NEG BINWRD
2869 011032 005267 000466 INC DECSGN
2870 011036 012704 016352 DECB1: MOV #TEMTAB,R4
2871 011042 012767 000012 004600 MOV #10,CHRCNT
2872 011050 006367 004432 ASL BINWRD
2873 011054 026727 000446 000002 CMP SCALEF,#2
2874 011062 001420 BEQ DECB2
2875 011064 006367 004416 ASL BINWRD
2876 011070 026727 000432 000001 CMP SCALEF,#1
2877 011076 001412 BEQ DECB2
2878 011100 006367 004402 ASL BINWRD
2879 011104 005767 004376 TST BINWRD
2880 011110 001005 BNE DECB2
2881 011112 112724 000002 MOVBN #2,(R4)+
2882 011116 005067 000476 CLR MPCND
2883 011122 000434 BR DECB3
2884 011124 016767 004356 000466 DECB2: MOV BINWRD,MPCND
2885 011132 012767 000012 000456 DEBCA: MOV #12,MPYERH
2886 011140 104030 MULTPY
2887 011142 126727 000446 000011 CMPB PRODH,#11
2888 011150 003424 BLE DECB4
2889 011152 005067 176670 CLR TEMP1
2890 011156 162767 000012 000430 DIGEXT: SJB #12,PRODH
2891 011164 100403 BMI DIGDON
2892 011166 005267 176654 INC TEMP1
2893 011172 000771 BR DIGEXT
2894 011174 116724 176646 DIGDON: MOVBN TEMP1,(R4)+
2895 011200 062767 000012 000406 ADD #12,PRODH
2896 011206 005267 000316 INC DECEXP
2897 011212 000403 BR DECB4
2898 011214 005267 000310 DECB3: INC DECEXP
2899 011220 000744 BR DEBCA
2900 011222 116724 000366 DECB4: MOVBN PRODH,(R4)+
2901 011226 005367 004416 DEC CHRCNT
2902 011232 001337 BNE DEBCA
2903
2904                                     ;INSERT SIGN AND DECIMAL POINT
2905
2906

```

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2907	011234	012704	016352		DECBGB:	MOV	#TEMTAB,R4
2908	011240	005767	000260			TST	DECSGN
2909	011244	001402				BEQ	DECEX
2910	011246	112723	000055			MOVB	#55,(R3)+
2911	011252	005757	000252		DECEX:	TST	DECEXP
2912	011256	003064				BGT	DECEG
2913	011260	001506				SEQ	DECEG2
2914	011262	112723	000056			MOVB	#56,(R3)+
2915	011266	112723	000060		DECEN:	MOVB	#60,(R3)+
2916	011272	005267	000232			INC	DECEXP
2917	011276	001373				BNE	DECEN
2918	011300	012767	000005	000214	DECEO:	MOV	#5,CNTR3
2919	011306	105714			DECEO1:	TSTB	(R4)
2920	011310	001006				BNE	DECEDN
2921	011312	112723	000060			MOVB	#60,(R3)+
2922	011316	005204				INC	R4
2923	011320	005367	000176			DEC	CNTR3
2924	011324	001370				BNE	DECEO1
2925	011326	012767	000006	000166	DECEDN:	MOV	#6,CNTR3
2926	011334	004767	000144		DECED1:	JSR	PC,DECMOV
2927	011340	112723	000126		BCDFIN:	MOVB	#126,(R3)+
2928	011344	112723	000040			MOVB	#40,(R3)+
2929	011350	005367	004266			DEC	WRDCNT
2930	011354	001402				BEQ	.+6
2931	011356	000167	177370			JMP	DECB81
2932	011362	010516				MOV	R5,(SP)
2933	011364	112743	000000			MOVB	#0,-(R3)
2934	011370	005767	003776			TST	CCRFLG
2935	011374	001003				BNE	BCDFN1
2936	011376	104003				TYPE	
2937	011400	016014				MBCD	
2938	011402	000002				RTI	
2939	011404	104003			BCDFN1:	TYPE	
2940	011406	016016				MBCD+2	
2941	011410	000002				RTI	
2942	011412	112723	000060		DECO:	MOVB	#60,(R3)+
2943	011416	112723	000056			MOVB	#56,(R3)+
2944	011422	112723	000060			MOVB	#60,(R3)+
2945	011426	000744				BR	BCDFIN
2946	011430	105714			DECEG:	TSTB	(R4)
2947	011432	001002				BNE	DECEGA
2948	011434	005204				INC	R4
2949	011436	000417				BR	DECEG2
2950	011440	016767	000064	000054	DECEGA:	MOV	DECEXP,CNTR3
2951	011446	004767	000032		DECEG1:	JSR	PC,DECMOV
2952	011452	112723	000056			MOVB	#56,(R3)+
2953	011456	012767	000007	000036		MOV	#7,CNTR3
2954	011464	166767	000040	000030		SUB	DECEXP,CNTR3
2955	011472	003320				BGT	DECED1
2956	011474	000721				BR	BCDFIN
2957	011476	112723	000056		DECEG2:	MOVB	#56,(R3)+
2958	011502	003676				BR	DECEO
2959	011504	152714	000060		DECMOV:	BISB	#60,(R4)
2960	011510	112423				MOVB	(R4)+,(R3)+
2961	011512	005367	000004			DEC	CNTR3
2962	011516	001372				BNE	DECMOV

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2963	011520	000207			RIS	PC
2964	011522	000000			CNTR3: 0	
2965	011524	000000			DECSGN: 0	
2966	011526	000000			SCALEF: 0	
2967	011530	000000			DECEXP: 0	
2968						
2969						
2970						
2971						
2972						
2973	011532	005067	000056		MULTI: CLR	MPYERL
2974	011536	012767	000017	000034	MULTU: MOV	#15, MCNT
2975	011544	016767	000050	000050	MOV	MPCND, MMPC
2976	011552	006067	000040		MULTA: ROR	MPYERH
2977	011556	103003			BCC	.+10
2978	011560	066767	000036	000026	ADD	MMPC, MPYERL
2979	011566	006067	000022		ROR	MPYERL
2980	011572	006067	000022		ROR	MPCND
2981	011576	005327			DEC	(PC)+
2982	011600	000000			MCNT: 0	
2983	011602	001363			BNE	MULTA
2984	011604	000241			CLC	
2985	011606	006067	000006		ROR	MPCND
2986	011612	000002			RTI	
2987	011614	000000			MPYERL: 0	
2988	011616	000000			MPYERH: 0	
2989	011620	000000			MPCND: 0	
2990	011622	000000			MMPC: 0	
2991						
2992						
2993						
2994						
2995						
2996	011624	000240			DISPT: NOP	
2997	011626	011605			MOV	(SP), R5
2998	011630	012567	000052		MOV	(R5)+, DISLST
2999	011634	010516			MOV	R5, (SP)
3000	011636	104013			INSTR	
3001	011640	013251			MASTER	
3002	011642	000003			3	
3003	011644	016704	000036		DISPA1: MOV	DISLST, R4
3004	011650	012703	014422		MOV	#INBUF, R3
3005	011654	021324			DISPA2: CMP	(R3), (R4)+
3006	011656	001007			BNE	DISPA3
3007	011660	012777	000100	004072	MOV	#100, 2TKCSR
3008	011666	005067	166104		CLR	PS
3009	011672	000174	000000		JMP	2(R4)
3010	011676	005714			DISPA3: TST	(R4)
3011	011700	001365			BNE	DISPA2
3012	011702	104014			INSTR	
3013	011704	000757			BR	DISPA1
3014	011706	000000			DISLST: 0	
3015						
3016						
3017						
3018	011710	104013			SUADD: INSTR	

;SINGLE PRECISION UNSIGNED MULTIPLY

;COMMAND DECODE AND DISPATCH

;INPUT SYSTEM UNIT ADDRESS

N05

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```

3019 011712 013314 MSUAD
3020 011714 000003 3
3021 011716 104015 SUAD1: BCDBN
3022 011720 000001 1
3023 011722 022767 000037 176774 CMP #31,BCDWD1
3024 011730 002002 BGE SUAD2
3025 011732 104014 INSTER
3026 011734 000770 BR SUAD1
3027 011736 016767 176762 003732 SUAD2: MOV BCDWD1,SYSUN
3028 011744 006367 176754 ASL BCDWD1
3029 011750 006367 176750 ASL BCDWD1
3030 011754 006367 176744 ASL BCDWD1
3031 011750 006367 176740 ASL BCDWD1
3032 011764 006367 176734 ASL BCDWD1
3033 011770 016767 176730 003702 MOV BCDWD1,SYSUNB
3034 011776 000002 RTI
3035
3036 ;INPUT NUMBER OF SAMPLES TO BE TAKEN
3037
3038 012000 104013 SAMPL: INSTR
3039 012002 013302 MSAMP
3040 012004 000005 5
3041 012006 104015 SAMPL1: BCDBN
3042 012010 000001 1
3043 012012 016700 003704 MOV MAXCHN,RO
3044 012016 006300 ASL RO
3045 012020 020067 176700 CMP RO,BCDWD1
3046 012024 002403 BLT SAMPL
3047 012026 005767 176672 TST BCDWD1
3048 012032 001002 BNE SAMPL2
3049 012034 104014 SAMPEL: INSTER
3050 012036 000763 BR SAMPL1
3051 012040 016767 176660 003634 SAMPL2: MOV BCDWD1,SAMPLE
3052 012046 000002 RTI
3053
3054 ;INPUT ERROR REPORT MODE
3055
3056
3057 012050 104013 EMODE: INSTR
3058 012052 013565 MEMODE
3059 012054 000002 2
3060 012056 104015 EMODE1: BCDBN
3061 012060 000001 1
3062 012062 005067 003710 CLR CRFLG
3063 012066 005767 176632 TST BCDWD1
3064 012072 001407 BEQ EMODE2
3065 012074 022767 000001 176622 CMP #1,BCDWD1
3066 012102 001012 BNE EMODE
3067 012104 012767 000001 003664 MOV #1,CRFLG
3068 012112 005067 003556 EMODE2: CLR PASSC
3069 012116 005067 003546 CLR ECONTL
3070 012122 005067 003544 CLR ECONTH
3071 012126 000002 RTI
3072 012130 104014 EMODER: INSTER
3073 012132 000751 BR EMODE1
3074

```

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:TYPE PARAMETERS OF TEST IN PROGRESS

PARAM1: MOV #PARL1,R0
 BR PARAM
 PARAM2: MOV #PARL2,R0
 PARAM: MOV (R0)+,MSG
 MOV (R0)+,PDATA
 SAVOSP
 TYPE
 PMSG: 0
 BCCASN
 PDATA: 0
 RESOS
 TST (R0)
 BNE PARAM
 RTI

:INPUT 1 GAIN

GAIN1: INSTR
 MGAIR
 S
 GAIN1A: BCCBN
 1
 MOV #GAIN1ST,R4
 CLR LOGAIN
 GAIN1B: CMP BCDW01,(R4)+
 BNE GAIN1C
 MOV LOGAIN,LOGGN
 MOV BCDW01,LOGAIND
 SWAB LOGAIN
 ASL LOGAIN
 ASL LOGAIN
 ASL LOGAIN
 ASL LOGAIN
 ASL LOGAIN
 RTI
 GAIN1C: INC LOGAIN
 TST (R4)
 BNE GAIN1B
 INSTR
 BR GAIN1A

:INPUT 1 CHANNEL ADDRESS

CHAN1: INSTR
 MCHANA
 S
 CHAN1A: BCCBN
 1
 CMP BCDW01,#1023.

C06

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012330	003004			BGT	CHANIE
012332	016767	176366	003356	MOV	BCDWD1, LOCHAN
012340	000002			RTI	
012342	004014			CHANIE: INSTER	
012344	000764			BR	CHANIA

: INPUT 2 CHANNEL ADDRESSES

012346	104013			CHAN2: INSTR	
012350	013334			MCHANA	
012352	000012			12	
012354	104015			CHAN2A: SCDBN	
012356	000002			2	
012360	026727	176340	001777	CMP	BCDWD1, #1023.
012362	003040			BGT	CHAN2E
012364	026727	176332	001777	CMP	BCDWD2, #1023.
012366	003034			BGT	CHAN2E
012370	016767	176320	003310	MOV	BCDWD1, LOCHAN
012372	016767	176314	003304	MOV	BCDWD2, HICHAN
012374	166767	176304	176304	SUB	BCDWD1, BCDWD2
012376	002422			BLT	CHAN2E
012378	026767	176276	003270	CMP	BCDWD2, MAXCHN
012380	003016			BGT	CHAN2E
012382	016767	176266	003274	MOV	BCDWD2, CHNCNT
012384	003267	003270		INC	CHNCNT
012386	016767	003264	003266	MOV	CHNCNT, SANTAB
012388	006367	003262		ASL	SANTAB
012390	062767	016504	003254	ADD	#DATAB, SANTAB
012392	000002			RTI	
012394	104014			CHAN2E: INSTER	
012396	000730			BR	CHAN2A

: INPUT HISTOGRAM VERTICAL SCALE FACTOR

012474	104013			VSFIN: INSTR	
012476	013520			MVSFI	
012478	000004			4	
012480	122767	000101	001712	VSFINA: CMPB	#101, INBUF
012482	001006			BNE	VSFMAN
012484	005067	003266		CLR	VSFFLG
012486	012767	000001	003200	MOV	#1, VSF
012488	000002			VSFINI: RTI	
012490	104015			VSFMAN: BCOBN	
012492	000001			1	
012494	026727	176166	000144	CMP	BCDWD1, #100.
012496	003012			BGT	VSFE
012498	005767	176156		TST	BCDWD1
012500	00140			BEO	VSFE
012502	016767	176150	003146	MOV	BCDWD1, VSF
012504	012767	000001	003220	MOV	#1, VSFFLG
012506	000767			BR	VSFINI
012508	104014			VSFE: INSTER	
012510	000744			BR	VSFINA

:INPUT A-D CONVERTER RESOLUTION

```

ADBIN: INSTR
        MADRES
ADBINA: SCDBN
        1
        MOV      BCDWD1,ADRES0
        MOV      #1,ADRES
        CLR      ADBIT
        CLR      ADMSK
        MOV      #13,R4
        CMP      BCDWD1,R4
        BEQ      ADBINB
        ASL      ADRES
        INC      ADBIT
        INC      ADMSK
        DEC      R4
        CMP      R4,BCDWD1
        BEQ      ADBINB
        ASL      ADRES
        ADD      #2,ADMSK
        DEC      R4
        CMP      R4,BCDWD1
        BEQ      ADBINB
        INSTR
        BR       ADBINA
ACBINB: RTI

```

:INPUT ERROR DETECTION LIMITS FOR REPEATABILITY TEST

```

REFRES: INSTR
        MREPRE
REFREA: SCDBN
        1
        CMP      #40,BCDWD1
        BLT      REPRE
        MOV      BCDWD1,REPRE
        RTI
REFREE: INSTR
        BR       REPREA

```

:POWER FAIL HANDLER

```

PFAIL: MOV      R0,-(SP)
        MOV      R1,-(SP)
        MOV      R2,-(SP)
        MOV      R3,-(SP)
        MOV      R4,-(SP)
        MOV      R5,-(SP)
        MOV      24,-(SP)
        MOV      SP,SAVSP
        MOV      #PWFUP,24

```

```

012572 104013
012574 013530
012576 000003
012600 104015
012602 000001
012604 016767 176114 003114
012606 000001 003110
012608 003106
012610 003104
012612 000015
012614 026704 176064
012616 001427
012618 006367 003062
012620 005267 003060
012622 005267 003056
012624 005304
012626 020467 176040
012628 001415
012630 006367 003036
012632 006367 003034
012634 062767 000002 003030
012636 005304
012638 020467 176012
012640 001402
012642 104014
012644 000730
012646 000002
012720 000002
012722 104013
012724 013547
012726 000003
012728 104015
012730 000001
012732 022767 000050 175762
012734 002404
012736 016767 175754 002766
012738 000002
012740 104014
012742 000764
012760 010046
012762 010146
012764 010246
012766 010346
012770 010446
012772 010546
012774 016746 165024
013000 010667 002620
013004 012767 013014 165012

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```

3243 013012 000000      HALT
3244
3245      ;POWER UP HANDLER
3246
3247 013014 012767 000340 164754 PWRUP: MOV      #340,PS
3248 013022 016706 002576      MOV      SAVSP,SP
3249 013026 012667 164772      MOV      (SP)+,24
3250 013030 012605      MOV      (SP)+,R5
3251 013034 012604      MOV      (SP)+,R4
3252 013038 012603      MOV      (SP)+,R3
3253 013040 012602      MOV      (SP)+,R2
3254 013042 012601      MOV      (SP)+,R1
3255 013044 012600      MOV      (SP)+,R0
3256 013046 000005      RESET
3257 013050 104003      TYPE
3258 013054 013351      MPFAIL
3259 013057 000167 166322      JMP      MONIT

      ;RESPONSE TO CONTROL C
3260 013060 104003      CONTC: TYPE
3261 013062 013231      MCONTC
3262 013064 000167 166312      JMP      MONIT

      ;RESPONSE TO CARRIAGE RETURN
3263 013070 104003      ALTMOD: TYPE
3264 013072 013244      MCRLF
3265 013074 005767 00255C      TST      CHRCNT
3266 013080 001002      BNE      ALTM01
3267 013082 000167 175346      JMP      INSTR1
3268 013086 000167 175350      ALTM01: JMP      INSTR2

      ;RESPONSE TO RUBOUT
3269 013112 104003      RUBOUT: TYPE
3270 013114 013247      MRUBOU
3271 013116 000167 175150      JMP      INSTR2

      ;RESPONSE TO CONTROL P
3272 013122 104003      CONTP: TYPE
3273 013124 013234      MCONTP
3274 013126 013706 001000      MOV      #1000,SP
3275 013130 000177 002E32      JMP      SCPRET

      ;RESPONSE TO CONTROL R
3276 013136 104003      CONTR: TYPE
3277 013138 013237      MCONTR
3278 013140 013706 001000      MOV      #1000,SP
3279 013146 000177 002E20      JMP      SCPRET

      ;SPECIAL CHARACTER DECODE LIST

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33299				
33300	013152	000215		SP_LST: 215
33301	013154	013070		ALTMOD
33302	013156	000203		203
33303	013160	013060		CONTC
33304	013162	000377		377
33305	013164	013112		RUBOUT
33306	013166	000000		0

:GENERAL MESSAGES

33312	013170	000			.BYTE	
33313	013171	015	040412	041506	MTITLE:	.ASCIZ <15><12>/AFC-11 DIAGNOSTIC/<15><12>
33314	013176	030455	020061	044504		
33315	013204	043501	047516	052123		
33316	013212	041511	005015	000		
33317	013217	015	027012	000	MPER:	.ASCIZ <15><12>./
33318	013223	054	000		MCOMMA:	.ASCIZ /
33319	013225	015	037412	000	MQMARK:	.ASCIZ <15><12>./
33320	013231	136	000103		MCONTC:	.ASCIZ /C/
33321	013234	050136	000		MCONTP:	.ASCIZ /P/
33322	013237	136	000122		MCONTR:	.ASCIZ /R/
33323	013242	000040			MSPACE:	.ASCIZ /
33324	013244	005015	000		MCRLF:	.ASCIZ <15><12>./
33325	013247	057	000		MRUBOU:	.ASCIZ !/!
33326	013251	015	025012	000	MASTER:	.ASCIZ <15><12>*/
33327	013255	015	040412	042526	MAVRG:	.ASCIZ <15><12>/AVERAGE=
33328	013262	040522	042507	000075		

:PARAMETER INPUT MESSAGES

33332	013270	043452	044501	024116	MGAIN:	.ASCIZ /*GAIN(S):/
33333	013276	024523	000072			
33334	013302	051452	046501	046120	MSAMP:	.ASCIZ /*SAMPLES:
33335	013310	051505	000072			
33336	013314	005015	051452	051531	MS_AD:	.ASCIZ <15><12>/*SYSTEM UNIT:
33337	013322	042524	020115	047125		
33338	013330	052111	000072			
33339	013334	041452	040510	047116	MCHANA:	.ASCIZ /*CHANNEL(S):/
33340	013342	046105	051450	035051		
33341	013350	000				
33342	013351	015	050012	053517	MPFAIL:	.ASCIZ <15><12>/POWER FAILURE
33343	013356	051105	043040	044501		
33344	013364	052514	042522	000		
33345	013371	040	041440	040510	MMAXCH:	.ASCIZ / CHANNELS CAN BE TESTED/
33346	013376	047116	046105	020123		
33347	013404	040503	020116	042502		
33348	013412	052040	051505	042524		
33349	013420	000104				
33350	013422	005015	051526	036506	MVSF:	.ASCIZ <15><12>/VSF*/
33351	013430	000				
33352	013431	055	044504	000126	MVDIV:	.ASCIZ /-DIV/
33353	013436	020040	020040	020040	MORANG:	.ASCIZ / OVER
33354	013444	053117	051105	020040		

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3355	013452	000	352412	042116	MURANG: .ASCIZ	<15><12>/UNDER /
3356	013453	015	000040			
3357	013460	051105	042522	042520	MREPET: .ASCIZ	<15><12>/REPET/
3358	013464	005015				
3359	013472	000124	047514	044507	MLOGIC: .ASCIZ	<15><12>/LOGIC/
3360	013474	005015				
3361	013502	000103	042504	047503	MDECOD: .ASCIZ	<15><12>/DECOD/
3362	013504	005015				
3363	013512	000104				
3364	013514	005015	000122		MR: .ASCIZ	<15><12>/R/
3365	013520	005015	053052	043123	MVSF!: .ASCIZ	<15><12>/VSF:/
3366	013526	000072				
3367	013530	005015	040452	042055	MADRES: .ASCIZ	<15><12>/A-D LENGTH:/
3368	013536	046040	047105	052107		
3369	013544	035110	000			
3370	013547	052	051105	047522	MREPRE: .ASCIZ	/ERROR LIMIT:/
3371	013551	020122	044514	044515		
3372	013562	035124	000			
3373	013565	052	051105	047522	MEMODE: .ASCIZ	/ERROR MODE:/
3374	013572	020122	047515	042504		
3375	013600	000072				
3376	013610	005015	040520	051523	MPASS: .ASCIZ	<15><12>/PASSES:/
3377	013614	000072	047524	040524	MERROR: .ASCIZ	<15><12>/TOTAL ERRORS:/
3378	013622	005105	051105	047522		
3379	013630	051522	000072			

:ERROR MESSAGES

013634	005015	047515	047516	EMONOT: .ASCII	<15><12>/MONOTONICITY FAILURE/
013642	047524	044516	044503		
013650	005015	043040	044501		
013656	005015	042522			
013662	005015	051461	004524		.ASCIZ <15><12>/1ST ZNC
013670	005015	000104			
013674	005015	020130	040502	MXBAD: .ASCIZ	<15><12>/X BAD/
013682	005015				
013704	005015	020131	040502	MYBAD: .ASCIZ	<15><12>/Y BAD/
013712	000104				.EVEN

:LIST OF TESTS TO BE EXECUTED

TEST: TAC
CA
ACAL
TX
TI
H
XTIM
MO
NO
Y
MONOT
RM

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013746 040503
 013750 000114
 013752 005560
 013754 047514
 013756 044507
 013760 000103
 013762 001532
 013764 040504
 013766 040524
 013770 000000
 013772 006576
 013774 042522
 013776 042520
 014000 000124
 014002 004326
 014004 042504
 014006 047503
 014010 000104
 014012 006240
 014014 046117
 014016 040517
 014020 000104
 014022 010052
 014024 000000

*CA
 *L
 *AMCAL
 *LO
 *GI
 *C
 *OGIC1
 *DA
 *TA
 O
 *DA
 *RE
 *PE
 *T
 REPETE
 *DE
 *CO
 *D
 DECOD
 *OL
 *OA
 *D
 OLOAD
 O

:COMMAND DECODER DISPATCH LISTS

:DATA ROUTINES COMMAND LIST

DATLIST:

*C
 CHANI :INPUT CHANNEL ADDRESS
 *G
 GAINI :INPUT GAIN
 *N
 SAMPL :INPUT NUMBER OF SAMPLES
 *T
 TAKEN :GET "N" DATA POINTS
 *L
 LIST :LIST "N" SAMPLES OF DATA
 *A
 AVREGG :AVERAGE "N" SAMPLES
 *D
 DISPLY :DISPLAY SINGLE CHANNEL
 :IN DATA LIGHTS
 *LC
 LISTC :CONTINUOUS SAMPLE AND TYPEOUT
 *H
 HISTO :TYPE HISTOGRAM ON TELETYPE
 *AD
 ADBIN
 *V
 VSFIN
 *P
 PARAM1
 O

014026 000103
 014030 012310
 014032 000107
 014034 012202
 014036 000116
 014040 012000
 014042 000124
 014044 006624
 014046 000114
 014050 006716
 014052 000101
 014054 006746
 014056 000104
 014060 006772
 014062 041514
 014064 007060
 014066 000110
 014070 007242
 014072 042101
 014074 012572
 014076 000126
 014100 012474
 014102 000120
 014104 012134
 014106 000000

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:REPEATABILITY TEST COMMAND LIST

3467
3468
3469 014110 000111
3470 014112 004364
3471 014114 000103
3472 014116 012346

REPLST: 'I
REPETA
'C
CHAN2

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3473	014120	000107	'G
3474	014122	012202	GAIN1
3475	014124	000116	'N
3476	014126	012000	SAMPL
3477	014130	042101	"AD
3478	014132	012572	ADBIN
3479	014134	051105	"ER
3480	014136	012722	REPRES
3481	014140	041503	"CC
3482	014142	004466	REPET
3483	014144	052123	"ST
3484	014146	004442	REPETR
3485	014150	046505	"EM
3486	014152	012050	EMODE
3487	014154	000120	'P
3488	014156	012142	PARAM2
3489	014160	000000	0
3490	014162	012346	REPPAR: CHAN2
3491	014164	012202	GAIN1
3492	014166	012000	SAMPL
3493	014170	012722	REPRES
3494	014172	012050	EMODE
3495	014174	004434	REPETB
3496	014176	000000	0
3497			
3498			
3499	014200	013334	PARL1: MCHANA
3500	014202	015716	LOCHAN
3501	014204	013270	MGAIN
3502	014206	015710	LGAINO
3503	014210	013302	MSAMP
3504	014212	015702	SAMPLE
3505	014214	013530	MADRES
3506	014216	015726	ADRESO
3507	014220	013520	MVSFI
3508	014222	015724	VSF
3509	014224	000000	0
3510	014226	000103	OLOLST: 'C
3511	014230	012310	CHAN1
3512	014232	000107	'G
3513	014234	012202	GAIN1
3514	014236	052123	"ST
3515	014240	010100	OLOADT
3516	014242	000000	0

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3517	014244	013334	PARL2:	MCHANA
3518	014246	015716		LOCHAN
3519	014250	013223		MCOMMA
3520	014252	015720		HICHAN
3521	014254	013270		MGAIN
3522	014256	015710		LGAIND
3523	014260	013302		MSAMP
3524	014262	015702		SAMPLE
3525	014264	013530		MADRES
3526	014266	015726		ADRESO
3527	014270	013547		MREPRE
3528	014272	015740		RERES
3529	014274	013565		MEMODE
3530	014276	015776		CRFLG
3531	014300	000000		0

:GAIN CONVERSION TUMBLE LIST

3535	014302	001750	GNLST:	1000.
3536	014304	000310		200.
3537	014306	000144		100.
3538	014310	000062		50.
3539	014312	000012		10.
3540	014314	000024		20.
3541	014316	000002		2.
3542	014320	000001		1.
3543	014322	000000		0
3544	014324	376	GNEXP:	.BYTE -2,-1,-1,-1,0,0,1,1
3545	014327	377		
3546	014332	001		

3547			.EVEN	
3548	014334	001	GNSCL:	.BYTE 1,2,1.5,1.2,2.1
3549	014337	005		
3550	014342	002		

3551			.EVEN	
3552	014344	000031	SCLTAB:	31
3553	014346	000001		1
3554	014350	000062		62
3555	014352	000001		1
3556	014354	000113		113
3557	014356	000001		1
3558	014360	000144		144
3559	014362	000001		1
3560	014364	000310		310
3561	014366	000005		5
3562	014370	000454		454
3563	014372	000012		12
3564	014374	000764		764
3565	014376	000005		5
3566	014400	000000		0

3567		014422	.=. +20	
3568	014422	000000	INBUF:	0
3569		014450	.=. +20.	

:END OF PASS
 :UPDATE PASS COUNT

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3573          :TYPE END OF PASS MESSAGE
3574          :CHECK FOR TRACE TRAPPING ON NEXT PASS
3575
3576 014450 005267 001134 EOP: INC PASCNT
3577 014454 012767 000001 001134 MOV #1,TSTNO
3578 014462 104003 TYPE
3579 014464 013474 MLOGIC
3580 014466 013701 000042 MOV #42,R1
3581 014472 001405 BEQ TRAC ;BRANCH IF NOT AUTO LOAD
3582 014474 000005 RESET
3583 014476 004711 JSR PC,(R1)
3584 014500 000240 NOP
3585 014502 000240 NOP
3586 014504 000240 NOP
3587 014506 012706 016704 TRAC: MOV #STACK,SP
3588 014512 012716 000340 MOV #340,(SP)
3589 014516 005746 TRACOF: PUSH1SP
3590 014520 000167 000122 JMP TSTENT
3591 014524 000002 TRACES: RTI
3592
3593          :EMT DISPATCH SERVICE
3594          :ARGUMENT OF EMT IS EXTRACTED
3595          :AND USED AS OFFSET TO OBTAIN POINTER
3596          :TO SELECTED SUBROUTINE
3597
3598 014526 011646 EMTSRV: MOV (SP),-(SP) ;GET PC OF RETURN
3599 014530 162716 000002 SUB #2,(SP) ;PC OF EMT
3600 014534 017616 000000 MOV 2(SP),(SP) ;GET EMT
3601 014540 005716 TST (SP) ;IS EMT VALID
3602 014542 001002 BNE EMTOK
3603 014544 000000 HALT ;INVALID EMT
3604 014546 000776 BR -2
3605 014550 006316 EMTOK: ASL (SP) ;MULTIPLY EMT ARG BY 2
3606 014552 042716 177001 BIC #177001,(SP) ;CLEAR UNWANTED BITS
3607 014556 062716 016116 ADD #EMTTAB,(SP) ;POINTER TO SUBROUTINE ADDRESS
3608 014562 017616 000000 MOV 2(SP),(SP) ;SUBROUTINE ADDRESS
3609 014566 000136 JMP 2(SP)+ ;GO TO SUBROUTINE
3610
3611          :END OF SUBTEST SERVICE
3612          :CHECK FOR LOOP ON CURRENT TEST
3613          :CHECK FOR ESCAPE TO NEXT TEST ON ERROR
3614          :UPDATE ITERATION COUNT AND EXIT TO NEXT TEST IF 0
3615
3616 014570 005767 001214 LOOP: TST ERRFLG
3617 014574 001404 BEQ LOOPS
3618 014576 032767 002000 162764 BIT #SW10,SWR
3619 014604 001016 BNE LOOPX
3620 014606 032767 040000 162754 LOOPS: BIT #SW14,SWR
3621 014614 001032 BNE LOOPPL
3622 014616 032767 004000 162744 BIT #SW11,SWR
3623 014624 001006 BNE LOOPX
3624 014626 005367 000762 DEC ICOUNT
3625 014632 001403 BEQ LOOPX
3626 014634 016716 000752 LOOPER: MOV RETURN,(SP)
3627 014640 000002 RTI
3628 014642 005267 000750 LOOPX: INC TSTNO

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3629 014646 016705 000744 TSTENT: MOV TSTNO,R5
3630 014652 006305 ASL R5
3631 014654 006305 ASL R5
3632 014656 062705 016222 ADD #TSTTAB,R5
3633 014662 011567 000724 MOV (R5),RETURN
3634 014666 012516 MOV (R5)+,(SP)
3635 014670 011567 000720 MOV (R5),ICOUNT
3636 014674 005067 001110 CLR ERRFLG
3637 014700 000002 RTI
3638 014702 012767 000001 000704 LOOPL: MOV #1,ICOUNT
3639 014710 000751 BR LOOPER
3640
3641 ;CHECK FOR LOOPING WITH SAME DATA
3642 ;CHECK FOR ESCAPE TO NEXT TEST ON ERROR
3643
3644 014712 005767 001072 FREEZE: TST ERRFLG
3645 014716 001413 BEQ FREEZX
3646 014720 032767 002000 162642 BIT #SW10,SWR
3647 014726 001345 BNE LOOPX
3648 014730 032767 001000 162632 BIT #SW09,SWR
3649 014736 001403 BEQ FREEZX
3650 014740 017616 000000 MOV @ (SP), (SP)
3651 014744 000002 RTI
3652 014746 062716 000002 FREEZX: ADD #2,(SP)
3653 014752 000002 RTI
3654
3655 ;GENERAL ERROR SERVICE
3656 ;ONLY PC OF FAILING TEST IS OUTPUT TO TELEPRINTER
3657
3658 014754 104004 ERR: SAVDSP
3659 014756 032767 020000 1626J4 BIT #SW13,SWR
3660 014764 001003 BNE ERRORR
3661 014766 104005 OCTASC
3662 014770 000001 1
3663 014772 015620 SAVPC
3664 014774 104006 ERRORR: RES05
3665
3666 ;ERROR HALT SERVICE
3667
3668 014776 032767 100000 162564 ERRORRH: BIT #SW15,SWR
3669 015004 001405 BEQ ERRORX
3670 015006 010046 PUSHRO
3671 015010 016700 000604 MOV SAVPC,R0
3672 015014 000000 HALT
3673 015016 012600 POPRO
3674 015020 012767 000001 000762 ERRORRX: MOV #1,ERRFLG
3675 015026 000002 RTI
3676
3677 ;CHANNEL ADDRESS ERROR SERVICE
3678
3679 015030 104004 ERRRC: SAVDSP
3680 015032 032767 020000 162530 BIT #SW13,SWR
3681 015040 001355 BNE ERRORR
3682 015042 104005 OCTASC
3683 015044 000003 3
3684 015046 015620 SAVPC

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3685 015050 015526 SAVRS
3686 015052 015630 SAVR4
3687 015054 000747 BR ERRORR
3688
3689
3690
3691 ;INTERGER BINARY TO BCD ASCII CONVERSION
3692 ;TYPE LEADING OS, NO CR-LF
3693 015056 005067 000226 BCDSCO: CLR SUOFLG ;TYPE LEADING OS
3694 015062 012767 000001 000302 MOV #1,CCRFLG ;SUPPRESS CR-LF
3695 015070 012767 000012 000414 MOV #10,RADIX ;SET UP FOR BCD
3696 015076 012767 000005 000544 MOV #5,CHRCNT ;5 DIGITS PER WORD
3697 015104 000455 BR BINASC ;DO CONVERSION
3698
3699 ;INTERGER BINARY TO BCD ASCII CONVERSION
3700 ;SUPPRESS LEADING OS
3701 ;SUPPRESS CR-LF
3702 015106 012767 000001 000256 BCDSN: MOV #1,CCRFLG ;SUPPRESS CRLF
3703 015114 012767 000001 000166 MOV #1,SUOFLG ;SUPPRESS LEADING OS
3704 015122 012767 000012 000362 MOV #10,RADIX ;SET UP FOR BCD
3705 015130 012767 000005 000512 MOV #5,CHRCNT ;SET UP FOR 5 DIGITS PER CHARACTER
3706 015136 000440 BR BINASC
3707
3708 ;FRACTIONAL BINARY TO BCD ASCII CONVERSION
3709
3710 015140 005067 000226 DCBCC: CLR CCRFLG
3711 015144 000167 173564 JMP DECBC
3712
3713 ;FRACTIONAL BINARY TO BCD CONVERSION
3714 ;SUPPRESS CR-LF
3715
3716 015150 012767 000001 000214 DCBCO: MOV #1,CCRFLG
3717 015156 000167 173552 JMP DECBC
3718 ;INTERGER BINARY TO OCTAL ASCII CONVERSION
3719
3720 015162 005067 000204 OCTASN: CLR CCRFLG ;TYPE CARRIAGE RETURN AND LINE FEED
3721 015166 005067 000116 CLR SUOFLG ;PRINT LEADING OS
3722 015172 012767 000010 000312 MOV #10,RADIX ;SET UP FOR OCTAL CONVERSION
3723 015200 012767 000006 000442 MOV #6,CHRCNT ;CONVERT 6 CHARACTERS PER WORD
3724 015206 000414 BR BINASC ;GO TO CONVERSION COMMON ROUTINE
3725
3726 ;INTERGER BINARY TO BCD ASCII CONVERSION
3727 ;WITH LEADING 0 SUPPRESSION
3728 ;TYPE CARRIAGE RETURN-LINE FEED BEFORE DATA
3729
3730 015210 005067 000156 BCDACO: CLR CCRFLG ;TYPE CARRIAGE RETURN AND LINE FEED
3731 015214 012767 000001 000066 MOV #1,SUOFLG ;SUPPRESS LEADING OS
3732 015222 012767 000012 000262 MOV #10,RADIX ;SET UP FOR DECIMAL CONVERSION
3733 015230 012767 000005 000412 MOV #5,CHRCNT ;CONVERT 5 CHARACTERS PER WORD
3734 015236 000400 BR BINASC ;GO TO CONVERSION COMMON ROUTINE
3735
3736 ;INTERGER BINARY TO ASCII CONVERSION COMMON ROUTINE
3737
3738 015240 011605 BINASC: MOV (SP),R5 ;GET POINTER TO DATA
3739 015242 012704 016016 MOV #MBCD+2,R4 ;SET UP POINTER FOR CONVERTED DATA
3740 015246 012567 000370 MOV (R5)+,WACCNT ;GET NUMBER OF WORDS TO BE CONVERTED

```

000230	BINAS1:	MOV	2(R5)+, BINWRD
000231		MOV	CHRCNT, R0
000232		MOV	*TEMAB, R1
000212	BINS1A:	EXTRACT	
000233		ADD	#60, DIGIT
000234		MOVB	DIGIT, (R1)+
000235		DEC	R0
000236		BNE	BINS1A
000237		TST	(PC)+
000238	SUDFLG:	0	
000239		BEG	BINAS3
000240		MOV	CHRCNT, R0
000241		MOV	R1, R2
000242	BINAS2:	CMFB	#60 - (R2)
000243		BNE	BINAS3
000244		DEC	R0
000245		BEG	BINAS3
000246		BR	BINAS2
000247	BINAS3:	MOV	CHRCNT, R0
000248	BINS3A:	MOVB	-(R1), (R4)+
000249		DEC	R0
000250		BNE	BINS3A
000251		MOVB	#40, (R4)+
000252		DEC	WRDCNT
000253		BNE	BINAS1
000254		MOVB	#C, -(R4)
000255		MOV	R5, (SP)
000256		TST	(PC)+
000257	CCRFLG:	0	
000258		BNE	BINAS4
000259		TYPE	
000260		MBCD	
000261		RTI	
000262	BINAS4:	TYPE	
000263		MBCD+2	
000264		RTI	

:SINGLE PRECISION UNSIGNED DIVIDE LOOP

000072	DIVI:	CLR	DIVIDH
000066	DIVIU:	CMF	DIVIDH, DIVIS
000021		BHIS	DIVIB
000046		MOV	#17, DIVCNT
000046	DIVIA:	BR	DIVIC
000040		CMF	DIVIDH, DIVIS
000034		BLO	DIVIC
000026	DIVIC:	SUB	DIVIS, DIVIDH
000024		ROL	DIVIDL
000022		ROL	DIVIDH
000021		DEC	(PC)+
000020	DIVCNT:	0	
000018		BNE	DIVIA
000017		ROR	DIVIDH
000016		COM	DIVIDL
000015		RTI	

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DIVIB: HALT
 DIVIDL: 0
 DIVIDH: 0
 DIVIS: 0

;SAVE PC OF TEST THAT FAILED AND RO-R5

015514 016667 000004 000076 SVOSP: MOV 4(SP),SAVPC

;SAVE RO-R5

015522 010567 000100 SVOS: MOV R5,SAVR5
 015526 010467 000076 MOV R4,SAVR4
 015530 010367 000074 MOV R3,SAVR3
 015536 010267 000072 MOV R2,SAVR2
 015542 010167 000070 MOV R1,SAVR1
 015546 010067 000066 MOV R0,SAVR0
 015552 000002 RTI

;RESTORE RO-R5

015554 016700 000060 RSOS: MOV SAVR0,R0
 015560 016701 000052 MOV SAVR1,R1
 015564 016702 000044 MOV SAVR2,R2
 015570 016703 000036 MOV SAVR3,R3
 015574 016704 000030 MOV SAVR4,R4
 015578 016705 000022 MOV SAVR5,R5
 015584 000002 RTI

;TELETYPE OUTPUT ROUTINE

;PROGRAM VARIABLES

MTFFLG: 0
 PASCNT: 00
 RETURN: 00
 ICOUNT: 00
 TESTNO: 000000
 SAVPC: 000000
 SAVR5: 000000
 SAVSP: 000000
 SAVR5: 000000
 SAVR4: 000000
 SAVR3: 000000
 SAVR2: 000000
 SAVR1: 000000
 SAVR0: 000000
 WPCNT: 000000
 DELAY: 0

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:VARIABLES

INCNT: 0
 CHRCNT: 0
 JUTCHN: 0
 INCHAN: 0
 CNTR1: 0
 CNTR4: 0
 CNTR5: 0
 POINT1: 0
 POINT2: 0
 ECONT: 0
 P: 0

:PROGRAM CONTROL PARAMETERS

SYSUN: 0
 SYSUNB: 0
 SAMPLE: 1
 LOGCN: 0
 LOGAIN: 0
 LGAINO: 0
 HGAINO: 0
 HIGAIN: 0
 LOCHAN: 0
 HICHAN: 37
 MAXCHN: 0
 VSF: 1
 ADRESO: 0
 ADRES: 1
 ADBIT: 0
 ADMASK: 0
 CHNCNT: 37
 PERES: 0
 SAMTAB: 0

:INDIRECT POINTERS

AFCINT: 134
 AFCPS: 136
 AFCSR: 172570
 AFDBR: 172572
 AFCAR: 172574
 AFCMN: 172576
 TKCSR: 177560
 TKDBR: 177562
 TPCSR: 177564
 TPDBR: 177566
 CPRET: 0
 CRPET: REPORT

:PROGRAM CONTROL FLAGS

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CPFLG: 0
CRFLG: 0
TYPEFLG: 0
GFLG: 0
VSFFLG: 0
REPFLG: 0
ERRFLG: 0
SINTFL: 0

MBCD: .ASCII (15)(12)::
.=.100
.EVEN

;EMT DISPATCH TABLE

EMTAB: ERRAC
LOOP
FREEF
TYPEF
SVOSF
OCTASN
RSCOS
OCTVY
ERRR
BCCACO
RSCBIZ
INSTR
INSTR
BCCBNN
OCTVY
SVOSF
OCTBCC
RSCBCC
BCCSCC
OCTVY
RSCBCC
DISPT
BCCSN
OCTVY

EMTLEN:
IS: 100

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DAPR.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

3190#	3460	3478	3936				
3193#	3215						
3201	3207	3213	3216#				
3203	3215	2538	2540	3197*	3203*	3209*	3885#
3205	3401						
3207	3204						
3209	3212	2214#					
3211	3212						
3213	3212						
3215	3212						
3217	3212						
3219	3212						
3221	3212						
3223	3212						
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[illegible]

BDCDNT	010730	2901*	2805	2845#															
BDCERR	010720	2814	2816	2818	2821	2923	2926	2840#											
BDCEXT	010706	2810	2819	2836#															
BDCFIN	011340	2927#	2945	2955															
BDCFNI	011404	2935	2939#																
BDCSCJ	015056	3693#	3945																
BDCSN	015106	3702#	3949																
BDCTAB	010724	2804	2842#																
BDCWD1	010724	2843#	3023	3027	3028*	3029*	3030*	3031*	3032*	3033	3045	3047	3051	3063					
		3065	3105	3108	3130	3132	3145	3149	3151	3177	3179	3181	3195	3200					
		3206	3212	3225	3227														
BDCWD2	010726	2844#	3147	3150	3151*	3153	3155												
BFINASC	015240	3697	3706	3724	3734	3739#													
BFINAS1	015252	3741#	3755																
BFINAS2	015322	3754#	3758																
BFINAS3	015336	3751	3755	3757	3759#														
BFINAS4	015404	3770	3774#																
BFINAS1A	015266	3744#	3748																
BFINAS2A	015342	3760#	3762																
BFINARD=	015506	940#	2857*	2865	2868*	2872*	2875*	2878*	2879	2884	3741*								
CAT2	004210	1967#																	
CAT2A	004242	1973#																	
CAT2B	004254	1974	1976#																
CAT2C	004302	1981	1985#																
CAT2D	004322	1987	1991#																
CAT2E	004324	1977	1992#																
CAT2L	004260	1978#	1984	1990															
CCRFLG	015372	2934	3694*	3702*	3710*	3716*	3720*	3730*	3769#										
CHAN1	012310	3125#	3441	3511															
CHAN1A	012316	3128#	3135																
CHAN1E	012342	3131	3134#																
CHAN2	012346	3140#	3472	3491															
CHAN2A	012354	3143#	3162																
CHAN2E	012470	3146	3148	3152	3154	3161#													
CHNCNT	015736	2035	2052	2124	2142	2159	3155*	3156*	3157	3927#									
CHRONT	015650	2737*	2757*	2906*	2813	2825*	2871*	2901*	3273	3696*	3705*	3723*	3733*	3742					
		3752	3759	3856#															
		961#	2151																
CLOCWZ=	000257																		
CNTR1	015656	3859#																	
CNTR2	010732	2805*	2837*	2846#															
CNTR3	011522	2918*	2923*	2925*	2950*	2953*	2954*	2961*	2964#										
CNTR4	015660	2035*	2045*	2052*	2069*	2142*	2155*	2153*	2179*	2364*	2394*	3360#							
CNTRS	015662	2028*	2071*	2141*	2157*	2341*	2386*	2390*	3861#										
CONTC	013060	1421	3265#	3303															
CONTP	013122	1426	3285#																
CONTR	013136	1431	3293#																
CPFLG	015774	1422	1443*	1997*	2191*	2224*	2270*	2312*	2335*	2404*	2690*	3910#							
CPRET	015770	2001*	2223*	2334*	2405*	2691*	3283	3904#											
CRFLG	015776	1427	1444*	2083	2192*	2225*	2271*	2313*	2336*	2403*	2699*	3062*	3067*	3530					
		3911#																	
CPRET	015772	3296	3905#																
CATA	006576	2403#	3421																
DATAB	016504	921	928	946	2050	2133	2143	2160	2161	2419	2439	2505	2533	2546					
		2612	3159	4001#															
DATAP	006616	2405	2406#	2409	2480														
DATAP1	006156	2068*	2093	2279*	2284	2297	2300*	2303#	2366*	2367*	2369*	2369*	2372	2373					

DATA2	006160	2441*	2444	2453*	2458	2495*	2498	2661*	2664	2371*	2372	2378
DATLST	014026	2090*	2094	2283*	2295	2298	2300	2304*	2370*			
DCBCO	015140	2407	3440#									
DCBCO	015150	2710#	3943#									
DECBB1	010752	2715#	3944									
DECB0	010734	2857#	2931									
DECB0A	011132	2853#	3711	3717								
DECB0B	011132	2885#	2899	2902								
DECB0C	011234	2907#										
DECB0C=	104022	1016#	2091	2456	2662							
DECB0D=	104020	1012#	2442	2496								
DECB0E	011036	2966	2870#									
DECB0F	011124	2874	2877	2880	2994*							
DECB0G	011214	2983	2898#									
DECB0H	011222	2988	2897	2900#								
DECB1	011012	2862	2864#									
DECEDN	011326	2920	2935#									
DECE01	011334	2926#	2955									
DECEG	011430	2912	2946#									
DECEGA	011440	2947	2950#									
DECEGI	011446	2951#										
DECEJ2	011476	2913	2949	2957#								
DECEK	011266	2915#	2917									
DECEX	011252	2909	2911#									
DECEXP	011530	2859*	2861	2863*	2896*	2898*	2911	2916*	2950	2954	2967#	
DECE0	011300	2918#	2958									
DECE01	011306	2919#	2924									
DECMOV	011504	2926	2951	2959#	2962							
DECOA1	006346	2349	2352#									
DECOB1	006410	2358	2361#									
DECOD	006240	2334#	3429									
DECODEA	006314	2345#	2353	2387	2391							
DECODEB	006356	2347	2354#	2362								
DECODEC	006420	2356	2363#									
DECODED	006542	2373	2392#									
DECODEE	006532	2375	2390#									
DECODEF	006260	2334	2337#									
DECODEI	006434	2365#	2381	2385								
DECSGN	011524	2864*	2969*	2908	2965#							
DECO	011412	2867	2942#									
DELAY	015644	1520*	1527*	1883*	1899*	1944*	1953*	3850#				
DELAY1	006236	2319	2323#									
DIGCON	011174	2891	2894#									
DIGEXT	011156	2890#	2893									
DIGIT =	015510	941#	3745*	3746								
DIS_ST	011706	2998#	3003	3014#								
DISPAT=	104026	1024#										
DISPA1	011644	3003#	3013	2406	2692							
DISPA2	011654	3005#	3011									
DISPA3	011676	3006	3010#									
DISPLY	006772	2465#	3453									
DISPL1	007016	2472#	2479									
DISPL2	007030	2474#	2475									
DISPT	011624	2996#	3948									
DISCNT	015466	3784*	3792#									
DISCNT	015412	3781#	3933	3946								

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DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

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DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

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DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

[illegible]

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 DZAFAC.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

REPRES	012722	3220*	3480	3494										
REPTRN	004424	2011	2013*											
REFRES	015740	2064	3227*	3528	3989*									
REFCOS =	104006	992*	3089	3664										
RETURN	015612	1450*	3626	3633*	3837*									
RSOS	015554	3919*	3932											
ALOCUT	013112	3279*	3305											
RO	=000000	925*	1331	1332*	1334	1337*	2007*	2008	2012	2204*	2476*	2509*	2510*	2511
		2827*	2829*	2930	2936	2958*	3043*	3044*	3045	3078*	3080*	3081	3082	3090
		3234	3255*	3671*	3742*	3747*	3752*	3755*	3759*	3761*	3814	3819*		
R1	=000001	926*	2059*	2060*	2284*	2285*	2287*	2288	2420*	2428*	2439*	2441	2507*	2511*
		2517*	2551*	2552*	2621*	2632*	2752*	2753*	2754	2808*	2828*	2829	2830*	2831*
		2832	3235	3254*	3580*	3582	3743*	3746*	3753	3760	3813	3820*		
R2	=000002	927*	2423*	2431*	2710*	2445*	2508*	2512*	2516	2548*	2549*	2550*	2554*	2556
		2560	2564*	2565*	2705*	2596*	2604*	2607*	2608	2610*	2614*	2615	2759*	2760
		2762	2763*	2764	2807*	2828	2832*	2837*	2834*	3236	3253*	3753*	3754	3812
		3821*												
R3	=000003	928*	2134*	2139*	2149*	2150*	2152	2161*	2177*	2248*	2249*	2421*	2422*	2424
		2506*	2513*	2547*	2567*	2595*	2603*	2626*	2628	2649*	2651*	2654*	2656*	2723*
		2735*	2739*	2755*	2804*	2836*	2855*	2856*	2910*	2914*	2915*	2921*	2927*	2929*
		2933*	2942*	2943*	2944*	2952*	2957*	2960*	3004*	3005	3237	3252*	3811	3822*
R4	=000004	929*	1391*	1392	1979*	1980	2054*	2055*	2056	2058*	2062*	2064	2133*	2137*
		2138*	2143*	2152*	2153*	2160*	2163	2164	2419*	2427*	2470*	2471*	2473	2505*
		2509	2531*	2532*	2533	2546*	2549	2574*	2576	2578	2590	2594*	2597	2606*
		2607	2608	2610	2611	2612	2622*	2623*	2624	2625*	2627*	2630*	2631*	2634*
		2635	2637	2639*	2640*	2645*	2646*	2647*	2648*	2650*	2653*	2655*	2658*	2732*
		2734*	2738*	2754*	2779*	2779	2781	2783	2803*	2809	2811	2815	2817	2820*
		2822	2824*	2827	2870*	2881*	2894*	2900*	2907*	2919	2922*	2946	2948*	2959*
		2960	3003*	3005	3009	3010	3103*	3105	3116	3139*	3200	3205*	3206	3211*
		3212	3238	3251*	3739*	3760*	3763*	3766*	3810	3823*				
RE	=000005	930*	1971*	1973	1975*	1976	1979	1980	1985	1991*	2245*	2246*	2247	2253*
		2254*	2318*	2320*	2726*	2727	2728	2729	2733*	2779	2781	2793	2796	2797*
		2788*	2789	2800*	2801	2802	2853*	2854	2857*	2932	2937*	2939	2999	3239
		3250*	3629*	3630*	3631*	3632*	3633	3634	3635	3738*	3740	3741	3767	3829
		3824*												
SAMPLE	012034	3046	3049*											
SAMPLE	012000	3038*	3445	3476	3493									
SAMPLE	015702	2141	2162	2169	2420	2440	2506	2515	2521	2547	2578	30514	3524	3524
		3873*												
SAMPLE1	012006	3041*	3050											
SAMPLE2	012040	3048	3051*											
SAMPLE3	015742	2036	2051	3157*	3159*	3159*	3899*							
SAMPLE4	015620	3663	3671	3684	3805*	3840*								
SAMPLE5	015622	3841*												
SAMPLE6	015640	3814*	3819	3848*										
SAMPLE7	015636	3813*	3820	3847*										
SAMPLE8	015634	3812*	3821	3846*										
SAMPLE9	015632	3811*	3822	3845*										
SAMPLE10	015630	3686	3810*	3823	3844*									
SAMPLE11	015626	3685	3809*	3824	3843*									
SAMPLE12	015624	3241*	3248	3842*										
SAMPLE13	104004	988*	3083	3658	3679									
SAMPLE14	011526	2860*	2873	2876	2966*									
SAMPLE15	014344	2574	3552*											
SAMPLE16	104001	982*	1478	1492	1508	1539	1562	1576	1590	1615	1645	1673	1701	1730
		1759	1788	1817	1846	1874	1893	1913	1934	1959	1992			

SW01	=	0000002
SW02	=	0000004
SW03	=	0000010
SW04	=	0000020
SW05	=	0000040
SW06	=	0000100
SW07	=	0000200
SW08	=	0000400
SW09	=	0010000
SW10	=	0020000
SW11	=	0040000
SW12	=	0100000
SW13	=	0200000
SW14	=	0400000
SW15	=	1000000
SYSUN		015676
SYSUNB		015700
TAKEN		006624
TAKEN1		006660
TAKEN2		006670
TAKEN3		006710
TEMP1		010046
TEMPAB		016352
TKCSR		015760
TKDBF		015762
TPB		001242
TPCSR		015764
TPCGR		015766
TPG		001240

984*	1993	1999											
1410*	1432*	2742	2744*	3917*									
931*	1331*	1332	1333*	1334*	1336	1337	1340	1342*	1344*	1350	1354	1355*	1355*
1356*	1359*	1355*	1406*	2010*	2011*	2726	2729*	2785*	2800	2802*	2853	2853*	2853*
2399*	2999*	3234*	3235*	3236*	3237*	3238*	3239*	3240*	3241	3248*	3249	3250	3250*
3251	3252	3253	3254	3255	3297*	3295*	3587*	3589*	3596*	3599*	3600*	3601	3601
3605*	3606*	3607*	3608*	3609	3626*	3634*	3650*	3652*	3738	3757*	3805		
2746	2748	2759*											
2760*	2766												
2761	2763*												
2759	3200*												
939*	3587												
1308	1375*												
1390	1393*												
1394	1396*												
1619*	1621	1646*	1649	1674*	1677	1702*	1705	1731*	1734	1760*	1763	1789*	1789*
1792	1818*	1821	1947*										
1010*	2225	2337											
3018*	3941												
3021*	3026												
3024	3027*												
3693*	3703*	3721*	3731*	3750*									
3809*													
3805*	3930												
535*	2074	2201	2205	2235	2348	2352	2357	2361	2374	2380	2479	3619	3619
3620	3622	3646	3648	3659	3668	3680							
920*													
919*													
918*													
917*													
916*													
915*													
914*													
913*													
912*	3648												
911*	3618	3646											
910*	3622												
909*													
908*	3659	3680											
907*	3620												
906*	3668												
3027*	3871*												
2229	2345	2354	2363	3033*	3872*								
2415*	3447												
2423*	2433												
2425*	2426												
2429	2431*	2432											
2615*	2628	2643*	2691*	2899*	2892*	2894							
2531	2622	2634	2642	2645	2660	2870	2907	3743	3997*				
381*	1409*	2005*	2015*	2195*	2230*	2273*	2316*	2343*	2472*	2697*	2740	3007*	3007*
3900*													

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TRAC      014506
TRACES    014524
TRACOF    014516
TSTENT    014646
TSTLST    013714
TSTNRA    010470
TSTNRM    010464
TSTNA1    010520
TSTNA2    010524
TSTNA3    010530
TSTNA0    015616
TSTTAB    016222
TYPE      = 104033

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TYPE	001:76
TYPE1	00:220
TYPEFLG	016000
T0	00:576
T1	001632
T10	002350
T11	002470
T12	002610
T13	002730
T14	003056
T15	003204
T16	003332
T17	003460
T2	001672
T20	003606
T21	003716
T22	003770
T23	004036
T24	004114
T25	004210
T3	001732
T4	002042
T5	002150
T6	002204
T7	002240
URANGE	010044
VSE	015724
VSFE	012566
VSFFLG	016004
VSFIN	012474
VSFNA	012502
VSFNI	012524
VSFMAN	012526
VSFCONT	015642
X	000017

[illegible]

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DZAFAC.P11 CROSS REFERENCE TABLE -- MACRO NAMES

1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453
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[illegible]

J08

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DZAFAC.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

RJR	2060	2062	2552	2976	2979	2980	2985	3794							
RT:	1338	1362	1433	2208	2213	2430	2447	2459	2526	2578	2770	2829	2938	2941	2986
	3034	3052	3071	3092	3114	3133	3160	3174	3216	3228	3591	3627	3637	3651	3653
	3675	3703	3776	3795	3815	3825									
RTS	1351	2180	2963												
SCB	2055	2172	2295	2525	2549	2890	2954	3151	3599	3788					
SLAB	3109														
TS*	1336	1377	1382	1392	1422	1427	1463	1459	1530	1547	1571	1585	1892	1904	1909
	1912	1923	1925	1930	1933	1947	1950	1958	1970	1976	1986	2008	2025	2056	2082
	2112	2151	2242	2290	2572	2576	2600	2611	2705	2742	2764	2789	2865	2879	2908
	2911	2934	3010	3047	3063	3090	3116	3179	3273	3601	3616	3644	3749	3768	
TS*	1348	1525	1531	1553	1574	1588	1604	1609	1629	1636	1657	1664	1685	1692	1713
	1720	1742	1749	1771	1778	1800	1807	1829	1836	1863	1887	1907	1928	1953	2040
	2147	2277	2281	2425	2474	2493	2703	2740	2749	2809	2815	2861	2913	2946	
WAT	2200														
.ABS	886														
.ASC11	3384	3919													
.ASC12	3313	3317	3318	3319	3320	3321	3322	3323	3324	3325	3326	3327	3332	3334	3335
	3339	3342	3345	3350	3352	3353	3356	3358	3360	3362	3364	3365	3367	3370	3373
	3376	3378	3388	3390	3392										
.BYTE	1363	1364	2312	3544	3546										
.END	4002														
.EVEN	3394	3547	3551	3921											
.LIST*	1	2	884	1310											
.MACR	969	973	975	976	977										
.MACRO	1														
.NLIST*	1	834	1310												
.PAGE	1310	1368	1435	2183	2218	2262	2327	2395							
.REPT	2	1025	1627	1705	3029	3110									
.SBT*L	1310	1368	1435	2183	2218	2262	2327	2395							
.TITLE	885														

% ERRORS DETECTED: 1
DEFAULT GLOBALS GENERATED: 0

*DZAFAC DZAFAC SEQ/SOL/CRF/DS:ERFZ/EN:ABS*DSKM:SYSMAC.SML,DSKM:DZAFAC.P11
RUN-TIME: 12 24 5 SECONDS
RUN-TIME RATIO: 188/42*4.3
COFE USED: 15K (29 PAGES)

K08

Spooler runtime 13 Seconds, 60 KCS, 341 disk reads, 4 disk writes, 100 pages

15-00000

[illegible]

11			...B1	2404	006602	012767	...B5
59			...C1	2460	006770	000302	...C5
95			...D1	2516	007170	010267	...D5
151			...E1	2572	007414	005767	...E5
180			...F1	2628	007626	026723	...F5
224			...G1				...G5
290			...H1	2692	010072	104026	...H5
336			...I1	2748	010362	100420	...I5
391			...J1	2804	010554	012703	...J5
437			...K1	2860	010770	115067	...K5
468			...L1	2916	011272	005267	...L5
503			...M1	2972			...M5
557			...N1	3028	011744	006367	...N5
607			...B2	3084	012160	104003	...B6
649			...C2	3140	012346	104013	...C6
673			...D2	3196	012612	012767	...D6
721			...E2	3252	013036	012603	...E6
777			...F2	3308	013166	000000	...F6
803			...G2	3364	013514	005015	...G6
849			...H2	3420	013770	000000	...H6
893			...I2				...I6
949		000100	...J2	3492	014142	004466	...J6
1005		000015	...K2	3526	014266	015726	...K6
1061	000064	000066	...L2	3582	014474	000005	...L6
1117	000244	000246	...M2	3638	014702	012767	...M6
1173	000424	000426	...N2	3694	015062	012767	...N6
1229	000604	000606	...B3	3750	015310	000000	...B7
1285	000764	000766	...C3	3806	015514	016667	...C7
1319			...D3	3862	015664	000000	...D7
			...E3	3918	016012	000000	...E7
1377	001256	005737	...F3	3974	016274	004000	...F7
1423	001530	000002	...G3	ADINTA	002316		...G7
1444	001536	005067	...H3	ADT7C	002450		...H7
1500	001672	012777	...I3				...I7
1556	002120	052767	...J3	DECBCC=	104022		...J7
1612	002330	005077	...K3	DONE =	000200		...K7
1668	002564	022626	...L3	HISTOM	007622		...L7
1724	003030	104010	...M3	MAVRG	013255		...M7
1780	003274	000240	...N3	MXTIMA	006230		...N7
1836	003542	105777	...B4				...B8
1892	003762	005777	...C4				...C8
1948	004150	100001	...D4	SPCHR1	010442		...D8
2004	004362	000775	...E4	TSTNA3	010530		...E8
2060	004662	006001	...F4				...F8
2116	005066	000001	...G4	.STYPE	1*	1310	...G8
2172	005354	162767	...H4		2202	2373	...H8
2192	005432	005067	...I4	HALT	1036	1038	...I8
2227	005602	104003	...J4		2112	2167	...J8
2271	005776	005067	...K4	**END**	USER DAVIES, TOM		...K8
2336	006254	005067	...L4				
2370	006466	016767	...M4				
			...N4				